

SECTION 323253
LANDSCAPE STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Outcropping Stone
2. Dry Laid Stone Walls
3. Drainage Aggregate
4. Compacted Aggregate Base
5. Rip Rap

- B. Related Sections include the following:

1. Division 2 Section Earthwork for soil materials, excavating, backfilling, and site grading.

1.3 REFERENCES

- A. Michigan Department of Transportation (MDOT), Standard Specifications for Construction current edition.

1.4 SUBMITTALS

- A. Submit product samples for all types of landscape stone.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Outcropping Stone: Natural quarried dolomitic stone, Provide the following type, size range, and color:

1. Type: Split Face or Weathered Edge
2. Size: 3'-5' length, 8"-12" face height, 30"-36" wide
3. Color: Lake Michigan Limestone natural color range, or University approved equal.

- B. Dry Laid Stone Walls: Natural quarried dolomitic stone, Provide the following type, size range, and color
 - 1. Type: Split Face or Weathered Edge.
 - 2. Size: 1'-3' length, 6"-12" face height, 18"-24" wide
 - 3. Color: Lake Michigan Limestone natural color range, or University approved equal.
- C. Compacted Aggregate Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; MDOT 22A, as defined in Michigan Standard Specifications for Construction.
- D. Drainage Aggregate:: Clean $\frac{3}{4}$ " – 1 $\frac{1}{2}$ " diameter washed stone.
- E. Geotextile Fabric for Drainage Backfill:
 - 1. Separation Fabric: 4oz. minimum/square yard, non-woven geotextile fabric.
 - a. TerraTex SD, as manufactured by Hanes Geo Components, or University approved equal.
- F. Rip Rap:
 - 1. Complying with MDOT 813 and 916 except as herein specified:
 - a. Stone to be sound, tough, and durable rock or stone; broken concrete pieces are not acceptable.
 - b. Stone to be washed, native, angular river stone or rock.
 - c. Smaller pieces of angular river stone or rock must be used for filling spaces between rip rap stone.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Grade slope bank to a maximum slope of 1 horizontal to 1 vertical.
- B. Compact subgrade to 95% of Maximum Unit Weight.
- C. Place and compact aggregate base to 95% Maximum Unit Weight.
- D. Place and secure geotextile fabric as shown on the Plans.
- E. Place backfill aggregate inside geotextile fabric in \pm 12 inch wide trench, hold down 4" from top of stone.
- F. Tolerance: \pm 0.2 feet from plan grade.

3.2 INSTALLATION

- A. Landscape Stone: Review placement of stone with Owner's Representative.
- B. Vertical joints between outcropping stone courses of stone shall overlap a minimum of 1 foot.

Project Name
Western Michigan University
WMU Project Number XXXX
OCBA Project Number XXXX
Author: XXXX
Issued for XXXX

LANDSCAPE STONE - **DRAFT**

Section 323253

- C. Courses of stone shall be stepped back or forward as shown on Drawings or as directed by the Owner's Representative in the field.
- D. Stone shall be stacked in irregular, natural patterns. Uniform or running bond stacking will be rejected.
- E. Shim stone as necessary to prevent any rocking motion between courses.

3.3 CLEAN UP

- A. All excess and waste material shall be disposed of legally off-site.
- B. Upon completion of Work, leave areas in clean condition.

END OF SECTION 323253

Project Name
Western Michigan University
WMU Project Number XXXX
OCBA Project Number XXXX
Author: XXXX
Issued for XXXX

LANDSCAPE STONE - **DRAFT**

Section 323253

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 328400
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 DESCRIPTION OF WORK

A. General:

- 1. The extent of base landscape irrigation as shown on the Drawings.
- 2. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for the proper installation and completion of the work, whether or not each necessary item is mentioned herein. The plans and specifications are intended to be cooperative and any time called for in one and not the other shall be as binding as if called for in both.

1.2 QUALITY ASSURANCE

A. Manufacturing Qualifications:

- 1. Provide the landscape irrigation system as a complete unit produced by the manufacturers specified for all portions of the work including heads, valves, piping circuits, controller, pump and accessories. Materials shall be purchased from the nearest authorized distributor to the project of the specified products.

B. Installer Qualifications:

- 1. Acceptable installers per General Conditions of Specifications.

C. Testing:

- 1. Pressure testing/verification shall be the responsibility of the irrigation contractor.

D. Requirements of Regulatory Agencies:

- 1. System shall comply with the requirements of state and local codes and ordinances.
- 2. Electrical devices shall carry Underwriters' Laboratory labels.

1.3 REFERENCES

- A. ASTM D2241 - Polyvinyl chloride plastic pipe.
- B. ASTM D2564 - Solvent cement for polyvinyl chloride plastic pipe and fittings.
- C. ASTM D2239- Flexible Polyethylene pipe.

1.4 SUBMITTALS

- A. As-Builts:
 - 1. Submit as-built drawings after Substantial Completion.
- B. Manufacturer's Data:
 - 1. Submit two copies of manufacturer's specifications and instructions for any materials and products to be substituted for those specified, no later than 10 business days prior to original bid date.

1.5 GUARANTEE

- A. The Contractor shall furnish a written warranty to the effect that all materials and work furnished under this section is warranted for at least one year, shall be free from defects and faulty workmanship and that any defective material or work shall be promptly repaired or replaced without additional cost to the Owner.

1.6 PROJECT/SITE CONDITIONS

- A. Protection:
 - 1. Protect structures, streets, curbs, sidewalks, fences, walls, trees and other existing features from damage.
- B. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted, and then only after arranging to provide temporary water service according to requirements indicated by Owner and construction manager.
- C. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.

1.7 SEQUENCING/SCHEDULING

- A. Irrigation contractor must coordinate closely his operations with the general contractor including the attendance of regular construction meetings. Extra care should be taken on the delivery and installation of the system.

1.8 OPERATION AND MAINTENANCE

- A. Provide instructions covering full operation, care and maintenance of system and controls. Also provide manufacturers' parts catalogs.
- B. Provide schedule showing length of time each valve is to be open (during May, July and September) to serve as a guide for the owner in establishing an appropriate water-window.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backflow Preventer - Irrigation contractor will be connecting to a service line at the approximate location shown on the plan. Refer to MEP plans as noted for more specifics. The backflow preventer is being installed by others in the building.
- B. Automatic Controller — Controller shown below is the basis of design. Other controllers can be submitted for approval, but will be evaluated on their compatibility with the campus BAS system, described in Part 3 — EXECUTION, Paragraph 3.3. All controllers will have a commensurate weather-station installed. Controller and weather-station locations shown on plan.
 - 1. Weathermatic model #SL4800 with necessary expansion modules (#SLMI.2), or approved equal, as determined by irrigation consultant.
 - 2. Weathermatic wireless weather-station (model #SLW5), or equal, mounted according to manufacturer's specifications.
 - 3. Weathermatic SmartLink wireless network aircard with flow: model #SL-AIRCARD→FLOW2F
 - 4. Weathermatic flow-sensor: model #SLFSI-T15 (see also Part 3, paragraph 3.3- C and G.)
- C. Controller - Valve Communications.
 - 1. Communication between controller and the valves shall be accomplished by a jacketed 14-gauge single strand wire to each valve. Common wire should be 12 gauge and white in color, with station wires being of other colors.
- D. Valves/Controls.
 - 1. Quick coupling valves.
 - a. Rainbird 5-NP (with non-potable purple cap), or equal.
 - b. All quick coupling valves shall be connected to the mainline by 1" triple-elbow swing joints and placed in valve boxes.

2. Automatic valves/filter assemblies: The automatic control valves shall be plastic valves operated by low-power solenoid, normally closed, manual flow adjustment, as indicated on plans, for all drip irrigation
 - a. Rainbird XCZ-100-PRF, or equal.
 - b. Rainbird 100-PGA and 150-PGA series valves, or equal, for all non-drip irrigation zones.
 3. Gate/IsolationValves
 - a. Rainbird XCZ-100-PRF, or equal.
 - b. Rainbird 100-PGA and 150-PGA series valves, or equal, for all non-drip irrigation zones.
 4. Flush Valves for Drip Tubing: at the end of each drip zone area, there shall be a manual flush valve installed on the end of the drip tubing. The valve will be installed in a 6" round valve box.
 - a. Netafim TLISOV. or equal.
- E. Valve Enclosure.
1. Control valves and quick-coupling valves shall be enclosed in a fiberglass valve box. Valve boxes are to be filled with a minimum of 6" of washed gravel below pipe level to insure adequate drainage.
 - a. Carson
 - b. Armour
 - c. Rainbird
- F. Pipe:
1. Main line piping shall be Class 200 polyvinyl chloride (PVC) solvent-weld pipe or Flexible Polyethylene (PE). Pipe shall carry the N.S.F. seal of approval and meet the following specifications: ASTM D-2241, SDR 21, SDR 11.5 for (PE) pipe, or latest revisions. Laterals shall be Class 160 (or 200) PVC, SDR 26, solvent-weld pipe; all 1" pipe shall be Class 200 PVC, SDR 21.
 2. Drip Tubing shall be flexible polyethylene pipe with .5-.6 gph emitters spaced at 18 inches on center. Pipe shall be installed at 18 inches on center. Tubing must be stapled or anchored in place to prevent heaving.
 - a. Netafim TLCV6-18xx or Rainbird XFCV-06-18, or equal.
 - b. Netafim stainless steel staples TES6
- G. Sprinkler Heads:

1. Spray heads, both 4" and 12" shall be installed as shown on the plans.
 - a. Rainbird 1804 and 1812 spray bodies with MPR nozzles, or equal.
 - b. All models shall have built-in pressure-regulation (PRS), or equal.
 - c. All spray heads shall have check-valves installed.
2. Rotors (both 3/4" inlet and 1/2" inlet) shall be installed as noted on plans.
 - a. Rainbird 3500 rotor, or equal
 - b. Rainbird 5004 rotor, or equal
3. Sleeves:
 - a. Sleeves shall be twice the nominal size of the pipe to be carried within, unless noted differently. Sleeves for control wire only shall be 2" diameter, placed alongside (or above) each sleeve for the mainline.
 - b. Under walks, paving and where indicated on drawings, install Schedule 40 PVC (ASTMD-1785). Tape ends of sleeves and mark sleeve locations with above grade stakes with appropriate annotation, (ex:"irrigation sleeve"). Stakes shall be protected. Do not backfill over sleeve locations behind back of curbs or along walk edges, until work has been completed.
 - c. Where sleeves are shown on the plan, provide and install an additional 4" diameter Schedule 40 PVC sleeve for future use.
4. Pipe fittings:
 - a. PVC fittings shall be solvent weld Schedule 40 standard weight. Attachment shall be made with both a primer and solvent cement as approved by the manufacturer.
 - b. Drip tubing and PE pipe will be connected by PVC barbed connectors.
5. Manufacturer/Supplier
 - a. The materials chosen for the design of the sprinkler system have been specifically referred to by manufacturer, enabling the Owner to establish the level of quality and performance required by the system design. After award of contract and prior to beginning work, the contractor shall submit for approval three copies of the complete list of materials to be installed. Substitutions will be allowed after review and approval from the irrigation consultant.
6. Acceptable manufacturers of sprinkler heads and control valves, and controller (Weathermatic):
 - a. Toro
 - b. Rainbird

- c. Irritrol
- d. Weathermatic (controller)
- e. Hunter
- f. Netafim

PART 3 - EXECUTION

3.1 WATER SUPPLY

A. General:

1. Comply with requirements of the Local Plumbing Code.
2. Install piping, valves, controls and sprinklers in accordance with manufacturer's written instructions.
3. Verify the location of the service line being provided, as shown on the plan.

B. Automatic Controllers

1. Connect remote control valves to controller in a sequence corresponding with station settings, as denoted on the plan.
2. Communication circuitry shall be run, wherever possible, along with the mainline pipe.
3. A minimum of 12 inches of wire shall be left at each valve to provide slack.
4. Controller is to be located as noted on the plan.
5. Verify that a conduit/sleeve is in place to run communication wire from controller to the field. This is to be supplied by others.
6. Install weather-station on, or near, southwest corner of the building.

C. Irrigation Heads:

1. Install check valves on all heads on the system.

D. Piping:

1. Pipe may be assembled and welded on the surface.
2. Plastic pipe and fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.

3. When pipe is pulled into the ground, all PVC pipe shall be solvent welded at least 2 hours before pulling.
4. Make all connections between plastic pipe and metal valves or steel pipe with threaded fittings using plastic male adapters.
5. Use dielectric fittings at connection where pipes of dissimilar metal are joined.
6. Lay pipe on solid subbase, uniformly sloped without humps or depressions.
7. Trenches (or pulls) shall be snaked, or the pipe snaked, within the trench to allow for expansion and contraction of pipe.
8. Drip tubing must be stapled to the ground prior to mulch being installed.

E. Closing of Pipes and Flushing Lines

1. Cap or plug openings as soon as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of the installation. Thoroughly flush out water lines and before installing heads, valves, and other hydrants.
2. Test in accordance with industry standards and pipe ratings.
3. Upon completion of the testing, the Contractor shall complete assembly and adjust sprinkler heads for proper distribution.

3.2 SYSTEM DESIGN

- A. Lay out work as closely as possible to the drawings. The drawings, though carefully drawn, are generally diagrammatic to the extent that all offsets and fittings are not necessarily shown as they will exist on site.
- B. The Contractor shall be responsible for full and complete coverage of irrigated areas as to spacing and precipitation rates being matched and shall make any necessary adjustments to the system at no additional charge to the Owner. Revisions to the irrigation system must be submitted to the landscape architect in written form for approval.

3.3 IRRIGATION CONTROL SEQUENCE OF OPERATION

- A. Irrigation system shall be controlled via the campus wide Invensys Niagara web based building automation system (BAS).
- B. Irrigation contractor shall furnish and install 24 VAC pilot operated valves for each zone and one for main line isolation. Irrigation contractor shall wire valves back to a central location as shown on the plans.
- C. Irrigation contractor shall install a main line flow meter (furnished by BAS contractor) and wire back to the central location. Recommended: Weathermatic flow-sensor: model #SLFSI-T15

- D. BAS contractor shall furnish a key locked panel at the central location. Panel shall contain hand/off/auto switches for each zone. Panel shall also contain off/auto switch for the main line isolation valve. Panel face shall contain displays for instantaneous and total flow.
- E. Main line isolation valve shall be continuously energized. Zones shall be cycled by the BAS based on time of day schedules. When scheduled on, the zones will be energized in sequence, one at a time, for their preset cycle time. Initial cycle times shall be eight minutes for spray zones and twenty minutes for rotary zones.
- F. Logic shall be provided in the BAS to shut down the system if rain is sensed by both of WMU's global rain sensors. Schedule shall be overridden if rain was sensed by both sensors during a 24- hour period prior to the scheduled on time.
- G. BAS shall monitor system flow and compare it to the design flow for the energized zone. BAS shall de-energize the zone valve and generate a zone alarm if flow exceeds design. If the sensor continues to sense flow the BAS shall de-energize the main line isolation valve and generate a main line alarm. Recommended: Weathermatic flow-sensor: model #SLFSI-T15
- H. Use of quick coupler connections will cause a main line alarm and de-energize the main line valve, Ground crews will need to place the main line valve local override in hand to use the quick couplers.
- I. BAS contractor shall add a graphic screen to WMU's BAS showing the irrigation zones, status of the zone and main line valves, flow and flow alarms. Flow alarms shall be manually reset from the graphic screen. Each zone and main line valve shall have a click point for overriding the zone on or off for a programmable time period. Alarm shut down shall be a higher priority than the software override.
- J. BAS contractor shall set up schedule screens for each system.

3.4 TRENCHING, BACKFILLING AND COMPACTING

- A. Pulling, Excavating and Trenching.
 - 1. Trenching, backfilling and compacting shall be as per Sitework Specifications - Trenching and Backfilling for utilities.
 - 2. If trenching, trenches shall be made wide enough to allow a minimum of 6 inches between parallel pipe lines. If pulling, the same lateral distance shall be observed.
- B. Minimum Cover:
 - 1. An absolute minimum of 12-inches cover shall be held over laterals and control wires. Mains shall be 18" (16" minimum) below finished grade.
 - 2. Drip Tubing shall be installed prior to mulching. Tubing shall be pinned down every two-feet with stainless steel staples.
- C. Backfill:
 - 1. Backfilling and backfill material shall be as per Sitework Specifications. Backfilling shall be done in 6" layers and compacted after each layer, to prevent excessive settling.

2. Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction in cold weather. Such backfilling can be done in early morning hours or the pipe may be water cooled prior to backfilling procedures.
3. Where pipe is pulled into the ground, slit-domes shall be compacted to original grade after pulling.

D. Pavements, Walks, Etc.

1. Communication wire must be placed in sleeving under pavement, walks, etc.
2. Sleeves required shall be furnished by this Contractor, unless directed otherwise.

3.5 TESTING

A. Operational Testing:

1. Perform operational testing after backfill is completed and sprinkler heads are adjusted to final position.
2. Demonstrate to the Owner that system meets coverage requirements and that automatic controls function properly.
3. Coverage requirements are based on operation of one circuit at a time, unless noted differently.

3.6 TRAINING

A. Personnel Training:

1. Contractor shall be responsible for the training of as many personnel as the Owner shall deem necessary.
2. Contractor shall be responsible for one closing and one opening of the system during the appropriate times of the year as part of the training of the Owner's personnel.
3. Contractor training shall include general trouble-shooting and operation of the system with reference to drip tubing, valve, and controller.

3.7 SPARE PARTS

A. Submit spare parts as pertains to warranted materials, described by manufacturers' warranties.

B. Provide:

1. One extra control valve of each size and type.
2. One key for quick coupling valves.

3. Owners/operational manuals available on controller, drip tubing, valves, spray heads and controller.

3.8 CLEAN UP

- A. Remove debris, resulting from work of this Section, from the site.

3.9 ADJUSTMENT

- A. After completion of all landscape work, if applicable, contractor shall return to the jobsite to perform any final adjustments to the system that might be deemed necessary.
- B. Maintenance shall include, in addition to initial start-up, one winterization and one spring start-up the following year.

END OF SECTION 328400

SECTION 32 9200

TURF AND GRASSES

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. Seeding
 - 2. Sodding
 - 3. Native meadow grasses
 - 4. Plugging.
 - 5. Fertilizer and mulch
 - 6. Topsoil
 - 7. Lawn renovation
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
 - 3. Division 32 Section "Exterior Plants" for planting beds.
 - 4. Division 32 Section "Planting Irrigation" for turf irrigation.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. All submittals must be received 30 days prior to installation.
- C. Soil test including physical properties.
- D. Chemicals and fertilizers to be used (including MSDS)
- E. Top soil analysis
- F. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Mix labels: For certified seed mixes.
- G. Material Test Reports: For existing surface soil and imported topsoil.
- H. Qualification Data: For qualified landscape Installer.
- I. Qualification Data: For qualified seed vendor.

1.5 QUALITY ASSURANCE

- A. Native Meadow Installer Qualifications: A qualified landscape Installer whose work has resulted in a minimum of ten (10) years successful native turf and meadow establishment, ecological restoration, and projects of this scale.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2. Installer must provide a list of recent native seeding project references with bid.
 - 3. Installer must be knowledgeable in plant identification both of seeded native species as well as weed species.
 - 4. Installer must provide list of plant and seed sources within ten (10) days of award.
 - 5. Installer must possess license for pesticide/herbicide application with public right-of-ways, aquatic applications and restoration.
 - 6. Acceptable Installers:
 - a. Wildtype Native Plant Nursery, Inc., 900 N Every Rd, Mason, MI 48854, (517) 244-1140
 - b. Native Connections, Inc., 17080 Hoshel Rd, Three Rivers, MI 49093, (269) 273-1367.
 - c. Michigan Wildflower Farm, 11770 Cutler Rd, Portland, MI 48875, (517) 647-6010.
- B. General Turf Installer Qualifications: A qualified landscape Installer whose work has resulted in a minimum of ten (10) years successful turf establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

- C. 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.
- D. 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; sodium absorption ratio; 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 satisfactory topsoil.
- E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding". Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. 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 run-off, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- D. Ensure that the cell packs and plugs of native plant cover are delivered moist and in good condition for planting. Review plants after delivery with the Landscape Architect and Owner.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: May 15th to June 30th
 - 2. Fall Planting: September 1st to October 31st
 - 3. Native Seed Frost Planting: November 1st to December 31st

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

1.8 MAINTENANCE SERVICE

- A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of Landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 90 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
 - 2. Sodded Lawns: 60 days from date of Substantial Completion.
- 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.
 - 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 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 40 percent of grass height. Remove no more than 40 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 XXXX seed mix to X" height when it has grown to a X" height.**
- E. Lawn Postfertilization: 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.

1.9 GUARANTEE FOR SEEDED NATIVE MEADOW AREAS

- A. A real coverage of the seeded areas will be at least 50% by time of one (1) year warranty review after Substantial Completion.

- B. No more than 10% (by real cover) of the seeded area will be dominated by perennial weedy species.
- C. If these standards are not met, the Contractor will be responsible for supplemental seedings as approved by the Architect.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. 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 $PLS = \% \text{ pure seed} \times \% \text{ germination} \times 100$.
 - 3. Turfgrasses:
 - a. Bluegrass/Fescue General Turf grass blend (for irrigated areas):
 - 1) 35% Kentucky Bluegrass blend
 - 2) 35% Red Fescue blend
 - 3) 30% Perennial Ryegrass blend
 - b. **XXX Seed Mix:**
 - 1) ***Note: Provide a minimum of two varieties of Perennial Rye from the following list. Affinity, APM, Buccaneer, Nighthawk, Partner, Saturn, Seville or other varieties that meet the minimum rating of 6.0 or higher for a seed tested at a Michigan location on the National Turfgrass Evaluation Program (NTEP) National Test.**
 - 2) ****Note: Provide a minimum of two varieties of Turf Type Tall Fescue from the following list. Jubilee, Veranda, Morgan, Stagecoach or other varieties that meet the minimum rating of 6.0 or higher for a seed tested at a Michigan location on the National Turfgrass Evaluation Program (NTEP) National Test.**
 - 4. Obtain the Owner's and Director of Landscape Services' 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 x lbs/xx sq.ft. of pure live seed.

2.8 TURFGRASS SOD

- A. Turfgrass Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding". Furnish viable sod of uniform density, color and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 1. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky Bluegrass (*Poa pratensis*)
 - b. 30 percent Chewings Red Fescue (*Festuca rubra* variety).
 - c. 10 percent Perennial Ryegrass (*Lolium perenne*).
 - d. 10 percent Redtop (*Agrostis alba*).
 2. Shade: Proportioned by weight as follows:
 - a. 50 percent Chewings Red Fescue (*Festuca rubra* variety).
 - b. 35 percent Rough Bluegrass (*Poa trivialis*).
 - c. 15 percent Redtop (*Agrostis alba*).

2.9 NATIVE MEADOW GRASSES

- A. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.
- B. Delivery of seed shall be timed to coordinate closely with the planting time. If seed needs to be held for more than one day, they shall be stored in a cool, dry place until such a time as they can be used. Minimize the need to hold seed over from one year to the next.
- C. All seed used shall be scarified and/or cold/moist stratified as recommended for each particular species specified.
- D. Legume seeds shall be inoculated with the appropriate rhizobial bacteria at the appropriate time prior to plantings.
- E. Seed shall be shipped, stored and handled in a manner that will insure protection from damage and to maintain dormancy until planted.
- F. 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 $PLS = \% \text{ pure seed} \times \% \text{ germination} \times 100$.
3. Native Meadow Grasses:
 - a. Seed Mix:

2.10 PLUGS

- A. The native grass and forb plugs species that shall be used shall be as shown on plans. The plugs shall be obtained from one of the licensed nurseries listed below that normally handles or has experience handling native plugs or a University approved equal:
 1. Wildtype Native Plant Nursery, Ltd., 900 North Every Road, Mason, MI 48854, (517)244-1140.
 2. Native Connections, 17080 Hoshel Road, Three Rivers, MI 49093, (269)580-4765.
 3. Michigan Wildflower Farms, 11770 Cutler Road, Portland, MI 48875, (517)647-6010.
- B. All species shall be true to species.
- C. Substitutions: Submit list of growers for each plant species to be installed within fifteen (15) days following award of contract. Include substitution requests based on plant non-availability.
 1. Substitution requests after this period will not be accepted.

2.11 ACCEPTABLE NATIVE MEADOW GRASS SEED SPECIES

- A. The native meadow grass seed species that shall be used shall be as shown on the plans. The seed shall be obtained from one of the licensed nursery or seed company listed below that normally handles or has experience handling native seeds or a University approved equal:
 1. Wildtype Native Plant Nursery, Ltd., 900 North Every Road, Mason, MI 48854, (517) 244-1140.
 2. Native Connections, 17080 Hoshel Road, Three Rivers, MI 49093, (269) 580-4765
 3. Michigan Wildflower Farms, 11770 Cutler Road, Portland, MI 48875, (517) 647-6010.
- B. All species shall be true to species.
- C. Substitutions: Submit list of growers for each plant species to be installed within fifteen (15) days following award of contract. Include substitution requests based on plant non-availability.
 1. Substitution requests after this period will not be accepted.

2.12 HYDROMULCH

- 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.

2.13 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Fiber Mulch: Biodegradable, dyed wood, cellulose-fiber mulch; non-toxic and free of plant growth or germination inhibitors; with a maximum moisture content of 15 percent and a Ph range of 4.5 to 6.5.
- C. Nonasphaltic Tackifier: Colloidal tackifer recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant growth or germination inhibitors.

2.14 WATER

- A. Free of substance harmful to plant growth.

2.15 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.

2.16 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.

2.17 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.
 - 1. 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.

2. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.
 - a. Surfactant-loaded liquid formulation for post-emergent weed control; active ingredient: Glyphosate Isopropylamine Salt.

2.18 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.

2.19 EROSION CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting 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 Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.
 2. Protect grade stakes set by others until directed to remove them.
- B. Provide 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. Verify limits of seeding material with the Owner's Representative in the field before starting seeding and sodding work.
 - D. Limit preparation to areas which will be immediately seeded.
 - E. 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.
 - F. Subgrades at Newly Planted Trees: Till a circular area, 6-feet wide measured from the edge of the tree pit, around each newly planted tree. Tilling shall be by rear-tined roto-tiller. After tilling, complete turf area preparation per above paragraph E, Newly Graded Subgrades.
 - G. 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.
 - H. 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.
 - I. 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.
 - J. Apply herbicides per manufacturer's written instructions. Delay seeding and plugging per manufacturer's written instructions.
 - K. 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.
 - L. Restore prepared areas to specified condition of eroded, settled, or otherwise disturbed after fine grading and prior to seeding and sodding.
 - M. Moisten prepared lawn areas before planting when soil is dry and allow surface to dry before planting.
- 3.3 HERBICIDES
- A. Apply two (2) application of herbicide to all soils to receive new perennial plants at least one (1) month prior to plant installation. Applications to be applied at least two (2) weeks apart with at least two (2) weeks between last application and plant installation.

1. Herbicide: Glyphosate
2. Application rate and quantity: Per manufacturer's label.

B. Once both herbicide applications have occurred, do not turn up any more new soil, as this brings new weed seeds to the surface. Roll prior to seeding to firm the seedbed. Do not work soil further, but seed directly.

3.4 HYDROSEEDING

- A. Hydroseeding is preferred. If any other method of seeding occurs, the seeded area must be covered with mulch immediately.
- B. 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.
- C. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
- D. 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.
 1. Seeding rate should be 8 lbs./1000 sq.ft.
 2. 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.
- E. Apply commercial fertilizer 1/2/1 at 200 lbs./acre.
- F. Mix specified seed, fertilizer and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
 1. Mix slurry with non-asphaltic tackifier.
 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 DRILL SEEDING/HYDROMULCHING LAWNS

- A. Lawn seed mixes shall be mechanically seeded with a "Brillion" or equivalent seeding machine. Do not broadcast or drop seed. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Seed at the following minimum rates:
 - a. Apply per manufacturer's label
3. Apply Commercial Fertilizer 1/2/1 per manufacturer's label.

3.6 BROADCAST SEEDING

- A. Native meadow seed mixes shall be broadcast seeded or drop seeded. Evenly distribute seed by broadcasting in multiple directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 2. Sow seed at the rate of x lbs. per acre.
 3. Mix clean, dry sand as a carrier for seed at a ratio of 1 part sand and 1 part seed.
 4. Criss-cross the seedbed several times to spread the seeds evenly.
 5. Bare, erosive soil should be lightly mulched with oat straw so that 50% of the soil still shows. Roll with lawn roller or tamp small area with rake or foot so seed will make good contact with the soil.
 6. Seed mix to include an annual cover crop (no Annual Wheat) at quantity recommended by approved seed nursery.

3.6 SEEDING NATIVE MEADOW MIXES

- A. Seed application shall be as installed as stated in above paragraphs.
- B. Seed shall not be covered with more than ¼ inch of soil.
- C. In places inaccessible to mechanical equipment, or where the area to be seeded is small, a hand operated cyclone seeder or other approved equipment may be used.
- D. The seeding equipment shall be calibrated to sow the seeds at the rates and proportions as specified in the plans.
- E. No fertilizers or soil conditioners will be required or allowed.

3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets,

and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smother sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaces as recommended by sod manufacturer but not less than two (2) anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.8 PLUGGING

- A. Plant plugs in holes or furrows, spaced per distance shown on Drawings apart in both directions. On slopes, contour furrows to near level.

3.9 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.

3.10 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Lawn Preparation" Article.
- B. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.11 LAWN RENOVATION

- A. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

- C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- D. Mow, dethatch, core aerate, and rake existing lawn.
- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply seed and hydromulch as required for new lawns.
- I. Water newly planted areas and keep moist until new lawn is established.

3.12 SATISFACTORY TURF LAWNS

- A. Lawn installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.13 SATISFACTORY NATIVE GRASSES AND MEADOWS

- A. Real coverage of the seeded areas will be at least 50% by time of one (1) year warranty review after Substantial Completion.
- B. No more than 10% (by real cover) of the seeded area will be dominated by perennial weedy species.
- C. If these standards are not met, the Contractor will be responsible for supplemental seedings as approved by the Architect.
- D. Inspection and Acceptance of native areas.
 - 1. Reseeding: Parts of the seeded area that fail to show uniform development as determined by the Architect shall be reseeded and such reseeded shall continue until the Contractor produces a uniform stand of permanent native plants.
 - 2. Damage to seeded areas resulting from erosion or the Contractor's operations shall be repaired by the Contractor until the native area is accepted.

3. Final inspection of native area will be made at the conclusion of the maintenance period. Written notice requesting inspection shall be submitted to the Architect at least 10 days prior to the anticipated inspection date.

3.14 CLEAN UP

- 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.
- B. 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
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.15 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.

END OF SECTION 329200

Project Name
Western Michigan University
WMU Project Number XXXX
OCBA Project Number XXXX
Author: XXX
Issued for XXXX

TURF AND GRASSES - **DRAFT**

Section 329200

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 32 9300
EXTERIOR PLANTS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trees.
2. Shrubs.
3. Ground cover.
4. Perennials.
5. Planting Soils
6. Tree Stabilization
7. Edgings.
8. Mulches.
9. Planters

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 31 1000 "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. Division 31 Section 31 2000 "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.

1.2 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced 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 exterior plants grown in a container with 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 exterior 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. Finish Grade: Elevation of finished surface of planting soil.
- I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- J. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- K. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- L. Planting Area: Areas to be planted.
- M. 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.
- N. 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.
- O. 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.
- P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- S. 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.

1.3 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. Nursery Source: For all nursery stock indicated on Plans.
 - 1. Submit list of growers for each plant species to be installed within 30 days following award of contract. Include substitution requests base on plant unavailability at that time. Substitution requests after this period will not be accepted.
- E. Topsoil Analysis: Analysis of topsoil stockpiled for re-spreading prior to spreading or use in planting mix.
- F. Material Test Reports: For existing surface soil and imported topsoil.
- G. Planting Schedule: Indicating anticipated planting dates for exterior plants.
- H. 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) during a calendar year. Submit before expiration of required maintenance periods.

- I. Warranty: Sample of special warranty.

1.4 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 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; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 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.
 3. Report suitability of topsoil for plant growth.
 - 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 exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

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. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6-inches above the ground for trees up to 4-inch caliper size, and 12-inches above the ground for larger sizes. 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.
 1. Other Plants: Measure with stems, petioles, and foliage in their normal position.
 2. 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.
- 1.5 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 exterior plants freshly dug.
 - D. Shipping will be scheduled to minimize on-site storage of plants.
 - E. Do not prune trees and shrubs before delivery except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, 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 exterior plants during delivery. Do not drop exterior plants during delivery and handling. Do not bend, stack or bind trees or shrubs in a manner that damages bark, breaks branches, deforms or breaks root balls or destroys the plants natural shape.

- F. Handle planting stock by root ball.
- G. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. 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 exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist 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.
 - 7. Cover plants transported on open vehicles with a protective covering to guard against damage from drying winds and sun. Bare root plant material will have roots covered with moist mulch immediately upon delivery. Air pockets will be prevented when heeling-in.
 - 8. Shipments of plants will be clearly identified with weather resistant labels securely attached to individual plants or to bundles of like kind and size. Labels will legibly state the correct plant name and size.
 - 9. If delays beyond the contractor's control occur after delivery, plants will be kept watered and protected from sun, wind and mechanical damage, root balls will be covered with mulch.
 - 10. Plants will be handled at all time in accordance with the best horticultural practices. Do not drop plant material whether balled and burlapped or container stock. Lift plant material by root ball or container, not by the stem. Plants handled otherwise will be subject to rejection. Balled and burlapped plants which have cracked, broken or loose root balls will be rejected.

1.6 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. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to manufacturer's written instructions and warranty requirements.
- D. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.
1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.
- E. 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.
- F. 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.

1.7 WARRANTY / INSPECTION

- A Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
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. Warranty Period: One year from Date of Substantial Completion
 3. Include the following remedial actions as a minimum:
 - a. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
 - b. Replace exterior 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 exterior 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.

1.8 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. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.
1. Maintenance Period: Maintenance shall continue through 2 leaf outs and 2 leaf drops for all tree and shrubs plantings after Substantial Completion.
- E. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:
1. Maintenance Period: Maintenance shall continue through 1 leaf out and 1 leaf drop for all perennial plantings after Substantial 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.

1.9 PLANT 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.

1.10 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.
4. Watering of existing trees under stress.
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, 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 and memorial garden/special interest garden 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 b 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:

Tree Size (diameter/inches)	Minimum Undisturbed Radius (measured from face of trunk)	Minimum Depth of Tun- nel/Bore
Less than 3"	3 feet	3 feet
3" through 8"	8 feet	3 feet
8" through 14"	14 feet	4 feet
Larger than 14"	20 feet	4 feet

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:

1-3" caliper	\$120/inch
3-6" DBH	\$180/inch
6-9" DBH	\$240/inch
9-12" DBH	\$300/inch
12-15" DBH	\$420/inch
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 auguring within protected zone, compaction/driving over the protected zone, storage of any materials or vehicles within the protected zone, dumping of construction waste or materials (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 2 PRODUCTS

2.1 TREE PROTECTION

- A. 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.

- B. Memorial Garden or "Special Interest" Garden Barricades: 4-foot minimum height plastic orange snow protection fencing with metal U-channel posts at 6-feet maximum on center. Barricade fencing to meet existing grade and encircle entire area.

2.2 PLANT MATERIAL

- A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. They will be sound, healthy and vigorous, of uniform growth typical of the species, cultivar or variety.
 - 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.
 - 8. Certification: All landscape materials shall be from stock inspected and certified by the appropriate governmental agencies. A Certificate of Inspection must be provided to the Owner. Plant materials shall comply with prevailing governmental regulations at the supply source and the job site.
 - 9. 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, Fourth Edition, 1990.
- B. Provide trees and shrubs of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to 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 trees or shrubs is shown, select stock for uniform height and spread, and number label 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. 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 questionable features that may affect the future form and beauty of the tree. The minimum acceptable shade tree caliper will be three inches (3") as measured six inches (6") above ground. Ball size will conform to ANSIZ60.1 specifications.
- 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.

2.3 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.
 1. Provide balled and burlapped trees.
 2. Branching Height: One-half of tree height.
- B. Small Upright Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:
 1. Stem Form: Single trunk.
 2. Provide balled and burlapped trees.
- C. Small Spreading Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:
 1. Stem Form: Multi-stem.
 2. Provide balled and burlapped trees.

2.4 DECIDUOUS SHRUBS

- A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
 1. Provide balled and burlapped shrubs.

2.5 CONIFEROUS EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
 1. Provide balled and burlapped trees.
 2. Heavy Grade "XX."

2.6 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
 - 1. Provide balled and burlapped trees.

2.7 GROUND COVER PLANTS

- A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1 and the following requirements:

2.8 PLANTS

- A. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, complying with requirements in ANSI Z60.1.

2.9 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. 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.

2.10 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum of 80 percent calcium 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. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, 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.
 - 1. Elemental Sulfur shall be finely ground horticultural grade material containing at least 90% purity.

2. Material shall be delivered in un-opened containers containing manufacturer's guaranteed analysis.
- 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: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.11 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-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. Compost shall be a mature/stabilized humus-like material derived from the aerobic decomposition of yard clippings or other materials as designated compostable as defined in P.A. 641, as amended, and shall be in compliance with all federal and state laws. Compost shall not have an objectionable odor and shall be free of plastic, glass, metal or other physical contaminants, as well as viable weed seeds and other plant parts capable of reproducing.
- B. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
 1. Peat shall meet the requirements of Federal Specification Q-P166E, Type II.
- C. 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, and material harmful to plant growth.

2.12 FERTILIZER

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
 1. Superphosphate shall be composed of finely ground phosphate rock, as commonly used for agricultural purposes.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
 2. Granular fertilizer shall conform to Federal Spec Q-F-241, Type 1, Level B, and shall bear the manufacturer's guaranteed statement of analysis.
 3. Granular fertilizer shall contain a minimum percentage of weight of nitrogen (of which 50% shall be organic), available phosphoric acid and potash.
 4. Fertilizer analysis to be determined by Owner upon receipt of written soil test results.
- C. 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.
- D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.13 PLANTING SOIL MIX

- 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 Kalamazoo Landscape Supply, Kalamazoo, 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 "Renewed Earth WMU Custom Blend" soil mix, as provided by Kalamazoo Landscape Supplies. Soil mixture contains peatmoss, 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 33% sand, 33% topsoil, and 33% peatmoss.
 3. Soil mixture should be placed 30 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.
- C. For Planters, use light weight on-structure planting soil as follows:
1. LiteTop® Extensive Growing Media as manufactured by American Hyrdrotech, Inc., (312)337-4998, or University approved equal. Local representative is Hunter & Swansey, (800)633-3530.
 2. Mix and place per manufacturer's written specifications.
- 2.14 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.
3. Color: Reddish brown.
4. Mulch will be porous, well-aerated and coarse enough that it is not prone to becoming compacted, layered, or caked.
5. Mulch will be free of rocks, sticks, branches, leaves, soil, weed seeds, glass shards and rubble.

B. Mineral mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Cobblestone Parking Lot Island Mulch

a. Size Range: 4" minimum – 6" maximum cobblestone

b. Color: Readily available natural cobblestone color range.

c. Mulch will be free of rocks, sticks, branches, leaves, soil, weed seeds, glass shards and rubble.

2. Type: Building Maintenance Strip Mulch

a. Size Range: 1/2" minimum – 2" maximum crushed, angular peastone

b. Color: Readily available natural peastone color range.

c. Mulch will be free of rocks, sticks, branches, leaves, soil, weed seeds, glass shards and rubble.

2.15 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.

2.16 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.

2.17 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
1. Edging Size: 1/8-inch thick by 4 inches deep and 16 feet long.
 2. Stakes: Tapered steel, a minimum of 12 inches long.
 3. Accessories: Standard tapered ends, corners, and splicers.
 4. Finish: Standard paint.
 5. Paint Color: green

2.18 PLANTERS

- A. Planter design should be reflective of the existing building and surrounding site character aesthetics. Each planter should be designed to allow seasonal movement on campus by a forklift by WMU Landscape Service Staff.
- B. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- C. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

2.19 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. The agent shall be designed to permit transpiration but retard excessive moisture loss from plants. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- wide minimum, with stretch factor of 33 percent.
- C. Wood Pressure-Preservative Treatment: AWWPA 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.
- D. Burlap: Non-synthetic, biodegradable.
- 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.
- F. Tree Watering Bags:
 - 1. Slow release water bags specifically manufactured for tree watering. Products may be incorporated into the Work include the following or University approved equal:
 - a. Treegator Original as manufactured by Spectrum Products.
 - b. Sherrilltree EZ Soak Tree Watering Bags as manufactured by Sherrilltree.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive exterior 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.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.
- B. Provide 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 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.
- 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.

3.3 PLANTING BED ESTABLISHMENT

- A. Loosen subgrade of planting beds 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. If underground utilities or other obstructions are encountered, alternate planting locations will be determined by Owner.
 - 1. Thoroughly blend planting soil mix off-site before spreading.
 - 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.
 - 2. Spread planting soil mix 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 beds 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.

3.4 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 overnight 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.
 - 9. If somewhat poorly-drained soils are encountered, plants may be elevated by placing the plant so the top of the root ball is slightly above grade as detailed in the Appendix. Planting soil mix shall be mounded or bermed around the above grade portion of the root ball and tapered to grade.
 - 10. Existing soil in shrub beds must be excavated to a depth shown on the Drawings be replaced with planting soil mixture. Plant beds will be brought to a smooth and even surface conforming to established grades and will allow for the specified depth of mulch.
- B. Topsoil removed from excavations may be used as planting soil. Soil must meet topsoil specification prior to placing.
- C. Obstructions: Notify 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 Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB 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. Trees, shrubs and planting beds shall be planted after final grades are established and prior to planting/seeding of lawns, unless otherwise acceptable to the Owner. If planting of trees, shrubs or planting beds occurs after lawn work is completed, lawn areas shall be protected and any damage done to lawn areas as a result of planting operations shall be promptly repaired.
- C. No planting will be performed when the ground is frozen, unless approved by WMU Landscape Services Representative.
- D. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- E. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 2 inch above adjacent finish grades. Balled and burlapped stock to be set in planting hole to proper grade and position and face plants to give the best appearance, relationship to other plants and relationship to adjacent structures. Plants shall be set on undisturbed soil, plumb and in the center of the excavated planting hole as diagrammed in Appendices.
 - 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. Remove wire baskets to a depth of one-half the depth of the ball.
 - 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. Water again after placing final layer of backfill and form a watering saucer from planting soil when the plant is isolated.
- F. 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.
- G. To provide natural drainage in heavy or compacted soils, root ball must be elevated slightly above grade and planting mixture used to create a mound around the root ball.

- H. Set container-grown stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.
 - 1. Carefully remove root ball from container without damaging root ball or plant.
 - 2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
 - 3. Vertically severing or slicing the sides of the root mass will not be necessary as pot bound container material will not be accepted.
- I. Organic Mulching: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.
- J. Trunk Wrapping: Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling.

3.6 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. Sever damaged roots with a clean, sharp pruner before planting.
- E. In heavy soils, the sides of holes dug with a tree spade shall be scarified with a shovel or spade to encourage root penetration into surrounding soil.
- F. The area outside the root plug and within an area three-times the plug diameter will be tilled to a depth of 8". A layer of compost, as specified in Section 2.11 (Organic Soil Amendments), three inches to five inches (3"-5") in depth will be evenly spread over the planting site, three times the root plug diameter, and tilled a second time as above. Care will be taken not to till the tree-spaded root plug.
- G. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.
- H. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.

- I. Where possible, orient the tree in the same direction as in its original location.
- J. Form a watering saucer from planting soil mixture around the perimeter of tilled planting site (three times the root plug diameter).

3.7 TREE AND SHRUB 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 and shrubs 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.

3.8 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 bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 - 5. 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.

3.9 PLANTING IN PLANTERS

- A. Place a layer of drainage gravel at least 4-inches (100-mm) thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 6-inches (150-mm) up on all sides. Duct tape along the entire top edge of the filter fabric to secure the filter fabric against the sides during the soil forming process.
- B. Fill planter with light weight on-structure planting soil. Place soil in lightly compacted layers to an elevation 1-1/2 inches (38-mm) below top of planter, allowing natural settlement.

3.10 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. Dig holes large enough to allow spreading of roots and backfill with planting soil.
- C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING BED 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. Groundcover and flowerbeds will be mulched as above, but to a depth of three inches (3"). If mulch is installed prior to planting groundcovers or flowers, ensure that all plants are properly planted in soil.

3. 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.

3.12 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

3.13 TREE TRUNK WRAPPING

- A. Unless specified by the Owner, the trunks of deciduous trees shall not be wrapped. If the Owner specifies that individual trees need to be wrapped, the material used will be as detailed in Section 2.16 (Tree Stabilization Materials). When wrapping, begin at the base of the tree and extend wrap up to the first lateral branches. The wrap shall be applied in a spiral manner with an overlap of one-half the width of the paper. The specified twine shall be used to hold wrap in place and will only be tied tightly enough to keep the paper from sliding down the trunk. Twine will be secured both at the top and bottom and at 18" maximum intervals in between.

3.14 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. If irrigation system is inoperative, hand watering shall be accomplished from a source approved by the WMU Landscape Services Representative. 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.
- E. Stakes and guys shall be adjusted to prevent plant damage and replaced as required. Eroded or damaged watering saucers shall be repaired as needed.
- F. All plant beds and watering saucers shall be maintained and weed free. Grass and weeds shall not be allowed to reach a height of three inches (3") before being completely removed. Application of a glyphosate herbicide (at label rates) to unwanted vegetation in the above areas is acceptable.

3.15 PESTICIDE APPLICATION

- A. Plants shall be kept free of insect pests and diseases. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. All insecticides and fungicides applied to control pests and maintain plants in a healthy growing condition shall be approved by the Owner. 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. MSDS information must be on file with the Department of Environmental Health & Safety prior to application of approved pesticides.
- 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.

3.16 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Excess and waste materials shall be removed daily. When planting in an area has been completed, the area shall be cleared of all debris, soil piles and containers.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, trespassers and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings. Any damage to existing landscape, paving, or other such features as a result of work related to this contract shall be repaired by the responsible contractor to its original condition.
- 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.

3.17 DISPOSAL

Project Name
Western Michigan University
WMU Project Number XXXXXX
Architect Project Number xxxx
Author: xxxxx
Issued for xxxxxx

EXTERIOR PLANTS -**DRAFT**

Section 329300

- A. Disposal: 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 9300