***Refer to Division 31 Earthwork, "Design Guidelines", for Excavation and Backfill requirements.***

**Demolition**

1. PM will designate material removed by demolition that is to remain on the University's property before completion of final review documents.

2. Materials acquired through demolition, other than those required to complete the construction project and designated for return to Owner, will become the property of the contractor and will be removed from the site and off University property in accordance with the Owner's instructions. The material will be disposed of in a legal manner.

3. All asbestos materials are to be removed before general demolition. *Refer to Division 1 for Hazardous Materials, under the Environmental Health and Safety section.*

***General guidelines for roadways, parking lots, and walkways.***

*1. Roadways, Parking Lots, and Walkways*

- *All curbs will be Portland cement concrete.*
- *Pavements shall be designed to accommodate the Design Vehicle for the pavements use. The minimum lane width shall be 10-feet, excluding curb and shy distance (concrete pavements), curb and gutter (asphalt pavements), or striping. Curve radii and intersection radii shall accommodate the Design Vehicle's design speed and turning movements.*
- *Paved walks less than eight feet wide will be designed with a cross slope of two percent to facilitate drainage. Walks equal to or greater than eight feet wide will have a minimum slope of one percent. It is desired to maintain positive drainage away from walks so surface water does not cross them.*
- *All sidewalks will have a minimum width of 7'. Where a sidewalk abuts to a road or driveway, minimum width is 9'. Walks adjacent to roads or driveways will not have grass strips between sidewalk and road or driveway. A medium broom finish will be applied perpendicular to traffic flow. All brooming directions will be shown on the drawings and described in the*

*specifications. Sidewalks abutting a curb line shall be pinned to resist differential movement. Include expansion joint where needed.*

- *At MU, all accessible parking spaces will be "universal spaces." Parking spaces, other than disabled, will typically be 9′ in width. No compact car spaces will be permitted.*
- *At MU locations where a parking lot abuts to lawn areas, a mowing strip will be incorporated into the design of the parking lot. A mowing strip is a strip of pavement, 18"-24" in width, on the lawn side of the curb or parking bumpers allowing the lawn to be mowed while parking spaces are occupied.*
- *At MU, accessible ramps adjacent to buildings will have a snow melt system installed, controlled by the Energy Management Control System. At MU, curb cuts for disabled access will use the campus standard detail. (See standard detail in appendix.)*
- *Preferred material for sidewalks, ramps, and other paved, exterior walking surfaces is concrete. All materials must be slip resistive.*
- *When necessary, fire lanes will be designated to comply with applicable codes and standards and coordinated through the project manager.*
- *Where exterior snow melt is to be included in outdoor paved surfaces, controls for such systems will be tied back to the University's building automation system where possible.*

**Asphalt and Portland Cement Concrete Paving**

1. Asphalt/Portland cement concrete pavement, will be designed according to the following guidelines:
   - Roadway: (rigid and flexible) *American Association of State Highway and Transportation Officials,* AASHTO Guidelines for the Design of Pavement Structures, *most current edition.*
   - Parking Lot:
     - Rigid - Portland Cement Association
     - Flexible - The Asphalt Institute
   - Walkways will have a minimum compressive strength of 4,000 psi for 28 days.
   - All exposed concrete (including precast concrete) will be air entrained according to the Chart in Division 3 in this standard.
   - Flint and chert will be limited to 1% maximum, by weight of the coarse aggregate, in all exposed concrete (cast-in-place or precast). Lignite will be limited to 0.07%, by weight of the fine aggregate in all exposed concrete. Some applications may be required to be lignite free (project manager will advise).

2. Asphalt surfaced parking lots will have a minimum cross section of 3" of asphalt surface prime coat, 6" of crushed stone Type 1 aggregate for base, and an underlayment of geotextile fabric.

3. Concrete surfaced parking lots will have a minimum cross section of 6" of concrete and 4" of Type 1 aggregate for base. The concrete will be Portland cement concrete with a heavy broom finish. All joints will be shown on the plans and will be sealed with traffic grade caulking.

4. All concrete walks will be reinforced with #3 rebar at 18" centers each way or 6x6/10xl0 welded wire fabric or rebar. Drive reinforcement and use of epoxy coated rebar and dowels shall be discussed with the PM. Steel shall be at the approximate mid-point of the concrete depth.
   - Concrete strengths will be specified in accordance with actual requirements. Concrete mix will be specified with minimum cement content, as well as maximum water/cement ratio.
   - Fibers (non-asbestos) can be used in addition to steel to control shrinkage cracking.

5. Consultant will specify inspection and testing requirements and will include procedures for evaluation of test data. *For UMSL and UMKC projects, the contractor will retain services of a concrete testing firm.* For MU and MoS&T projects, the University will retain services of a testing firm. Contractor will be responsible for scheduling the tests. Contractor will be required to notify the Owner's representative a minimum of 48 hours prior to all placement of concrete.

   Specifications will require strength, air entrainment, temperature, and slump tests, and will indicate allowable limits for each measure. Strength tests will require 4 cylinders (3 to be broken and 1 spare). Test results will be specified to be sent directly to the contractor, architect, and the Owner's representative.

   Concrete will be tested at the minimum rate of one test for the first 25 cubic yards [CY] placed each day, and one test for each additional 50 CY placed. Concrete may be tested more often at the discretion of the Owner's representative.

   Test data from concrete cylinder breaks will be evaluated using procedures of the American Concrete Institute (latest edition of ACI 214) to determine if the compressive strength of the concrete tested is acceptable.

6. All concrete walks and drives will be constructed on a minimum of 4" of compacted crushed stone base course. Gradation of the crushed stone will be as required for Type 1 aggregate.

7. Sand will be from local sources meeting ASTM C-144 for mortar and ASTM C-33 Size 67 for concrete. If matching of color is necessary, sand for mortar and concrete will be from the following sources:

   MU - Missouri River
   UMSL - Meramec River
   UMKC - Kaw River
   S&T - Meramec River/Little Piney

8. At MU only, driving surface pavement patches for utility cuts will include 8" of concrete with #4 transverse bars (to the patch centerline) at 18" maximum centers and 2-#4 longitudinal bars. Patch will extend 1-foot minimum outside the trench. Patch surface shall be concrete with abutting concrete paving or 2" of asphaltic concrete/tack coat with abutting asphalt surface.

9. Joints and Concrete Flatwork
   - Expansion joints shall be installed to provide for thermal expansion of concrete pavements. Generally expansion joints shall be provided at the PC and PT of curves where the deflection angle is greater than 30E and intersections. If required for load transfers, expansion joints will be detailed with dowel bars to allow load transfer and expansion of the concrete slabs. Non-extruding expansion joint material will be used with expansion joints.
   - Portland cement concrete flatwork will be isolated from manholes, existing walls, etc., by use of expansion joints.
   - Contraction joints shall be tooled during finishing or sawed within 18-hours of concrete placement. If the joint edge ravels, stop, do not proceed until concrete has sufficient cure to saw without damage. Refer to 4.3.3 for further requirements.
   - Construction joints will be located at expansion joint locations wherever possible. Construction joints at other locations will be keyed.
   - All joints will be sealed with traffic grade, non-asphalt, and non-extruding sealant.
     (Consultant is to consider specifying protection of sealant in foot traffic areas, such as applying a coating of silica sand over sealant to minimize potential for tracking, only as allowed by manufacturer.)

- Joint spacing and joint detail will be shown on the drawings.

10. Paint colors will be white for general lot striping, yellow for no parking areas, and blue for accessible spaces and areas. Lead bearing substance paints are prohibited.

***Site Utilities - (Refer to Division 33 Utilities)***

**Storm Sewers – *(Refer to Division 33 4000 – Storm Drainage System)***

**Sanitary Sewers – *(Refer to Division 33 3100 – Sanitary Sewer Systems)***

**Waterlines – *(Also refer to Division 33 1113 – Water Distribution Piping)***

**Gas Mains and services**

1. Gas Mains and services shall have a minimum of 24" of cover.

***Refer to Division 15 for utilities within a building envelope.***

**Landscape**

1. Owner will be notified prior to grade changes during backfilling and prior to the establishment of the "rough grade" (existing grade prior to application of top soil or growing medium for turf or other plants).

2. Owner will be notified prior to applying top soil or growing medium for turf or plants for the purpose of establishing the finish grade.

3. Soil or growing medium for turf or plants will be examined and approved by the Owner as to its physical properties, fertility level, and weed content before application.

4. Planters will be checked for adequate drainage by the Owner before filling. Planters will be filled with specific soil mixtures. For MU projects, tree grates within the City of Columbia right-of-way are required to be 3' x 5'.

5. Landscape plant materials will be in accordance with the American Association of Nurserymen's Standards.

6. Landscape installer will provide typewritten instructions to the Owner for the maintenance of plant materials for one full year. Instructions will be submitted upon completion of planting.

7. Landscape plants will be maintained by the contractor for a thirty (30) day period following the final planting and University's acceptance of the project.

*8. Preservation of existing trees and landscaping will be a primary consideration. At MU, all landscaping materials, installation, and landscape design is provided by the campus. Grading should be at 6" below finish grade to allow for topsoil placement by the campus. Site construction access lay-down and work plan shall include construction fencing limits for landscape and tree preservation. Coordinate with the Project Manager.*

*9. Finished lawn areas will have a finished slope no steeper than one (1) foot vertically to three (3) feet horizontally. Steeper areas will be covered with ground covers or modified with walls or other treatments. At MU, all landscaped areas shall have a finished slope no steeper than one (1) foot vertically to three and one-half (3.5) feet horizontally. Walls may have to be used to reduce steeper areas to this standard.*

*10. Selection of landscape plant materials will be based on plant hardiness and on growth success within the area used. Invasive plant species and/ or noxious weeds are not to be used in landscape plantings on University properties. At MU, standard practice is for Landscape Services to select and specify plant materials. Coordinate with the Project Manager.*

*11. A planting schedule will be provided and timed in relation to planting season and on University's acceptance of the project.*

*12. Specific treatments will be identified for project limit lines or edges.*

*13. The following planting schedules will be used:*

- *Spring schedule*
  - *Trees, shrubs, ground covers and herbaceous perennials (Deciduous and Coniferous Evergreen): Will be planted between March 15 – June 15*
  - *Turf: will be seeded (sodded) between April 1 and May 15*
- *Fall schedule*
  - *Trees (Deciduous): will be planted between September 15 and November 15*

- *Trees and shrubs (Coniferous Evergreen): will be planted between September 1 and October 30*
- *Ground covers and Herbaceous Perennials: will be planted between September 15 and October 15*
- *Turf: will be seeded between August 25 and October 1; will be sodded between September 1 and November 15*

***Site Exterior Equipment***

1. *Exterior equipment, such as ground mounted transformers, air conditioning units, etc., will be located and landscaped/screened to be aesthetically compatible with surrounding area and adjoining buildings.*

**Site Furnishings**

1. *MU only: Bicycle racks will be as manufactured by Brandir International, Inc., New York, New York.*

2. *MU only: Trash receptacles will be Model S-42, black, manufactured by Victor Stanley, Dunkirk, Maryland, or approved equal.*

3. *MU Only: Benches will be models bench58-60 and bench 160, 4' or 6', black, with plaque insert, as manufactured by DuMor Inc., Mifflintown, PA, or approved equal. Benches will be surface mount with a concrete pad.*

4. *MU Only: Picnic tables will be model Carousel as manufactured by Landscapeforms, Kalamazoo, Michigan, or approved equal. Tables will be in ground mount with a concrete pad.*

5. MoS&T Only: Trash receptacles will be Victor Stanley #A-36 (satin black) – no ashtray, http://www.victorstanley.com/product/a-36/

6. MoS&T Only: Benches will be Victor Stanley #RB-28 (satin black), http://www.victorstanley.com/product/rb-28/

7. MoS&T Only: Bike Racks will be Grainger #13R028, holds 20 bikes (to be paint finished by owner), http://www.grainger.com/product/ULTRAPLAY-Bike-Rack-13R028?nls=3&ssf=3&searchQuery=13r028

END OF SECTION