

Design and Construction Standards

Division 31 Earthwork

General

In general, follow the guidelines below when designing, specifying and installing earthwork. Unless specifically indicated otherwise, these guidelines are not intended to restrict or replace professional judgment.

1. Earthwork to comply with Phase 2 Stormwater Federal Guidelines.

Section 31 10 00 Site Clearing

1. Use of explosive is prohibited. See Division 2 for further explanation.

Section 31 11 00 Clearing and Grubbing

1. CLEARING: All objectionable growth shall be stripped. Debris resulting from stripping and clearing operations shall be promptly removed from University property so as to prevent this material from accumulating on the site.
2. GRUBBING: Removal of trees and shrubs shall include the removal of stumps and roots to the extent that no root greater than 3 inches in diameter remains within 5 feet of an underground structure or utility line or under footings or paved areas. Grubbing in open areas shall include removal of stumps and 3 inch roots to 2 feet below finish grade elevations.
3. PROTECTION OF TREES: Existing trees indicated to remain shall be protected by boxing. Boxing shall be 4 by 4 inch posts with two 2 by 4 inch rails, approximately 8 by 8 feet centered on tree trunk, to a height of approximately 5 feet. Some specimens will require fencing at the drip line of the branches. Do not store anything within the drip line of any trees.
4. PROTECTION OF SPECIAL TREES AND SHRUBS: Trees and shrubs are of such value that special attention of the contractor must be directed to protection for them. Roads and Grounds and/or the University Landscape Architect shall be consulted by project specific document notes and details for protection of trees. A monetary value has been assigned to every tree on EMU property. The contractor will pay the listed value for any tree that dies as a result of the construction process. Consult Buildings and Grounds for current tree values.
 - a. Occasionally, protection of a specimen will require fencing at the drip line of the branches; or, if the specimen is in danger from objects falling on it, a sturdy roof over the tree or shrub may be required.

Section 31 22 00 Grading

1. Slopes shall not be greater than 1'-0" vertical to 3'-0" horizontal in grassed areas. Steeper slopes shall only be granted by special permission from the University.

Section 31 23 00 Excavation and Fill

1. MATERIALS FOR FILL AND BACKFILL: Specify only materials which can be compacted, without containment, to the densities specified by the project engineer.
2. SOIL COMPACTION CONTROL: Compaction control shall be provided for all fill, backfill, and embankments, both inside and outside the perimeter of the structure. Field compaction tests and related laboratory analyses shall be performed by a qualified independent laboratory (a member of the American Society for Testing and Materials), under the supervision of a registered professional engineer specializing in soils engineering. Soils proposed for fill, backfill, and embankments shall be analyzed by the soils engineer to determine acceptability; no soil shall be placed until it is approved by the soils engineer. A representative of the testing laboratory shall provide continuous inspection during placement and compaction operations; tests shall be made in a quantity that will assure uniform compaction and density of each course, or lift, of fill.
3. PAYMENT FOR LABORATORY SERVICES: The testing laboratory shall be made responsible to the Professional. All costs for tests and analyses performed shall be paid from Project Funds on an actual cost basis without fee mark-up. The testing laboratory shall be made responsible to the associate. Written reports of field tests shall be submitted directly to the Professional, the responsible contractor and the Manager, Planning and Design.
4. COMPACTION REQUIREMENTS: Specify that soils be compacted to the following densities, as determined by Standard Proctor Tests:
 - a. ROAD BEDS: Compaction shall conform to requirements specified in the latest edition of the MDOT Standard Specifications for Construction, Section 301 entitled "Subbase". Compaction is required for the entire subgrade area for the full width and depth of slope of the embankment supporting the berm and pavement.
 - b. INSIDE STRUCTURES:
 - i. UNDER NON-STRUCTURAL SLABS ON GRADE, with normal loading:
 1. 98 percent, standard Proctor test procedures (ASTM D-698).
 - ii. UNDER SPECIAL FOUNDATIONS, ISOLATED PADS, AND FOOTINGS: 100 percent, standard Proctor test procedures (ASTM D-698).
 - c. OUTSIDE THE STRUCTURES:
 - i. TRENCH COMPACTION Under paved surfaces shall be as described below except that shallow trenches shall be filled with flowable controlled density fill (FCDF) per Michigan Department

of Transportation 3717 Special Provision for Flowable Fill For Utility Trenches and topped with 3 inches of asphaltic concrete with fibers. Deep large volume trenches under paved surfaces shall be benched 12" back from the face of the excavated trench and filled and compacted as described below and at least the top 15 to 18 inches of trench shall be filled with 12 inches of material control density fill and topped with 3 inches of asphaltic concrete with fibers.

- ii. PARKING AREAS: The top 1 foot of subgrade shall be compacted to 100 percent of maximum dry density.
 - iii. FOUNDATION BACKFILL UNDER PLANTING BEDS AND LAWN: The upper 2 feet of soil below finish grade - 92 percent maximum. Remainder of backfill - 95 percent if depth is less than 10 feet; - 100 percent if depth exceeds 10 feet.
 - iv. FOUNDATION BACKFILL UNDER PAVEMENTS: 100 percent, standard Proctor test (ASTM D-698).
 - v. UNDER PAVED PEDESTRIAN WALKS AND COURTS: 98 percent, standard Proctor test (ASTM D-698). Specify that extreme care be exercised to obtain proper compaction under edges of walks which abut walls, stairs, curbs, adjacent slabs, and other structures where use of mechanical compactors is made difficult.
 - vi. BACKFILL AROUND MANHOLES AND OTHER UNDER-GROUND STRUCTURES: 98 percent if depth is less than 10 feet; 100 percent if depth is more than 10 feet.
 - vii. UNDER LAWN AND PLANTING AREAS WHICH ARE NOT ADJACENT TO STRUCTURES: The upper 1 foot of soil below finish grade - 92 percent maximum. Remainder - 95 percent.
 - viii. DENSITY OF TRENCH BACKFILL shall be equal to densities specified for all adjacent fill and backfill.
5. DISPOSAL OF EXCESS: Excess fill material or topsoil which is not required nor permitted as fill shall be removed from University property at the contractor's expense.

Section 31 25 00 Erosion and Sedimentation Control

1. Inspect, repair, and clean erosion control blankets after each rain event.

End of Division 31 Earthwork – Construction Standards