

Basis of Design

This section applies to the design and installation of earthwork.

Design Criteria

- No stockpiling of excavation materials unless Geotechnical Engineer provides inspection services to assure compliance with their recommendations as to the use of excavation material. Submit report from Geotechnical Engineer prior to material placement that verifies compliance with Geotechnical recommendations. All stockpile locations/covering measures shall be included in the Temporary Erosion Control plan.
- Excavated native material may be used in landscaped areas up to sub-grade and no closer than three feet from the building. Discuss with Geotechnical Engineer and Campus Engineering for approval.
- See attached Earthwork guide specification.
- Provide all shoring designs required for permit approval.
- Identify all excavation requiring shoring and provide a shoring solution.
- Identify shoring constraints in the construction documents. For example, "provide a shoring design, or specify vertical shoring, where a sloped excavation would undermine existing structures, utilities, or pavement."
- Include drawing and specification notes to indicate that the Contractor shall notify the Utility Notification Center (1-800-424-5555) at least two full working days before digging. When contacting the Utility Location Center, the Contractor shall also contact the University Construction Coordinator and request the University to hire a professional utility locator to locate University utilities.

Design Evaluation

The following information is required to evaluate the design:

- Design Development Phase: Outline specifications.
- Construction Document Phase: Details and specifications.

Construction Submittals

- See attached Earthwork guide specification.

Related Sections

- Facilities Services Design Guide - Water Distribution
- Facilities Services Design Guide - Sanitary Sewer
- Facilities Services Design Guide - Storm Drainage
- Facilities Services Design Guide - Gas Distribution
- Facilities Services Design Guide - Irrigation

Products, Material and Equipment

- See attached Earthwork Design Guide.

Installation, Fabrication and Construction

- See attached Earthwork guide specification.
- See Pipe Bedding drawing.

END OF DESIGN GUIDE SECTION

GUIDE SPECIFICATION

The following specification is intended as a guide only. The Consultant shall write the specifications to meet the project needs in consultation with the Owner.

CIVIL – EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. These standards and procedures apply to the use of excavated materials and the installation of the earthwork materials.
- B. This section includes but is not limited to the following:
 - 1. Mass excavation and disposal for building
 - 2. Excavation and back fillings for footings
 - 3. Excavation and backfilling of trench within building lines
 - 4. Excavation and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances
 - 5. Preparation of subgrade for building slabs, walls, walkways and pavements
 - 6. Structural backfill for foundation and walls
 - 7. Final grading together with placement and preparation of topsoils for lawns and plantings
- C. Geotechnical report (Include documents about borings for reference only)

1.02 RELATED SECTIONS

- A. Mechanical
- B. Electrical

1.03 REFERENCES

- A. All work shall conform to the following codes, regulations and standards:
 - 1. WSDOT-APWA 1998 Standard Specifications for Road, Bridge and Municipal Construction (not including Measurement and Payment provisions)
 - 2. City of Seattle Supplement to the Specification for Road, Bridge and Municipal Construction
 - 3. ASTM Test method D1557 modified for density of soils

1.04 SPECIFIC REQUIREMENTS

- A. Excavation of materials shall consist of removal of materials encountered to subgrade elevation.

- B. Unauthorized excavation shall consist of removal of materials below subgrade or outside the dimensions as shown on the plans.
- C. Testing and inspection service will be provided by the Owner. The Contractor shall cooperate and provide access and samples when requested by the Owner.
- D. All excavated material shall be treated in the following ways:
 - 1. Removed from campus at no cost to the University
 - 2. Used for wall backfill outside 18 inches from the drainage zone
 - 3. Used in landscape areas to subgrade
 - 4. Followi the recommendations of the Geotechnical Engineer.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. The University requires submittals of the gradation SE of all backfill materials to pre-qualify their use. The Contractor shall also provide, for each, material moisture density curves which indicate the optimum moisture content.
- B. Pipe bedding, as shown on Pipe Bedding drawing, shall meet City of Seattle Supplement Requirement for Mineral Aggregate Type 9 for rigid pipe or Type 22 for PVC.
- C. Backfill for walls: The first 18 inches behind any wall shall meet City of Seattle Supplement Requirement for Mineral Aggregate Type 17. The remaining backfill behind the wall can be either excavated material or Mineral Aggregate Type 17 as in City of Seattle Supplement.
- D. Backfill under slabs in building shall consist of a reinforced vapor barrier layer covered by 4 inches of material meeting the requirements for Mineral Type 17 or Type 4 as in City of Seattle Supplement.
- E. Backfill over piping and structural fill for foundation and walls shall meet requirement either CDF or Mineral Aggregate Type 17 as in City of Seattle Supplement.
- F. Backfill for electrical or mechanical utilities and around mechanical and electrical apparatus shall be either CDF or Mineral Aggregate Type 17 as in City of Seattle Supplement.
- G. Backfill for walks and pavements shall meet the requirement of City of Seattle Supplement for Mineral Aggregate for type 4 from 0 - 4 inches of depth. Added depth, if required, shall be Type 3 according to the City of Seattle Supplement.
- H. Materials used in the top 24 inches for the final grading for planting shall meet the requirements for Mineral Aggregate Type 17.
- I. Pea gravel shall NOT be used for backfill except for pipe bedding.

- J. Gradation - The Mineral Aggregate Type 17 of the City of Seattle Supplement shall be within the following gradation:

Sieve Size	Percent Passing by weight
3"	95-100%
¼"	25-75%
#200	0-5%
Sand Equivalent (Min.) = 60	
Dust Ratio (Max.) = 2/3	

PART 3 – EXECUTION

3.01 REQUIREMENTS

A. Compaction

1. Compact all fill and backfill to prevent subsequent settlement.
2. Water settling or jetting will not be permitted as a means of compaction.
3. Furnish heavy rollers or compactors except as follows:
 - a. Use pneumatic hand tampers for trenches less than 3 inches in width and areas not accessible to heavy equipment.
 - b. Compact areas within 5 feet of footings, foundations and walls with hand vibrators.
4. Required compaction: Compact fills and backfills to the following minimum relative compaction (percentage of maximum dry density determined in accordance with ASTM D1557, modified):

Locations	Relative Compaction (Required Minimum)
Under Slabs on Grade	95%
Under Walkways and Paving (roads, streets and parking lots)	95%
Under footing	95%
Against walls	95%

Against footings and foundations	95%
Plantings and Landscape areas	85%
Other	95%

- B. Placement of materials: The Contractor shall place materials so that they do not damage new or existing utility lines; footing drains; protection boards or insulation; or waterproofing.
- C. Buried utilities: The Contractor shall place a traceable marking tape above buried utilities.

END OF GUIDE SPECIFICATION SECTION