

DIVISION 31 – EARTHWORK

SECTION 31 00 00 EARTHWORK

CONSULTANT DESIGN GUIDELINE

The intent of the University is to employ a third party geotechnical engineer to provide testing services for earthwork and soils analysis. The contractor should work with the assigned soils engineer for testing as the project progresses.

EXECUTION

Notification. The Contractor, upon encountering any underground water, springs, wells, etc., in the course of excavation, shall immediately notify the Facilities Management Construction Coordinator and shall not proceed further until instructions are given.

END SECTION

31 01 00 Maintenance of Earthwork

31 01 10 Maintenance of Clearing

31 01 20 Maintenance of Earth Moving

31 01 40 Maintenance of Shoring and Underpinning

31 01 50 Maintenance of Excavation Support and Protection

31 01 60 Maintenance of Special Foundations and Load Bearing Elements

31 01 62 Maintenance of Driven Piles

31 01 62.61 Driven Pile Repairs

31 01 63 Maintenance of Bored and Augered Piles

31 01 63.61 Bored and Augered Pile Repairs

31 01 70 Maintenance of Tunneling and Mining

31 01 70.61 Tunnel Leak Repairs

31 05 00 Common Work Results Earthwork

31 05 13 Soils for Earthwork

31 05 16 Aggregates for Earthwork

31 05 19 Geosynthetics for Earthwork

31 05 19.13 Geotextiles for Earthwork

31 05 19.16 Backfill Material Schedule

31 05 23 Cement and Concrete for Earthwork

31 06 00 Schedules for Earthwork

31 06 10 Schedules for Clearing

31 06 20 Schedules for Earth Moving

31 06 20.13 Trench Dimension Schedule

- 31 06 20.16 Backfill Material Schedule
- 31 06 40 Schedules for Shoring and Underpinning
- 31 06 50 Schedules for Excavation Support and Protection
- 31 06 60 Schedules for Special Foundations and Load Bearing Elements
 - 31 06 60.13 Driven Pile Schedule
 - 31 06 60.16 Caisson Schedule
- 31 06 70 Schedules for Tunneling and Mining

31 09 00 Geotechnical Instrumentation and Monitoring of Earthwork

- 31 09 13 Geotechnical Instrumentation and Monitoring
 - 31 09 13.13 Groundwater Monitoring During Construction
- 31 09 16 Special Foundation and Load Bearing Elements Instrumentation and Monitoring
 - 31 09 16.13 Foundation Performance Instrumentation
 - 31 09 16.23 Driven Pile Load Tests
 - 31 09 16.26 Bored and Augered Pile Load Tests

31 10 00 SITE CLEARING

31 11 00 Clearing and Grubbing

31 12 00 Selective Clearing

31 13 00 Selective Tree and Shrub Removal and Trimming

- 31 13 13 Selective Tree and Shrub Removal
- 31 13 16 Selective Tree and Shrub Trimming

31 14 00 Earth Stripping and Stockpiling

- 31 14 13 Soil Stripping and Stockpiling
 - 31 14 13.13 Soil Stripping
 - 31 14 13.16 Soil Stockpiling
 - 31 14 13.23 Topsoil Stripping and Stockpiling
- 31 14 16 Sod Stripping and Stockpiling
 - 31 14 16.13 Sod Stripping
 - 31 14 16.16 Sod Stockpiling

31 20 00 EARTH MOVING

31 21 00 Off-Gassing Mitigation

- 31 21 13 Radon Mitigation
 - 31 21 13.13 Radon Venting
- 31 21 16 Methane Mitigation
 - 31 21 16.13 Methane Venting

31 22 00 Grading

- 31 22 13 Rough Grading
- 31 22 16 Fine Grading
 - 31 22 16.13 Roadway Subgrade Reshaping

SECTION 31 22 19
FINISH GRADING

CONSULTANT DESIGN GUIDELINE

Coordinate earthwork design with Facilities Management.

INCLUDE IN THE CONSTRUCTION DOCUMENTS

CONSTRUCTION DEBRIS. Before start of final grading, remove all construction debris and construction materials from the site.

APPROVAL. The contractor shall supply samples of soils that are intended to be used for imported fill or for other purposes. Topsoil must be approved by Facilities Management and consulting landscape architect.

TOPSOIL QUALITY. Topsoil shall be fertile, well drained of uniform quality, free of foreign materials, oil or chemicals, rocks, sticks, noxious weeds or grasses (Bermuda grass, Nut grass, Bind weed, Johnson grass, and Kudzu), and must be approved by Facilities Management and consulting landscape architect before being placed.

SOIL TESTING. Submit soil test of proposed topsoil verifying amounts of nitrogen, potassium, and phosphorus to Facilities Management Construction Coordinator. Before placing soil, sample sections of the ground. Landscape architect will determine location of sampling. Dig a ditch of 1'-0" wide x 1'-6" deep by 20'-0" long to determine the condition of the soil.

EXECUTION

FINISH GRADE. Bring all areas to a finished grade (hand-raked surface) not to exceed 1" below all walks and/or doorways of buildings. The finished grade shall be in physical condition for landscape planting as approved by Facilities Management Construction Coordinator.

SLOPE. Design slopes with a minimum slope of 2% to all drain inlets to assure positive surface water drainage. Design sloped sites, not to exceed a slope ratio of 4:1. In areas where a more abrupt change of slope is necessary, design a series of "OGEE" terraces with grade surfaces not to exceed a ratio of 3:1.

Verify slope design with Facilities Management Landscape Architect.

END SECTION

31 22 19.13 Spreading and Grading Topsoil
31 23 00 Excavation and Fill

31 23 13 Subgrade Preparation

SECTION 31 23 16

EXCAVATION

CONSULTANT DESIGN GUIDELINE

Notify the University Construction Coordinator for soil bearing/soils analysis testing as required for project. Provide Facilities Management with drawing of locations for soil borings as specified by structural engineer.

It shall be the responsibility of the contractor to calculate soil and rock excavation volumes to be a part of the project. Reasonable allowances will likely be allowed in the formulation of project costs, however, the consultant should work with Facilities Management to closely control and manage excavation costs by limiting allowance overruns, or other methods.

END SECTION

31 23 23.13 Trenching

31 23 23.16 Structural Excavation for Minor Structures

31 23 23.26 Rock Removal

31 23 19 Dewatering

31 23 23 Fill

31 23 23.13 Backfill

31 23 23.23 Compaction

31 23 23.33 Flowable Fill

31 23 23.43 Geofam

31 23 33 Trenching and Backfilling

31 24 00 Embankments

31 24 13 Roadway Embankments

31 24 16 Railway Embankments

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

CONSULTANT DESIGN GUIDELINE

SLOPE. Design slopes with a minimum slope of 2% to all drain inlets to assure positive surface water drainage. Design sloped sites, not to exceed a slope ratio of 4:1. In areas where a more abrupt change of slope is necessary, design a series of "OGEE" terraces with grade surfaces not to exceed a ratio of 3:1.

Verify slope design with Facilities Management Planning Group.

END SECTION

31 25 13 Erosion Controls

31 25 23 Rock Barriers

31 25 53 Sedimentation Controls

31 25 63 Rock Basins

31 30 00 EARTHWORK METHODS

31 31 00 Soil Treatment

31 31 13 Rodent Control

31 31 13.16 Rodent Control Bait Systems

31 31 13.19 Rodent Control Traps

31 31 13.23 Rodent Control Electronic Systems

31 31 13.26 Rodent Control Repellants

31 31 16 Termite Control

SECTION 31 31 16

TERMITE CONTROL

CONSULTANT DESIGN GUIDELINE

Treat all the soil under new buildings and around the buildings with chemicals as appropriate and meet current standards and guidelines for termite protection.

Closely follow instructions on the manufacturers label and obey all state and federal laws.

INCLUDE IN THE CONSTRUCTION DOCUMENTS

WARRANTY. Provide a five-year certificate of guarantee to the University.

END SECTION

31 31 16.13 Chemical Termite Control
31 31 16.16 Termite Control Bait Systems
31 31 16.19 Termite Control Barriers

31 31 19 Vegetation Control
31 31 19.13 Chemical Vegetation Control

31 32 00 Soil Stabilization

31 32 13 Soil Mixing Stabilization
31 32 13.13 Asphalt Soil Stabilization
31 32 13.16 Cement Soil Stabilization
31 32 13.19 Lime Soil Stabilization
31 32 13.23 Fly-Ash Soil Stabilization
31 32 13.26 Lime-Fly-Ash Soil Stabilization
31 32 16 Chemical Treatment Soil Stabilization
31 32 16.13 Polymer Emulsion Soil Stabilization
31 32 19 Geosynthetic Soil Stabilization and Layer Separation
31 32 19.13 Geogrid Soil Stabilization
31 32 19.16 Geotextile Soil Stabilization
31 32 19.19 Geogrid Layer Separation
31 32 19.23 Geotextile Layer Separation
31 32 23 Pressure Grouting Soil Stabilization
31 32 23.13 Cementitious Pressure Grouting Soil Stabilization
31 32 23.16 Chemical Pressure Grouting Soil Stabilization
31 32 33 Shotcrete Soil Slope Stabilization
31 32 36 Soil Nailing
31 32 36.13 Driven Soil Nailing
31 32 36.16 Grouted Soil Nailing
31 32 36.19 Corrosion-Protected Soil Nailing
31 32 36.23 Jet-Grouted Soil Nailing
31 32 36.26 Launched Soil Nailing

31 33 00 Rock Stabilization

31 33 13 Rock Bolting and Grouting

- 31 33 23 Rock Slope Netting
- 31 33 26 Rock Slope Wire Mesh
- 31 33 33 Shotcrete Rock Slope Stabilization
- 31 33 43 Vegetated Rock Slope Stabilization

31 34 00 Soil Reinforcement

- 31 34 19 Geosynthetic Soil Reinforcement
 - 31 34 19.13 Geogrid Soil Reinforcement
 - 31 34 19.16 Geotextile Soil reinforcement
- 31 34 23 Fiber Soil Reinforcement
 - 31 34 23.13 Geosynthetic Fiber Soil Reinforcement

31 35 00 Slope Protection

- 31 35 19 Geosynthetic Slope Protection
 - 31 35 19.13 Geogrid Slope Protection
 - 31 35 19.16 Geotextile Slope Protection
 - 31 35 19.19 Slope Protection with Mulch Control Netting
- 31 35 23 Slope Protection with Slope Paving
 - 31 35 23.13 Cast-In-Place Slope Paving
 - 31 35 23.16 Precast Concrete Slope Paving
 - 31 35 23.19 Concrete Unit Masonry Slope Paving
- 31 35 26 Containment Barriers
 - 31 35 26.13 Clay Containment Barriers
 - 31 35 26.16 Geomembrane Containment Barriers
 - 31 35 26.23 Bentonite Slurry Trench

31 36 00 Gabions

- 31 36 13 Gabion Boxes
- 31 36 19 Gabion Mattresses
 - 31 36 19.13 Vegetated Gabion Mattresses

31 37 00 Riprap

- 31 37 13 Machined Riprap
- 31 37 16 Non-machined Riprap
 - 31 37 16.13 Rubble-Stone Riprap
 - 31 37 16.16 Concrete Unit Masonry Riprap
 - 31 37 16.19 Sacked Sand-Cement Riprap

31 40 00 SHORING AND UNDERPINNING

31 41 00 Shoring

- 31 41 13 Timber Shoring
- 31 41 16 Sheet Piling
 - 31 41 16.13 Steel Sheet Piling
 - 31 41 16.16 Plastic Sheet Piling
- 31 41 19 Metal Hydraulic Shoring
 - 31 41 19.13 Aluminum Hydraulic Shoring
- 31 41 23 Pneumatic Shoring

31 41 33 Trench Shielding

31 43 00 Concrete Raising

31 43 13 Pressure Grouting

31 43 13.13 Concrete Pressure Grouting

31 43 13.16 Polyurethane Pressure Grouting

31 43 16 Compaction Grouting

31 43 19 Mechanical Jacking

31 45 00 Vibroflotation and Densification

31 45 13 Vibroflotation

31 45 16 Densification

31 46 00 Needle Beams

31 46 13 Cantilever Needle Beams

31 48 00 Underpinning

31 48 13 Underpinning Piers

31 48 19 Bracket Piers

31 48 23 Jacked Piers

31 48 33 Micropile Underpinning

31 50 00 EXCAVATION SUPPORT AND PROTECTION

31 51 00 Anchor Tiebacks

31 51 13 Excavation Soil Anchors

31 51 16 Excavation Rock Anchors

31 52 00 Cofferdams

31 52 13 Sheet Piling Cofferdams

31 52 16 Timber Cofferdams

31 52 19 Precast Concrete Cofferdams

31 53 00 Cribbing and Walers

31 53 13 Timber Cribwork

31 54 00 Ground Freezing

31 56 00 Slurry Walls

31 56 13 Bentonite Slurry Walls

31 56 13.13 Soil-Bentonite Slurry Walls

31 56 13.16 Cement-Bentonite Slurry Walls

31 56 13.19 Slag-Cement-Bentonite Slurry Walls

31 56 13.23 Soil-Cement-Bentonite Slurry Walls

31 56 13.26 Pozzolan-Bentonite Slurry Walls

31 56 13.29 Organically-Modified Bentonite Slurry Walls

31 56 16 Attapulgite Slurry Walls

31 56 16.13 Soil-Attapulgite Slurry Walls

- 31 56 19 Slurry-Geomembrane Composite Slurry Walls
- 31 56 23 Lean Concrete Slurry Walls
- 31 56 26 Bio-Polymer Trench Drain

31 60 00 SPECIAL FOUNDATIONS AND LOAD-BEARING ELEMENTS

31 62 00 Driven Piles

- 31 62 13 Concrete Piles
 - 31 62 13.13 Cast-in-Place Concrete Piles
 - 31 62 13.16 Concrete Displacement Piles
 - 31 62 13.19 Precast Concrete Piles
 - 31 62 13.23 Prestressed Concrete Piles
 - 31 62 13.26 Pressure-Injected Footings
- 31 62 16 Steel Piles
 - 31 62 16.13 Sheet Steel Piles
 - 31 62 16.16 Steel H Piles
 - 31 62 16.19 Unfilled Tubular Steel Piles
- 31 62 19 Timber Piles
- 31 62 23 Composite Piles
 - 31 62 23.13 Concrete-Filled Steel Piles
 - 31 62 23.16 Wood and Cast-In-Place Concrete Piles

31 63 00 Bored Piles

- 31 63 13 Bored and Augered Test Piles
- 31 63 16 Auger Cast Grout Piles
- 31 63 19 Bored and Socketed Piles
 - 31 63 19.13 Rock Sockets for Piles
- 31 63 23 Bored Concrete Piles
 - 31 63 23.13 Bored and Belled Concrete Piles
 - 31 63 23.16 Bored Friction Concrete Piles
- 31 63 26 Drilled Caisson
 - 31 63 26.13 Fixed End Caisson Piles
 - 31 63 26.16 Concrete Caissons for Marine Construction
- 31 63 29 Drilled Concrete Piers and Shafts
 - 31 63 29.13 Uncased Drilled Concrete Piers
 - 31 63 29.16 Cased Drilled Concrete Piers
- 31 63 33 Drilled Micropiles

31 64 00 Caissons

- 31 64 13 Box Caissons
- 31 64 16 Excavated Caissons
- 31 64 19 Floating Caissons
- 31 64 23 Open Caissons
- 31 64 26 Pneumatic Caissons
- 31 64 29 Sheeted Caissons

31 66 00 Special Foundations

- 31 66 13 Special Piles
- 31 66 16 Special Foundation Walls

- 31 66 16.13 Anchored Foundation Walls
- 31 66 16.23 Concrete Cribbing Foundation Walls
- 31 66 16.26 Metal Cribbing Foundation Walls
- 31 66 16.33 Manufactured Modular Foundation Walls
- 31 66 16.43 Mechanically Stabilized
- 31 66 16.46 Slurry Diaphragm Foundation Walls
- 31 66 16.53 Soldier-Beam Foundation Walls
- 31 66 16.56 Permanently-Anchored Soldier-Beam Foundation Walls
- 31 66 19 Refrigerated Foundations

31 68 00 Foundation Anchors

- 31 68 13 Rock Foundation Anchors

31 70 00 TUNNELING AND MINING

31 71 00 Tunnel Excavation

- 31 71 13 Shield Driving Tunnel Excavation
- 31 71 16 Tunnel Excavation by Drilling and Blasting
- 31 71 19 Tunnel Excavation by Tunnel Boring Machine

31 72 00 Tunnel Support Systems

- 31 72 13 Rock Reinforcement and Initial Support
- 31 72 16 Steel Ribs and Lagging

31 73 00 Tunnel Grouting

- 31 73 13 Cement Tunnel Grouting
- 31 73 16 Chemical Tunnel Grouting

31 74 00 Tunnel Construction

- 31 74 13 Cast-in-Place Tunnel Lining
- 31 74 16 Precast Concrete Tunnel Lining
- 31 74 19 Shotcrete Tunnel Lining

31 75 00 Shaft Construction

- 31 75 13 Cast-in-Place Concrete Shaft Lining
- 31 75 16 Precast Concrete Tunnel Lining

31 77 00 Submersible Tube Tunnels

- 31 77 13 Trench Excavation for Submerged Tunnels
- 31 77 16 Tube Construction (Outfitting Tunnel Tubes)
- 31 77 19 Floating and Laying Submerged Tunnels