**SECTION 31 23 16.16**

# structurAL excavation FOR MINOR STRUCTURES

**BASED ON DFD MASTER SPECIFICATION DATED 09/01/2015**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

# PART 1 - GENERAL

**SCOPE**

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete trenching for utilities and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. Included are the following topics:

PART 1 - General

Scope

Related Work

Reference Standards

Quality Assurance

PART 2 - Materials

Granular Fill

Structural Fill

PART 3 - Execution

Preparation

Dewatering

Excavation

Bearing Surface Approval

Construction of Foundations, Footings and Slabs

Backfill and Compaction

Restoration

#### RELATED WORK

***(Note to the designer: The designer must determine if this work will impact other related work or Contractors and should revise these specifications accordingly to only include those Sections that apply to the project.)***

Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:

Section 02 32 00 – Geo Technical Investigation

Section 02 41 13 – Demolition

Section 30 05 00 – Common Work Results For All Exterior Improvements

Section 31 20 00 – Earthmoving

Section 31 23 16.13 – Trenching

Section 31 23 19 – Dewatering

Section 31 25 00 – Erosion Control

Section 00 00 00 – (Section Title)

**REFERENCE STANDARDS**

***(Note to the designer: The A/E shall discuss the quality assurance procedures with the DFD Project Manager. The A/E shall determine the frequency of the required tests based on the project specifics. Delete references from this section that are not applicable to the project.)***

American Society for Testing and Materials (ASTM):

D422-63 Standard Test Method for Particle Size Analysis of Soils

D4318 Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils

D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3)

D1140 Standard Test Methods for Determining the Amount of Material Finer than 75‑μm (No. 200) Sieve in Soils by Washing

D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

D2922 Standard Test Methods for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)

D3017 Standard Test Method for Water Content of Soil and Rock In-Place by Nuclear Methods (Shallow Depth)

D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

**QUALITY ASSURANCE**

***(Note to the designer: A/E to determine the type and frequency of quality assurance geotechnical testing required on each project. Provide listing of quality assurance testing requirements associated with trenching in this item. If Contractor is not responsible for testing, modify this section accordingly. If Contractor is required to complete testing, complete the table below and specify the type of tests required and the frequency of the testing. Materials, tests and frequency shown are provided as a starting point and should be modified as necessary based on scope of project.)***

The Contractor’s construction materials testing personnel shall complete material testing as outlined in Table 31 23 16.16 -1.

***Table 31 23 16.16 -1***

|  |  |  |
| --- | --- | --- |
| Material | Test Required | Test/Sample Frequency |
| ***Granular or Structural Backfill (1)*** | *ASTM D422-63Standard Test Method for Particle Size Analysis of Soils* | *0 tests: 0-500 cy*  *1 test: 500-3000 cy* |
|  | *ASTM D1140 Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75-μm) Sieve in Soils by Washing* | *“* |
| ***Granular or Structural Backfill*** | *ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)* | *0 tests: 0-500 cy*  *1 test: 500-3000 cy* |

(1) Tests shall meet the requirements for gradation as listed in WisDOT Section 209.2 and 210.2.

**PART 2 - MATERIALS**

(Note to the designer: Edit material requirements as necessary to account for local variations in material availability. Comply with the substantive requirements of the materials described below.

**GRANULAR FILL**

Clean material meeting the requirements of “Grade 1” or “Grade 2” granular backfill as defined in WisDOT Section 209.2.1.

**STRUCTURAL FILL**

Clean material meeting the requirements of “Structure Backfill” as defined in WisDOT Section 210.2.1.

**PART 3 - EXECUTION**

**PREPARATION**

Review drawings and prepare work plan and schedule. Coordinate any necessary interruptions in utility service with DFD Project Representative, in accordance with other specification sections.

Contact Diggers Hotline. Locate and protect utilities, structures, pavement, trees, landscaping, benchmarks and other features in the work area.

Layout work according to drawings. Establish and transfer lines and grades as necessary to complete the work.

Remove topsoil from work area in accordance with Section 31 20 00 – Earthwork. Sawcut and remove pavement from work area in accordance with Section 02 41 13 – Demolition.

Support existing buildings, utilities and structures as necessary prior to beginning building excavation.

Grade area surrounding excavation to drain water away from excavation.

#### dewatering

Dewatering shall be completed in accordance with Section 31 23 19 – Dewatering.

#### excavation

***(Note to the designer: Provide any site-specific requirements relative to limitations on the size of the excavation, protection requirements, etc... Also reference geotechnical reports for site-specific requirements relative to shoring, underpinning or piling associated with protecting existing structures.)***

Excavate to elevations and dimensions necessary to complete construction. Excavations shall be sufficiently deep to provide for foundations, footings, slabs, and any required base material.

Do not excavate material from under the 45 degree bearing splay beneath existing foundations or footings.

Notify DFD Project Representative if correction of unauthorized excavation or over-excavation is necessary. Said excavations will be corrected based on recommendations of DFD Project Representative or DFD’s geotechnical consultant. Contractor will be responsible for all costs associated with correcting these excavations, including fees charged by DFD’s geotechnical consultant.

Segregate the various materials excavated. Reserve material meeting the requirements of backfill for the project location. Excavated material that does not meet the requirements of backfill, and excess excavated material, shall be removed from the site and disposed by the contractor unless directed otherwise by other specification sections or the DFD Project Representative.

Locate bedding, backfill and spoil piles in accordance with OSHA requirements, and so that it does not interfere with public travel, adjacent landowners or other construction activities.

#### bearing surface review

***(Note to the designer: Reference geotechnical reports and provide any site-specific requirements relative to bearing soil requirements or modifications****.)*

Prior to over-excavating below the proposed bearing surface grade, or modifying bearing surface soil, contact DFD Project Representative to schedule inspection. Provide minimum of 24 hours confirmed notice.

Provide smooth soil surface at bearing surface grade, unless otherwise required by site-specific geotechnical reports. Hand trim excavation, remove loose material, lumped subsoil, rock and boulders from the bearing surface.

Once the bearing surface grade is established, protect the soils from becoming saturated, frozen, or adversely altered. Do not allow soils from the sidewall of the excavation to spall and fall onto the bearing surface.

**construction of foundations, footings and slabs**

Construct foundations, footings and slabs in accordance with the drawings and pertinent specification sections.

Do not allow excavation sidewall soils to spall into excavation.

Do not allow water to collect in excavation.

Protect base of excavation from freezing.

Install waterproofing and foundation drainage system in accordance with drawings.

**BACKFILL AND COMPACTION**

Remove all forms, bracing, staking and other construction materials from the excavation prior to initiating backfilling.

Excavation shall be reasonably free of water prior to beginning backfilling. Do not place material on frozen surfaces or use frozen material.

Backfill excavation using the material specified on Table 31 23 16.16 - 2, or as shown on the drawings.

Compact fill material as required by Table 31 23 16.16 - 2 for the given use.

Moisture condition backfill material as necessary to achieve density required for given use.

Place and compact material to minimize settlement and avoid damage to structures, pipes, utility lines and other features. Hand-place and compact material as necessary.

Place backfill simultaneously on both sides of structures.

Backfill trenches to elevations shown on the drawings; allow for placement of base course, pavements, and topsoil as required by the drawings and other Contract Documents. Where final restoration will be delayed, backfill excavation to existing grade to provide a safe, free-draining surface.

It the responsibility of the Contractor to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified density. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

Flooding or jetting of backfill material for compaction purposes is not allowed.

***(Note to the designer: Remove row and/or columns from table that are not applicable to the project.)***

***Table 31 23 16.16 -2***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location | Required  Material | Maximum Compacted Lift Thickness | Minimum Proctor Compaction | Minimum Relative Density (a) |
| Areas Beneath Footings, Floor Slabs, or Structures | Structural Fill | 6” | 95% Modified | 70% |
| Footing, Foundation and Structure Backfill | Structural Fill | 6” | 95% Modified | 70% |
| Areas within 10’ of an Existing or Proposed Building or Structure Footing or Slab | Granular  Fill | 8” | 90% Modified | 60% |
| Areas Beneath Existing or Proposed Pavement (Roads, Drives, Walks) | Granular Fill | 8” | 90% Modified | 60% |
| Turf Areas | Earth Fill | 12” | 85 % Modified | 50% |

(a) Minimum relative density as determined by ASTM D-4253-00 for coarse-grained soils with less than 15% by mass passing the No. 200 sieve. Applicable only when minimum proctor compaction cannot be achieved.

**restoration**

Restore structure excavation to proposed grades and surfaces as soon as practicable after backfilling.

Remove excess backfill and spoil material from the site as soon as possible after backfilling is complete, but no later than 2 calendar days after backfilling is complete.

Thoroughly clean all drainage ways, roads, parking lots sidewalks and paved surfaces and remove and dispose all debris and mud.

**END OF SECTION**