

DIVISION 2 – SITE WORK
SECTION 02110 – SITE CLEARING

PART 1 – GENERAL

SUMMARY

This Section includes the following:

- Removing above-grade improvements.
- Removing below-grade improvements.

PROJECT CONDITIONS

Traffic: Conduct site-clearing operations to ensure minimum interference with the roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of contract.

Extent of work on adjacent property is indicated on Drawings.

EXISTING SERVICES

General: Indicated locations are approximate; determine exact locations before commencing work.

Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.

Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 – EXECUTION

SITE CLEARING

General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. The owner will identify any trees & shrubs to remain.

Trees indicated to remain shall have minor roots and branches cut in a clean and careful manner where such roots and branches obstruct installation of new construction.

Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to prevent damage to root system.

Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

DISPOSAL OF WASTE MATERIALS

Burning on Owner's Property: Burning is not permitted on Owner's property.

Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property.

EARTHWORK

PART 1 – GENERAL

SUMMARY

This Section includes the following:

Preparing and grading subgrades for slabs-on-grade, walks, pavements, and landscaping.

Excavating and backfilling for buildings and structures.

Drainage and moisture-control fill course for slabs-on-grade.

Subbase course for walks and pavements.

Subsurface drainage backfill for walls and trenches.

Excavating and backfilling trenches within construction limits.

Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.

DEFINITIONS

Excavation: consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

Borrow: Soil material obtained off site when sufficient approved soil material is not available from excavations.

Subbase Course: The layer placed between the subgrade and surface pavement or walk.

Drainage Fill: Course of washed granular material placed under slab-on-grade to cut off upward capillary flow of pore water toward slab.

Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the owner. Unauthorized excavation, as well as remedial work directed by the owner, shall be at the Contractor's expense.

Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

Utilities include on-site underground pipes, conduits, ducts, cables, and underground services within building lines.

QUALITY ASSURANCE

Codes and Standards: Perform earthwork complying with requirements of authorities with jurisdiction.

Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site or borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

PROJECT CONDITIONS

Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the owner and then only after acceptable temporary utility services have been provided.

PART 2 – PRODUCTS

SOIL MATERIALS

General: Provide approved borrow soil materials from off site when sufficient approved soil materials are not available from excavations.

Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.

Backfill and Fill Materials: Satisfactory soil materials.

Subbase Material: Naturally or artificially graded mixture of natural of limestone or dolomite, with at least 100 percent passing 0-1-inch sieve, 60-90 percent passing a 1/2-inch sieve, 35-60 percent passing a No. 4 sieve, and 10-35 percent passing a No. 30 sieve.

Bedding Material: Subbase materials with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1 1/2-inch sieve and not more than 5 percent passing a No. 8 sieve.

ACCESSORIES

Detectable Warning Tape: Polyethylene film warning tape encasing a metallic core, 6 inches wide and 4 mils thick minimum, continuously encircling a description of the utility shall be installed in trench above all water mains as installed for this development.

PART 3 – EXECUTION

PREPARATION

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

Provide erosion and sedimentation control measures.

DEWATERING

Protect surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

Protect subgrades and foundation soils from softening and damage by rain or water accumulation and from freezing temperatures or frost.

EXCAVATION

Explosives: Do not use explosives.

Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of character of materials and obstructions encountered.

Excavate for structures, pavements, and walks to indicated elevations and dimensions. Widens excavations to permit placing and removing concrete formwork, installing services and other construction, and for inspections. Trim subgrades to required lines and grades to leave solid tops to receive other work.

Excavate utility trenches to indicated slopes, lines, depths, and invert elevations of uniform widths to provide a maximum 12 inches of working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than the top of pipe or conduit.

Excavate and slope trench subgrade to provide uniform bearing and continuous support for pipe and conduit. Where encountering rock or other underlying bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.

Approval of Subgrade: When Geotechnical Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed. Payment will be made according to the Contract provisions for changes in the work.

The construction site will be maintained so that the following conditions can be avoided, but if they occur, then the Contractor shall be responsible to reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities.

Fill unauthorized excavation under foundations or fill footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Fill unauthorized excavations under other construction as directed by Geotechnical Engineer.

Store excavated and borrow soil materials acceptable for backfill and fill in shaped, graded, drained, and covered stockpiles. Locate stockpiles away from edge of excavations and outside drip line of remaining trees.

BACKFILLING

Backfill excavations promptly following acceptance of affected work below final grade.

Utility Trench Backfill: Place, compact, and shape bedding course to provide continuous support for pipes and conduits over rock or other underlying bearing surfaces and to fill unauthorized excavations.

Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. Place and compact final backfill of satisfactory soil material to final subgrade.

Coordinate backfilling with utilities testing.

Install warning tape directly above water lines, 12 inches below finished grade, except 6 inches below subgrade under pavements and sidewalks.

Fill Preparation: Plow strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil, and backcompact to required density.

Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer to within 2 percent of optimum moisture content before compaction.

Remove and replace, or scarify and air dry, satisfactory soil material that is too wet to compact to specified density.

COMPACTION

Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Place evenly alongside structures and utilities to required elevations.

Compact soil to not less than the following percentages of maximum dry density according to Modified AASHTO T-180 Compaction Test: 95 percent

Under structures, building slabs, steps, and pavements, compact the top 12 inches below subgrade and each layer of backfill or fill material to 95 percent.

Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of trimbackfill or fill material to 90 percent.

Under walkways, compact the top 6 inches below subgrade and each layer of backfill or fill material to 95 percent.

GRADING

Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Grade laws, walks, and unpaved subgrades to tolerances of plus or minus 0.10 foot and pavements and areas within building lines to plus or minus 1/2 inch.

SUBBASE AND BASE COURSES

Sub base: Under pavements and walks, place sub base course material on prepared subgrade and compact at optimum moisture content to required grades, lines, cross sections, and thickness.

Place shoulders along edges of sub base to prevent lateral movement. Construct shoulders at least 12 inches wide of acceptable soil materials and compact simultaneously with each subbase layer.

Under slabs-on-grade, place drainage fill on prepared subgrade and compact to required cross sections and thickness.

FIELD QUALITY CONTROL (BY GENERAL CONTRACTOR)

Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify requirements.

Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), ASTM D 2922 (nuclear method) or ASTM D 2937 (drive cylinder method), as applicable.

Footings Subgrades: Test each soil stratum to verify design bearing capacities.

Paved Areas and Building Slabs: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

Foundation Wall Backfill: At each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but in no case fewer than two tests.

Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but in no case fewer than two tests.

When testing agency reports that subgrade, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact, or rest until obtaining required density.

PROTECTION

Repair and re-establish grades where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction.

Settling: Where settling occurs during the project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

DISPOSAL

Transport surplus satisfactory soil to designated stockpiles on the Owner's property. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

Diaposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

SECTION 2200 – EXCAVATING, FILLING & GRADING

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION: Excavating, filling and grading required for this work includes, but is not necessarily limited to:

- A. Excavating, filling and backfilling to attain indicated grades;
- B. Trenching and trench backfilling;
- C. Rough and finish grading of the site; and
- D. Preparation of subgrade for areas to be paved.

1.2 RELATED WORK IN OTHER SECTIONS:

Demolition, Clearing & Grubbing – Section 2100

Site Drainage – Section 2500

Site Utilities (Water Main) – Section 2550

Miscellaneous Asphaltic Concrete Paving – Section 2850

Sodding and Seeding – Section 2810

Cast-in-Place Concrete – Section 3300

1.3 JOB CONDITIONS:

A. Dust Control:

- Use of all means necessary to control dust on and near the work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the work or if resulting from the condition in which the Contractor leaves the site.
- Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

B. Protection: Use all means necessary to protect all materials of this section before, during, and after installation and to protect all objects designated to remain. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner. Protect tops, trunks and roots of existing trees on project site which are to remain, as follows:

- Box, fence around, or otherwise protect trees before any construction work is started. (See Section 2100.)
- Do not permit heavy equipment or stockpiles within branch spread.
- Remove interfering branches without trunk injury, and cover covers with tree paint.

1.4 LINES AND GRADES: All excavation, filling and backfilling shall be done to the lines and grades shown on the drawings.

1.5 BENCH MARKS AND MONUMENTS: Maintain carefully all bench marks and reference points which are shown on the drawings. The Contractor shall pay for the replacement of such reference points if disturbed by negligence during construction.

1.6 APPLICABLE STANDARDS: The latest revision of the following standards shall apply to work hereunder:

American Society for Testing Materials (ASTM) Designation D-698 Moisture-Density Relations of Solids Designation D-1556 Standard Method of Test for Density Soil in Place

Associated General Contractors of America, Inc. "Manual of Accident Prevention in Construction"

Missouri Highway and Transportation Commission Missouri Standard Specifications for Highway Construction.

1.7 QUALITY ASSURANCE: The quality of the compaction for fill and backfill areas shall be verified by compaction tests as required by the Engineer. It shall be the Contractor's responsibility to have these tests performed by a qualified testing agency. Written test results shall be prepared and submitted to the Engineer for approval. Results shall be identified by location and depth from finished grade or elevation. If the quality of compaction does not meet the requirements of the specifications, the material will be removed and replaced to meet the requirements of the expense of the Contractor.

PART 2 – PRODUCTS

2.1 FILL MATERIAL, GENERAL:

Approval Required – All fill material shall be subject to approval of the Engineer.

2.2 ON-SITE FILL MATERIAL: All on-site fill material shall be soil or soil-rock mixture which is free from organic matter and other deleterious substance; it shall contain no rocks or lumps over 6 inches in greatest dimension; and not more than 15% of the rocks or lumps shall be larger than 2-1/2 inches in greatest dimension.

2.3 IMPORTED FILL MATERIAL:

A. Notification: For approval of imported fill material, notify the Engineer at least four (4) working days in advance of intention to import material, designate the proposed borrow area, and permit the Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Requirements: All imported fill material shall meet the requirements of paragraph 2.2 above and shall, in addition, be predominantly granular with a maximum particle size of 2 inches and plasticity index of 12 or less.

2.4 TRENCH AND STRUCTURAL BACKFILL:

A. On-Site Fill Material: All on-site fill material used for trench and structural backfill shall meet the requirements of paragraph 2.2 above.

B. Imported Cohesionless Material: All imported cohesionless material used for trench and structural backfill shall be free from organic substance and other deleterious matter, shall be subject to the approval of the Engineer, and shall be in particle size grading within the following limits:

Sieve Size	Percentage Passing
3/4"	100%
1/2"	90-100
3/8"	20-55
No. 4	0-5
No. 8	0-2

Material finer than the No. 200 sieve shall not exceed 2.5%.

2.5 TOPSOIL: All areas disturbed by construction operations which are not to be paved under this contract shall be provided with a 6-inch compacted layer of topsoil approved by the Owner's Representative. Topsoil from areas within the project limits may be stockpiled and used where such topsoil is considered satisfactory to sustain plant growth, is finely graded, and is completely free of gravel, rock or debris. Additional materials, if required, shall be brought to the project site by the Contractor. Topsoil areas shall be neatly and accurately brought to final grade as shown on the drawings and shall be compacted by light rolling.

2.6 OTHER MATERIALS: All other materials, not specifically described but required for proper completion of the work of this section shall be as selected by the Contractor subject to the approval of the Engineer.

PART 3 – INSTALLATION

3.1 GENERAL:

A. Familiarization: Prior to all work of this section, become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this section.

B. Backfilling Prior to Approval:

1. Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this section prior to all required inspections, tests, and approval.

2. All parts of the work to be enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner.

3. Site Drainage: During construction, excavation and fill shall be performed in a manner and sequence that will provide drainage at all times.

3.2 STRIPPING: Remove topsoil from areas within limits of excavation and areas designated to receive compacted fill as follows:

A. Scrape areas clean of all brush, grass, weeds, roots and other material.

B. Strip to depth of approximately 6 inches or to a sufficient depth to remove excessive roots in heavy vegetation or brush areas, as approved by the Engineer.

C. Stockpile stripping in areas where it will not interfere with construction operations or existing facilities.

3.3 EXCAVATION AND FILLING:

A. General: All excavation as hereinafter specified shall be unclassified and shall comprise the satisfactory removal and disposal of all material. Following the removal and stockpiling of topsoil, excavation and filling of every description and of whatever substances encountered shall be performed to the lines and grades indicated on the Drawings.

B. Waste Materials: All suitable excavated material shall be transported to and placed in areas requiring fill within the limits of the work as specified and shown on the drawings. All excavated materials which are considered unsuitable by the Engineer, and any surplus of excavated material which is not required for fill, will be known as "waste" and shall be disposed of by and at the expense of the Contractor to the satisfaction of the Owner's Representative.

C. Depressions Resulting from Removal of Obstructions: Where depressions result from or have resulted from, the removal of surface or subsurface obstructions, open the depression to equipment working width and remove all debris and soft material as directed by the Engineer.

D. Borrow: Any additional fill material required which is not available from excavation within the immediate project area shall be obtained from a borrow area approved by the Owner's Representative and shall be brought to the immediate site of this construction by the Contractor.

E. Preparation of Ground Surface for Fill: All vegetation such as roots, brush, sod, heavy growth or grass, and all decayed vegetable matter, rubbish, and other unsuitable material within the area upon which fill is to be placed, shall be cleared, stripped or otherwise removed before any fill is started. In no case will such objectionable material be allowed to remain in or under the fill area.

F. Sloped Surfaces: Sloped ground surfaces steeper than 1 vertical to 4 horizontal on which fill is to be placed shall be plowed, stepped (benched or broken up in such manner that the fill material will bond with the existing surface).

G. Fill and Backfill: All fill or backfill material shall consist of earth or other approved material with all undesirable material removed. Unless otherwise specified, all fill shall be uniformly placed in layers not more than 6 inches in compacted thickness, moistened as required and then compacted by means of power rollers or other approved equipment. Areas not supporting pavement, piping, structures or adjacent to foundations shall be compacted to 85% of the maximum density obtained at optimum moisture content as determined by the Standard Compaction Test, ASTM D-698.

H. Over-excavation: Backfill and compact all over-excavated areas as specified for fill at no additional cost to the Owner.

I. Unfavorable Weather: Do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

J. Flooding: Provide berms or channels to prevent flooding of subgrade; promptly remove all water collecting in depressions.

K. Softened Subgrade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and recompact as specified for fill and compaction below.

L. Dewatering: Provide and maintain at all times during construction, ample means and devices with which to promptly remove and dispose of all water from every source entering the excavations or other parts of the work. Dewater by means which will insure dry excavation and the preservation of the final lines and grades of bottoms of excavations.

M. Blasting: Blasting for excavation will be permitted only after securing written approval of the Owner's Representative and only when proper precautions are taken for the protection of persons and property. The hours of blasting shall be fixed by the Owner's Representative. Any damage caused by blasting shall be repaired by the Contractor at his expense. The Contractor's method of procedure relative to blasting shall conform with all state laws and municipal ordinances. No blasting shall be attempted within a distance of 80 feet from finished work or existing utilities.

N. Siltation Control: Straw bales or other approved measures shall be used to prevent silt from leaving the work area.

3.4 EXCAVATION AND FILLING FOR STRUCTURES:

A. All structure foundations shall be founded on undisturbed subsoil. Excavation shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or timber which may be used to hold and protect the excavation.

B. Whenever wet or otherwise unstable soil is encountered which is incapable of properly supporting the structure, as determined by the Engineer, the soil shall be removed to the depth required and the excavation backfilled to the proper grade with compacted coarse sand, fine gravel, or other suitable material as may be authorized.

C. Shoring designed by the Contractor shall be installed by the Contractor as excavation proceeds to properly protect workmen, adjacent structures or facilities, and previously completed work from accident or damage.

D. All excavations for structure shall be kept dry; no reinforcing steel shall be installed in water; and no water shall be permitted to inundate or freeze pipes placed, or hand operations, the surface shall be rolled with a 3-wheel roller weighing not less than 10 tons. Rolling shall be continued until the subgrade is thoroughly stable and until it has been approved by the Engineer.

3.5 EXCAVATION AND SUBGRADE PREPARATION FOR PAVEMENT:

A. General: Excavation for pavement construction shall be performed to the lines and grades shown in typical sections on the drawings.

B. Subgrade: The portion of the graded area upon which pavement, pavement base course, walkway surfacing, concrete deck, or other types of pavement are to be placed, is hereinafter designated as the "subgrade". The subgrade shall be brought to a true shape as indicated on the typical details and grading plan for the surfacing to be placed thereon.

1. Compaction of Subgrade: The Contractor shall scarify, compact, and shape the subgrade area until it is brought to a density of 95 percent of maximum density as determined by the Standard Compaction Test, ASTM D-698, for a depth of at least 6 inches below the finished subgrade elevation and at optimum to optimum plus 2% moisture content. If, during compaction, soft spots in the subgrade are encountered, they shall be removed and replaced by satisfactory materials, and brought to required density.

2. Subgrade Under Curb Section: Where portland cement concrete curb sections are called for on the drawings, these shall be constructed upon compacted subgrade prior to the grading and finishing of the base course subgrade.

3. Compaction of Pavement Subgrade – After the subgrade has been compacted and brought to proper grade and section by an approved subgrade machine, good grades, or hand operations, the surface shall be rolled with a 3-wheel roller weighing not less than 10 tons. Rolling shall be continued until the subgrade is thoroughly stable and until it has been approved by the Engineer.

3.6 EXCAVATION AND TRENCHING FOR PIPING:

A. General: Perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as otherwise specified herein. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to