SECTION 31 10 00

EARTHWORK

PART 1 - GENERAL

1.01 CONDITIONS

A. Requirements of the Conditions of the Contract apply to all work under this Section. This includes all labor, materials, equipment and services necessary to complete all work indicated on the drawings and herein specified, or both.

B. Carefully read the General Conditions of the Specifications, which shall be considered as and made a part of this section.

1.02 SCOPE

A. The work required under this section consists of all excavating, filling, grading, dewatering, and related items necessary to complete the work indicated on the Drawings and described in these Specifications, including but not necessarily limited to the following:

1. Excavating and disposal of existing concrete, building and site rubble, removal of top 12" of on-site soils (stripping) and stockpile for landscaping purposes.
2. Rough grading and subgrade preparation. Filling to top of subgrade with ordinary fill (locally available soil) approved by the Engineer.
3. Providing and installing geofabric under all areas of fill except slabs.
4. Providing and installing controlled fill materials, footings and slabs.

1.03 EXAMINATION OF SITE AND DOCUMENTS

A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation at the site.

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period as no allowance will be made for any errors or inaccuracies that may be found herein.

1.04 SUBSURFACE CONDITIONS

A. Subsurface conditions are to be assumed substantially as shown on the Drawings.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.

B. Comply with rules, regulations, laws and ordinances of all authorities having jurisdiction.

C. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings.

D. The Contractor shall not close or obstruct any street, sidewalk, alley or passageway without permission from authorities having jurisdiction. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, alleys, sidewalks, or other facilities near enough to the work to be affected thereby.

PART 2 - MATERIALS AND EQUIPMENT

2.01 FILL MATERIALS

A. Gravel Fill. Well graded natural sand and gravel free from ice, organic or other deleterious materials, conforming to the following gradations:

U.S. Sieve No.	Percent Passing by Weight	
	Maximum	Minimum
4 Inch	---	100
1 Inch	100	60
No. 4	85	25
No. 40	35	5
No. 200	5	0

B. Ordinary Fill. Well-graded, natural, inorganic soil shall consist of sand or gravel clays approved by the Architect/Engineer and meeting the following requirements:

1. It shall be free of organic and other weak or compressive materials, of frozen materials, and of stones larger than 6 inches maximum dimension.
2. It shall be of such nature and character that it can be compacted to the specified density of 100% Standard Proctor in a reasonable length of time.
3. It shall be free of highly plastic clays, of all materials subject to decay, decomposition, or dissolution, and of cinders or other materials which will corrode piping or other materials.
4. It shall have a plasticity index (PI) of less than 15.
5. Ordinary fill shall be used to fill to the top of subgrade.

C. Controlled Fill/Base Material Under Footings Slabs, Paved (both Rigid and Flexible) Driveways and Parking Areas.

1. The controlled fill under the floor slabs and footings shall consist of clayey sand or clayey gravel with a plasticity index less than 15. Samples of materials proposed shall be submitted for approval.

D. Granular Material Under Concrete Slabs.

1. The granular material under floor slabs shall consist of porous sands or crushed fine limestone with no more than 5% passing a No. 200 sieve (absence of fines), as approved by the Engineer.

E. Topsoil. Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, brick and other foreign materials, with acidity range of between pH 6.0 and 6.8. Disturbed areas to be seeded shall receive a 3" minimum of approved topsoil. Areas that shall receive beds and sod shall receive a 3" minimum layer of approved topsoil.

1. Identify source location of topsoil proposed for use on the project.
2. Provide topsoil free of substances harmful to the plants, which will be grown in the soil.

2.02 SOURCE QUALITY CONTROL

A. All fill materials shall be subject to quality control testing. A qualified laboratory will be selected and paid by the Contractor to perform tests on materials. Test results and laboratory recommendations will be available to the Owner.

2.03 COMPACTION EQUIPMENT

A. Provide sufficient equipment units of suitable types to spread, level and compact fills promptly upon delivery of materials.

B. Contractor may use any compaction equipment or device which he finds convenient and economical, but the Architect/ Engineer retains the right to disapprove equipment which, in his opinion, is of inadequate capacity or unsuited to the character of materials being compacted.

PART 3 - EXECUTION

3.01 GENERAL

A. Site Preparation

1. To prepare for construction, all topsoil, vegetation, roots, and any soft soils in the building or pavement areas shall be stripped from the ground surface and either wasted or stockpiled for later use in landscaping. Some old foundation slabs may be encountered.
2. Site grading should include removal of the surficial organic soil zone in the building and pavement areas. Depth of stripping is estimated to be on the order of 12 inches, although potentially greater in localized soft and/or moist areas during wetter seasons.
3. Following stripping, and prior to placing fill, the site should be proof-rolled with a minimum 20,000 pound pneumatic tired roller, loaded tandem-wheeled dump truck, or similar equipment. Soft or loose zones should be undercut and be processed and re-compacted or undercut and replaced with approved select fill. Additional undercutting in excess of the 12 inches will be considered a part of "site work" in the lump sum bid schedule and no additional compensation will be made.
4. Subgrade shall be compacted to 98% Standard Proctor. A subgrade support fabric such as Mirafi 500x (or equal) shall be placed between the compacted fill and the natural ground to improve site stability of soils.
5. Undercutting to depths of 3 to 4 feet are possible under extremely wet conditions, or if excessive disturbance occurs due to heavy construction equipment. To reduce undercut potential, the use of light dozers is recommended for stripping. In addition, operation of heavy rubber-tired equipment should be limited. See Soils Report, Appendix A.
6. Fill required for backfill or to raise existing grade should consist of select clayey sand (SC), sandy clay (CL), or clayey gravel (GC) having a liquid limit less than 40, or an approved alternate. Since the footings will be supported in fill, a compaction criteria of at least 100 percent of Standard Proctor dry density (ASTM D-1557) with a moisture content range of -2 to +3 percent of optimum is recommended. In pavement areas, a compaction criteria of at least 100 percent of maximum Standard Proctor dry density (ASTM D-698) for base course, at a moisture content near optimum is recommended. Fill should be placed in maximum 8

inch lifts. Each lift or fill should be properly compacted, tested, and approved prior to placing subsequent lifts.

B. Layout and Grades

1. All lines and grade work not presently established at the site shall be laid out by the Contractor in accordance with the Contract Drawings and Specifications. The Contractor shall establish permanent bench marks determined by a Registered Land Surveyor Professional Civil Engineer. Maintain all established bounds and bench marks and replace as directed any which are destroyed or disturbed.
2. The words "finished grades" as used herein shall mean the required final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas outside of the buildings shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.
3. The word "subgrade" as used herein means the required surface of subsoil, ordinary fill or compacted fill. The surface is immediately beneath the site improvements, specially dimensioned fill, paving, loaming, or other surfacing materials.

C. Disposition of Existing Utilities

1. Active utilities existing on the site shall be carefully protected from damage and relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record drawings and both the Architect/Engineer and the utility owner notified in writing.
2. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on the record drawings and reported in writing to the Architect/Engineer.

D. Frost Protection

1. Make no excavations to the full depth indicated when freezing temperatures may be expected, unless the footings or slabs can be placed immediately after the excavation has been completed. Protect the bottom so excavated from frost if placing of concrete is delayed. Should protection fail, remove frozen materials and replace with gravel fill as directed, at no cost to the Owner.
2. The underside of in-place beams and slabs shall be protected from freezing temperatures.

E. Disposal

1. All excavated materials which are not used for fill or backfill, and all surplus excavated materials shall be removed from the site and disposed of at no cost to the Owner.

3.02 EXCAVATION

A. Excavate all materials as required to allow construction of the foundations for the structure as shown on the Drawings. Attention is called to "General Notes" on Structural Drawings and to the requirements contained therein which may affect the work under this section.

B. If rock is encountered, trenches shall be excavated to 6 inches below bottom of pipe. Trenches for storm and sanitary sewers shall have a continuous slope in the direction of flow.

C. When the depth of backfill over the pipes exceeds ten (10) feet, keep the trench below the level of the top of the pipe as narrow as practicable.

3.03 DEWATERING

A. Provide, maintain and operate pumps and related equipment, including standby equipment, of sufficient capacity to keep excavation free of all water at all times and under any and all contingencies that may arise until the structures attain their full strength.

3.04 PLACING FILLS

A. General

1. Areas to be filled or backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place when fill materials or layers below it are frozen.
2. Notify the Architect/Engineer when excavations are ready for inspection. Filling and backfilling shall not be started until conditions have been approved by the Architect/Engineer.
3. Furnish approved materials. Place fill in layers not exceeding 6 inches compacted thickness and compact as specified below for various fill conditions.
4. Before backfilling against walls, the permanent structures (including basement floor slabs) shall be cast and sufficiently aged to attain strength required to resist backfill pressures without damage. Temporary bracing will not be permitted except by written permission from the Architect/Engineer. When filling on both sides of a wall or pier, place fill simultaneously on each side. Correct any damage to the structure caused by backfilling operations at no cost to Owner. Place no stones closer than eighteen (18) inches to wall surfaces.
5. Backfill trenches only after pipe has been inspected, tested, and location of pipes and appurtenances have been recorded.
6. Pipe bed shall be shaped by means of hand shovels to give full and continuous support to lower third of pipe. Backfill by hand around pipe and for a depth of twelve (12) inches above the pipe; use sand and tamp firmly in layers not exceeding six (6) inches in thickness, taking care not to disturb the pipe. Compact the remainder of the backfill thoroughly with a rammer of suitable weight or with an approved mechanical tamper to achieve the compaction specified below for various fill conditions.
7. Where soft materials of poor bearing qualities are found in trenching, a concrete foundation may be required to insure a firm foundation for the pipe. Such concrete foundation shall be bedded with six (6) inches of sand tamped in place so as to provide a uniform bearing for the pipe between joints.
8. All exposed subgrade shall be proof-rolled prior to fill placement to aid in identifying areas of loose or soft subgrade soils. Random compaction tests shall be performed to verify a subgrade soil compaction of 98% Standard Proctor of the top 6" of subgrade soil prior to ordinary fill or base course fill placement.

B. Placing Ordinary Fill

1. Ordinary fill as specified in Paragraph 2.1.B. hereinabove shall be provided behind all walls and for all backfill and fill where gravel fill has not been specified hereinabove or on Drawings.
2. Place ordinary fill in lifts not exceeding eight (8) inches, uncompacted thickness, and compact to 100% standard proctor density (ASTM D-698).

C. Placing Controlled Fill

1. The controlled fill should be scarified and then processed to a moisture content between three percentage points below and two percentage points above the Standard Proctor optimum. The subgrade

soils should be recompacted to a dry density of at least 98% of the standard Proctor maximum dry density for depths of at least 6 inches below the surface.

2. After subgrade preparation and inspection have been completed, fill placement may begin. Fill materials should be free of organic or other deleterious materials, have a maximum particle size of 3 inches, and have a plasticity index of less than 15. If a fine-grained (silt or clay) soil is used for fill, very close moisture content control will be required to achieve the recommended degree of compaction.
3. Fine-grained and granular structural fill should be compacted to at least 100% of the maximum Standard Proctor dry density as determined by ASTM Designation D-698. The fills under the concrete pavements shall have some plasticity. Select clayey sand or clayey gravel with a plasticity index between 4 and 15 shall be used.
4. Fill should be placed in maximum lifts of eight inches of loose material and should be compacted within the range of two percentage points above to three percentage points below the optimum moisture content as determined by the standard Proctor test. If water must be added, it should be uniformly applied and mixed into the soil by disking or scarifying.
5. Each lift of compacted soil should be tested and approved by the soils Architect/ Engineer or his representative prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one test per 2500 square feet of surface area per lift of fill in the building areas. This testing frequency may be reduced to one test per 5000 square feet of surface area per lift of fill in the pavement areas.

D. Field Quality Contro

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1. Cooperate with laboratory in obtaining field samples of in-place materials after compaction. Furnish identical field labor in connection with these tests.

E. Construction Procedures

1. It is anticipated that the surficial silty clay soils encountered over portions of the site may be subject to significant loss in shear strength upon exposure and saturation. Therefore, adequate drainage of surface runoff should be established during the early phases of site grading and continued throughout construction to prevent ponding and subsequent saturation of subgrade soils.
2. It is anticipated that if construction is initiated during wetter seasons limited perched ground water may be encountered above excavation depths. Further, if the silty clay surficial soils within the building area are near saturation, pumping of these soils may occur during fill placement, requiring additional undercutting or the use of a "bridge" lift procedure. The potential for these problems to occur is considered to be significantly reduced if the site is dry.
3. Foundation excavations should be free of all loose or soft soils and water prior to placing concrete. Concrete should be placed as soon as possible after excavation, cleaning and inspection are complete to minimize possible changes in soil conditions due to the effects of wetting and drying. The Contractor shall notify the Architect/Engineer so he can be present during foundation excavation to monitor soil conditions at foundation depths.
4. Care should be taken to adequately slope or brace the sides of foundation excavations to prevent sloughing or caving. All applicable safety requirements (OSHA) regarding trench excavations should be adhered to.

3.05 CLEAN UP

A. Remove all excess earth, debris, topsoil or other materials associated with this work from the job site.

B. Keep driveways and city streets free from mud or trash deposited by equipment used in performing work under this section.

END OF SECTION