

SECTION LS 02300

EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Preparing of subgrade for slabs, walks, pavements and improvements.
 2. Aggregate base for pavement and support of asphalt or concrete pavement and drainage fill for structure slabs.
 3. Excavation and backfilling for underground utilities and appurtenances.
 4. Sediment and erosion control.
- B. Final grading placement and preparation of topsoil for lawns and planting is specified in Section 02900, "Landscaping".

1.2 DEFINITIONS

- A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or concrete dimensions without specific direction of The City of Lakewood. Unauthorized excavation, as well as remedial work directed by The City of Lakewood, shall be at Contractor's expense.
1. Under footings, foundation bases or retaining walls fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable by The City of Lakewood.
 2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classifications, unless otherwise directed by City Engineer.

- C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If The City of Lakewood determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated materials as directed by The City of Lakewood.
 - 1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to the work.
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill or topsoil materials.
- E. Aggregate base courses: The aggregate layers placed on prepared subgrade for use as paving, or under concrete pavers or under asphalt or concrete pavements.
- F. Structure: Buildings, foundations, slabs, tanks, curbs, walls or other man-made stationary features occurring above or below ground surface.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation, embankment and paving preparation work in general compliance with ODOT Items 203, 304 and other applicable requirements of authorities having jurisdiction and this specification.
- B. The Contractor shall retain the services of a qualified geotechnical engineering testing and inspection service to perform all laboratory and field quality control testing and to advise the contractor on soils related constructability questions. The geotechnical service organization will be subject to the approval of The City of Lakewood. Unless itemized separately, geotechnical services shall be considered incidental to the performance of all earthwork operations.

1.4 PROJECT CONDITIONS

- A. Site Information: Typical subsurface soils in Lakewood consist of clay, silty clay with rock fragments, sandy clay with rock fragments and sand or sand and gravel. Moisture conditions vary from indurate to optimum with some saturated soil in local areas. Bedrock may be encountered below three (3) feet, consisting of weathered shale. These soils are known to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Care should be exercised during the grading

operations at the site. The traffic of heavy equipment, including heavy compaction equipment, may create pumping and a general deterioration of these soils in the presence of water. The contractor shall maintain positive site drainage and if wet/pumping conditions occur, the contractor will be responsible to over excavate the wet soils and replace them with a properly compacted structural fill. Conditions are not intended as representations or warranties of accuracy. The City will not be responsible for interpretations or conclusions drawn from this 'typical' data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
- B. Existing Utilities: Call OUPS and the City of Lakewood Division of Water/Wastewater Collection at least 48 hours before digging. Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 2. Do not interrupt existing utilities servicing facilities occupied by Owner or others during occupied hours except when permitted in writing by The City of Lakewood and then only after acceptable temporary utility services and 24-hour resident and Owner notification have been provided. Provide minimum of three (3) working days' notice to Engineer and receive written notice to proceed before interrupting any utility.
 3. Demolish and completely remove from site existing underground utilities indicated to be removed, unless directed otherwise by the plans or City Engineer. Coordinate with utility companies for shutoff of services if lines are active.
- C. Use of Explosives: Use of explosives is not permitted.
- D. Protection of Persons and Property: Barricade and secure open excavations occurring as part of this work and post with warning lights.
1. Operate warning lights as required by OMUTCD Standards.

2. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
 3. Perform excavation by hand within drip line of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with moistened burlap.
- E. The location for stockpiling fill materials shall be done with the approval of The City of Lakewood so as to avoid inconveniencing the public. It is strictly prohibited to so obstruct active commercial or residential drives or to obstruct emergency access pathways. If so directed by The City of Lakewood, all obstructing stockpiles shall be moved by the contractor at his expense.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. Pipe trench backfill:

1. Water Mains: All backfill from trench bottom to 12” above pipe elevation shall be approved natural bank run sand conforming to the gradation of ODOT 703.06. Item LS 613 Flowable Fill LSM shall be installed from bedding to pavement subgrade elevation. All proposed trench backfill materials shall be subjected to an ASTM C-150 Type I. Fine Aggregate shall conform to ODOT Specification 703.03 Fine Aggregate for Mortar Grout. (ODOT Construction and Materials Specifications most current edition). **The use of spent foundry sand or core sand is strictly prohibited.** The test shall be performed by an independent laboratory at the Contractor’s expense.
2. Sewer Pipe: All backfill from trench bottom to 12” above pipe elevation shall be approved No. 57 limestone. Item LS 613 Flowable Fill LSM shall be installed from pipe cover to pavement subgrade elevation. All proposed trench backfill materials shall be subjected to an ASTM C-150 Type I. Fine Aggregate shall conform to ODOT Specification 703.03 Fine Aggregate for Mortar Grout. (ODOT Construction and Materials Specifications most current edition). **The use of spent foundry sand or core sand is strictly prohibited.** The

test shall be performed by an independent laboratory at the Contractor's expense.

3. Field density tests shall be performed during trench backfill according to ASTM D6938; D5195 nuclear method and compared to laboratory tests. The degree of compaction of the backfill above the pipe bedding will be accepted if the test shows the lift was compacted to 98% of maximum dry density. At least one field density test shall be done every 100 feet of trench and every lift. The compaction and field testing operation will be subject to quality control inspection by the third party inspection service. All test results shall be submitted to The City of Lakewood within three (3) working days.
4. A failed density test indicates that the backfill has not met specifications and is not acceptable. Additional fill shall not be placed until compaction procedures have been modified, the failed lift has been re-installed and the lift has been re-tested and has passed its field density test.
5. Underdrains: Backfill shall consist of washed #8 bank run gravel subjected to vibratory compaction under the observation of The City of Lakewood's representative.

- B. Other suitable fill material is defined in Section 605.03 of the CMS. Fill Materials: The soil shall be free of rock or gravel larger than two inches (2") in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

2.2 SEDIMENT AND EROSION CONTROL MATERIALS

- A. Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*) and applied in accordance with Section 659 of the CMS.
- B. Filter fabric for sediment fences shall meet the requirements of Section 712.09, Type C, of the CMS.

PART 3 – EXECUTION

3.1 EXCAVATION – GENERAL

- A. Perform excavation work in conformance with local codes, ordinances and general conformance with ODOT Items 203, 603, 605 and 623. The excavation shall include the removal, handling, rehandling and disposal of

materials encountered in the work and shall include all pumping, bailing, draining, sheeting and bracing.

1. The use of excavating machinery will be permitted, except in places where operation of same will cause damage to trees, building or existing structures above or below ground, in which case hand methods shall be employed.
 2. Trees, fences, poles, signs and all other property shall be protected, unless their removal is authorized. Any property damaged shall be satisfactorily restored by the Contractor at no additional cost.
- B. The Contractor shall remove all existing structures, roadways, driveways and other similar materials and make to the lines and grades given all excavation necessary for the proper construction of the pavement, curbs, walks, underdrains, sewers, water main, pipe connections and appurtenant structures as indicated.
- C. Restoration of disturbed surfaces.
1. If any sidewalks, driveways or curbs are removed or damaged by the Contractor in the course of excavations or handling materials or for any other reason which may be attributed to work which has been done by the Contractor, then he shall replace same after all work including backfilling has been completed. Curb replacement shall be curb in kind, as directed by The City of Lakewood. In any case, curb replacement shall not be less than thirty inches (30") long. All disturbed curb drains shall be replaced with perforated polyethylene underdrain per the drawings and specifications and bedded with washed No. 8 limestone backfill per ODOT 605.03. Slag shall not be permitted.
 2. If necessary, at intersecting walks, drives, etc., additional concrete slabs beyond the excavation limits may have to be removed and replaced with new material in order to avoid having more joints than in the original work. All slabs shall be of full width. The Contractor shall furnish, place and maintain, wherever the sidewalk has been removed or damaged by him, a temporary sidewalk so as to provide a safe and passable sidewalk until such time as the final sidewalk is completed.
 3. All asphalt surface replacement and concrete base replacement of the trench area shall be constructed as shown on the Contract Documents. All driveway repair details are also found in the Construction Drawings.

4. The Contractor shall exercise care in his work operations to keep damage to trees to a minimum. All damage to trunks and tree limbs shall be repaired in a satisfactory manner by a competent and reputable tree repair and maintenance company qualified to do work in the City of Lakewood.
 5. No specific or separate payment will be made for all of this work, unless specifically called for in the Bid proposal. The cost thereof shall be included in the prices bid for the various items of the work to be done under this Contract.
- D. Protect excavation bottoms against freezing when atmospheric temperature is less than 32 degrees F.

3.2 STABILITY OF EXCAVATION AREAS

- A. The Contractor has complete and unconditional responsibility for the safety of his work site and compliance with all OSHA and OBBC requirements.
- B. Slope sides of excavations to comply with requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
 1. The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of trenches or other excavation and shall remove such sheeting and bracings as the trench or excavation is filled up.
 2. If The City of Lakewood is of the opinion that at any point sufficient or proper supports, sheeting or bracing have not been provided, he may order additional supports, sheeting or bracing at the expense of the Contractor, and the compliance with such orders by the Contractor shall not relieve or release him from his responsibility for sufficiency of such supports.

3.3 DEWATERING EXCAVATION AREAS

- A. Prevent surface water and subsurface water or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines and other dewater system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 STORAGE AND DISPOSAL OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade and shape stockpiles for proper drainage.
 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
- B. Dispose of excess excavated soil material and materials from work area not acceptable for use as backfill or fill.
 1. All surplus material and such other material as The City of Lakewood may deem unfit for use as backfill shall be disposed of by the Contractor so as to give a minimum of inconvenience to the public. In case of settlement after backfill, the Contractor shall supply sufficient material satisfactory to The City of Lakewood to make up for the deficiency.
 2. The storing of excavated material shall be done upon approval by The City of Lakewood so as to avoid inconveniencing the public. If, in the opinion of The City of Lakewood, it is necessary to remove this excavated material from the streets or lots, the Contractor shall be required to do so at his expense.
 3. Any material which may spill or drip from vehicles by hauling in the streets shall be removed and the streets cleaned by the contractor to the satisfaction of The City of Lakewood.
 4. When so directed by The City of Lakewood, the Contractor shall immediately remove all excavated materials from the site and dispose of the same.

3.5 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services and other construction and for inspection. Do not disturb bottom of excavations intended for bearing surface.
 - 1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR PAVEMENTS

- A. Cut surface of pavements to comply with the plan details, cross-sections, elevations and grades as indicated.
 - 1. All pavement cuts for utility trench repair shall be cut back in a straight line to provide support for the pavement replacement of at least eighteen inches (18") of undisturbed subgrade beyond the limits of the trench.
 - 2. All existing asphalt surfaces shall be powered saw cut and trimmed back to a neat straight vertical line.
- B. Pavement subgrade shall be prepared in accordance with ODOT 203.
- C. Pavement subgrade shall be proof rolled per ODOT 204 or as directed by The City of Lakewood.
- D. Over excavation for any purpose shall only be done with the approval of The City of Lakewood or The City of Lakewood's representative. Where The City of Lakewood deems necessary, a maximum of twelve inches (12"), undercutting of poor soil conditions encountered is to be performed by the Contractor, as directed by The City of Lakewood. Undercut areas shall be backfilled and compacted with subbase stone material as specified herein. Undercut quantity shall be paid from the subgrade soil excavation tabulated items. Undercut backfill quantity shall be paid from the subbase stone tabulated item.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. The Contractor shall remove all existing structures, roadways, driveways and other similar materials and make to the lines and grades given all excavation necessary for the proper construction of the storm sewer,

sanitary sewer, water main, pipe connections and appurtenant structures. The excavation shall include the removal, handling and disposal of materials encountered in the work and shall include all pumping, bailing, draining, sheeting and bracing.

- B. Excavate trenches to a uniform width, generally in conformance with ODOT 603.05.
- C. Trenches shall not be excavated more than two lengths of pipe (20 foot nominal) in advance of pipe laying. Backfilling shall follow pipe installation as soon as permitted by The City of Lakewood and not more than fifty feet (50') of trench overall shall be open at one time.
- D. Excavate trenches and conduit to depth indicated in the plans, or required to establish indicated slope and invert elevations.
 - 1. Trenches shall in every case be of sufficient width to permit solid packing of backfill under and around pipes and satisfactory construction of all appurtenances and for such sheeting and shoring, pumping and draining as may be necessary.
 - 2. The trench shall be excavated to the alignment and depth required and only so far in advance of pipe laying as The City of Lakewood shall permit. The trench shall be so braced and drained or pumped dry that workers may work therein safely and efficiently.
 - 3. The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon a full six inches (6") of approved bedding placed upon sound soil cut true and even so that the barrel of the pipe will have a bearing for its full length.
 - 4. Ledge rock, boulders, large stones and shale shall be removed to provide a clearance of at least six inches (6") on each side of all concrete pipe, and nine inches (9") on each side of all cast iron, steel and plastic pipe shall be provided.
 - 5. Excavations below subgrade in shale or in boulders shall be refilled to subgrade with approved material, thoroughly compacted. No additional pay shall be given for this work.
 - 6. When the uncovered trench bottom at subgrade is soft and in the opinion of The City of Lakewood cannot support the pipe, a further depth and/or width shall be excavated and refilled to pipe foundation grade as required under Paragraph 3, or other approved means shall be adopted to assure a firm foundation for the pipe.

7. Any part of the trench over excavated below grade shall be corrected with approved material, thoroughly compacted. No additional pay shall be given for this work.
8. Bell holes of ample dimensions shall be dug to earth trenches at each joint to permit the jointing to be made properly. Adequate clearance for properly jointing pipe laid in rock shall be provided at bell holes.

E. Excavation for Water System Items

1. The water main trench may vary with the type of excavated material but shall be a minimum of thirty inches (30") wide and in any case shall be wide enough to permit ample room for joining properly and to secure proper backfill. The maximum width shall not exceed thirty-six inches (36").
2. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire or police call boxes, or other utility controls shall be left unobstructed and accessible during the construction periods.
3. Excavations in the tree lawn are to be of sufficient size to make connections to curb stops. If, in the course of these tree lawn excavations, any house connections are damaged by the Contractor past the curb stops and/or outside the construction limits, the Contractor shall have repair made by a plumber licensed to work in the City of Lakewood at the Contractor's own expense. The Contractor shall remain responsible and indemnify the City from any damage on private property resulting from the installation of new water service connections. Said damage shall include but not necessarily be limited to: back flushing meters; replacement of copper service line, repair of domestic potable water systems; repair of hot water tanks, washing machines, etc. The Contractor is reminded that existing house connections may not run perpendicular from curb box to corporation stop. **The Contractor shall remove all existing curb boxes as part of new water service connections.** If circumstances should exist where curb boxes cannot be removed, they shall then be broken off at least eighteen inches (18") below grade and filled with sand or other suitable material.

3.8 BACKFILL AND FILL

- A. Place soil material in conformance with ODOT 203. Place soil in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use bank run sand to three inches (3”) below grade.
 2. Under walks and pavements, use LS 613 base material or as specified and/or approved.
- B. Place base material in conformance with LS 613.
- C. Place drainage fill material as specified and shown in the plans.
- D. Backfill trenches as shown in the plans.
1. Do not backfill trenches until inspections have been made and backfilling is authorized by owner. Use care in backfilling to avoid damage or displacement of pipe systems.
- E. Backfill excavations as promptly as work permits, but not until completion of the following.
1. Acceptance of construction below finish grade.
 2. Inspection, testing, approval and recording locations of underground utilities have been performed and recorded.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
 5. Removal of trash and debris from excavation.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.9 PLACEMENT AND COMPACTION OF FILL MATERIAL

- A. Place fill material in conformance with the following requirements.
- B. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface prior to placement of fills. Plow strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a moisture content that prevents proper compaction as revealed during tamping or proof-rolling, The City of Lakewood shall approve either removal and replacement or break up ground surface, pulverize, moisture-condition to optimum moisture content and compact to required depth and percentage of maximum density.
- C. Place backfill and fill materials in layers not more than six inches (6") in loose depth for material compacted by heavy compaction equipment and not more than four inches (4") in loose depth of material compacted by hand-operated tampers.
- D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
- E. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Prevent wedging action of backfill against structures of displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.
- F. All shoring and sheeting shall be removed during the backfill operation and shall be done so that backfill is compacted against the natural trench walls.
- G. Control soil and fill compaction, providing minimum percentage of dry density specified for each area classification indicated below. Correct improperly compacted areas or lifts, directed by The City of Lakewood, if soil density tests indicate inadequate compaction.
 1. Percentage of maximum Density Requirements: compact soil to not less than the following percentages of maximum dry density, in accordance with ASTM D 698:
 - a. Under structures, building slabs and steps, and pavement, compact top twelve inches (12") of subgrade to a width of eighteen inches (18") beyond the edge and each layer of backfill or fill material 98 percent maximum dry density.
 - b. Under lawn or unpaved areas, compact top six inches (6") of subgrade and each layer of backfill or fill material to 95 percent maximum dry density.

- c. Under walkway, compact top six inches (6") of subgrade to a width of eighteen inches (18") beyond the walkway edge and each layer of backfill or fill material at 98 percent maximum dry density.
2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - a. Remove and replace or scarify and air dry soil material that is too wet to permit compaction to specified dry density.
 - b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value, or by adding dry material, lime, or cement.

3.10 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades. Shape all surfaces to within 1/2" of planning grade.
- B. Grading Near Structures: Grade areas adjacent to structures to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.05 foot above or below required subgrade elevations.
 2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.05 foot above or below required subgrade elevation.
 3. Pavements: Shape subgrade surface of areas under pavement in accordance with CMS Item 203 to line, grade and cross-section, with surface not more than 1/2 inch above or below required subgrade elevation.

- C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact and proof roll subgrade surfaces in accordance with CMS Item 203 to the depth and indicated percentage of maximum or relative density for each area classification.

3.11 BACKFILLING OF TRENCHES

- A. Where water main pipe is laid in shale or clay trench, at least four inches (4") of fill sand shall be placed below the pipe and be well compacted and no more than eighteen inches (18") of sand shall be placed around and above the pipe, and it too shall be thoroughly compacted with an approved tamper. No blocking is to be left under the pipe. Where fill sand is authorized under this Contract, it must meet the approval of The City of Lakewood.
- B. The Contractor must exercise extreme care in placing the backfill sand to a point eighteen inches (18") above the pipe and make certain that it is compacted properly in order that the pipe is not moved or that the alignment of the pipe is not disturbed.
- C. Only after the backfill previously mentioned has been satisfactorily compacted may work proceed in placing the remaining backfill which must be carefully placed and compacted by using an approved tamper or other approved compaction method.
- D. Where sheeted trenches are being backfilled, the sheeting and bracing shall be removed in such a manner as to ensure complete compaction of the backfill material in the spaces occupied by the sheeting and bracing.
- E. Backfilling operations shall follow the pipe-laying operations as closely as practical. In no case shall more than fifty feet (50') of trench be opened during pipe-laying operations unless permitted by The City of Lakewood.
- F. The Contractor shall take every precaution against the floating of the pipe due to water coming into the trench or through caving in, flushing or puddling. In case of such floating, the Contractor shall replace the pipe at his own expense and make wholly good any injury or damage which may have resulted.
- G. Backfill puddling will not be permitted unless at the expressed written direction of The City of Lakewood. Only mechanical compaction techniques will be permitted.

- H. Backfilling of curb stop excavations in tree lawn areas, unless otherwise specified, shall be made with bank run sand or other granular material approved by The City of Lakewood. All backfill material shall be free from slag, cinders, rubbish and other objectionable material. All backfill shall be tamped and compacted to eliminate any settlement. **The Contractor shall remain responsible for correcting any settled areas for a period of ONE YEAR AFTER RETAINAGE RELEASE.**

3.12 AGGREGATE BASE COURSES FOR PAVING

- A. General: Aggregate base courses consist of placing base material in layers of specified thickness over subgrade surface to be used as pavement or a pavement base course. The work is to be performed in accordance with CMS Item 304.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing: place base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
 - 1. When a compacted subbase course is indicated to be six inches (6") thick or less, place material in a single lift. When indicated to be more than six inches (6") thick, place material in equal layers, except no single layer more than six inches (6") or less than three inches (3") in thickness when compacted.

3.13 STRUCTURAL SLAB DRAINAGE COURSE

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete structural slabs.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
 - 1. When a compacted drainage course is indicated to be six inches (6") thick or less, place material in a single layer.
 - 2. When indicated to be more than six inches (6") thick, place material in equal layers, except no single layer more than six

inches (6") or less than three inches (3") in thickness when compacted.

3.14 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction is the contractor's responsibility. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
1. Perform field density tests in accordance with Item 203 and 204, except that all testing shall be performed by the contractor's geotechnical firm.
 2. For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Engineer.
 3. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case fewer than three tests.
 4. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations directed.
 5. If in the opinion of The City of Lakewood, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

3.15 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grade in settled, eroded and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.
- E. The Contractor shall not drive heavy machinery over sewer lines installed with minimal cover.

PART 4 – PAYMENT

4.1 METHOD OF MEASUREMENT

- A. The City of Lakewood will Measure and Pay for pavement removed by the actual material removed in cubic yards. Payment for this item shall be considered full compensation for all labor and materials including removal of all asphalt, brick, concrete base and aggregate base to existing sub-grade elevation. Measurement of pavement removed will not include pavement removal paid under a different item, (e.g., pavement for watermain installation).
- B. The City of Lakewood will Measure and Pay for sub-grade excavation by the actual material removed in cubic yards. Payment for this item shall be considered full compensation for all labor and materials including removal of all soil, clay, rock, shale, stone or any other material indicated in the soil borings, that underlies the removed pavement, to proposed sub-grade elevation.

4.2 BASIS OF PAYMENT

- A. The City will pay for accepted quantities at the contract unit price as follows:

<u>Item</u>	<u>Unit</u>	<u>Description</u>
LS 2300	CY	Pavement Removed, as per plan
LS 2300	CY	Subgrade Excavation

END SECTION LS 02300