

SECTION 1100 – GRADING

1101 **SCOPE.** This section covers the performance of all the work and appurtenances required for grading the project in accordance with the approved plans.

1102 **MATERIALS AND DEFINITIONS.**

- A. **Grading.** Grading shall be defined as all excavation and placement of embankment and backfill.
- B. **Excavation.** Excavation is defined as the removal of materials from the construction area to the lines and grades as shown on the approved plans.

Unless otherwise provided for in the Special Conditions and included in the approved plans, all excavation shall be unclassified excavation and the contractor shall satisfactorily remove and dispose of all materials encountered regardless of their nature.

When provided for in the Special Conditions and included in the approved plans, the excavation may be classified according to the following categories.

- 1. **Common Excavation.** Suitable materials shall include all earth free of rock, sod, weeds, roots and other debris, and containing the soil characteristics and moisture content to obtain the required compaction.
 - 2. **Rock Excavation.** Rock excavation will be so classified when sandstone, limestone, blue shale or other similar material is encountered and, in the opinion of the engineer, requires drilling or blasting to remove the material.
- C. **Embankment.** Embankment is defined as the placement and compaction of material to the lines and grades as shown on the approved plans.

Construction of fills and embankments in frozen conditions shall not be permitted unless otherwise approved by the City Engineer. No fill or embankment material shall be installed on frozen surfaces, nor shall frozen materials, snow or ice be placed in any fill or embankment.

Material suitable for use as embankment shall be entirely imperishable and shall be approved by the City Engineer.

Earth embankment shall be free of waste material and shall contain less than ten (10) percent by volume of rock and gravel and contain no particles having a dimension greater than three (3) inches.

Rock embankment shall be free of waste material and shall contain ten (10) percent or greater by volume of rock or gravel with particles ranging in size from a minimum dimension of three (3) inches to maximum dimension of twenty-four (24) inches.

Embankment material shall not include frozen material, organic material, topsoil, rubbish, broken concrete, brick, asphaltic concrete and other debris and soil.

D. Structures. Structures, as used herein, refers to bridges, basins, street drainage structures, headwalls, retaining walls, and similar construction.

1103 CONSTRUCTION - GENERAL. During excavation and embankment grading operations, the work shall be performed in a manner and sequence that will provide positive drainage at all times. Unstable areas that develop during grading operations shall be undercut, backfilled with suitable material, and compacted in accordance with the approved plans. No additional payment will be made to the Contractor for undercutting.

1104 EXCAVATION - GRADING. Excavation within the construction limits shall be performed to the lines and grades on the approved plans.

All suitable material removed by excavation shall be used for embankment construction or elsewhere when directed by the City Engineer. The Contractor shall coordinate excavation operations to ensure suitable materials are readily available. No additional compensation will be made for any re-handling of materials.

Excavation materials in excess of the amount needed to complete the grading shall be considered as waste material, and shall be removed from the site by the Contractor.

Any additional fill material required which is not available from excavation within the construction limits shall be supplied by the Contractor at no expense to the City unless provided for in the approved plans. All such material brought to the site and incorporated in the work shall be approved by the City Engineer.

Unsuitable or unstable material, as determined by the City Engineer, shall be undercut to the depth required to reach stable material, backfilled with suitable material and compacted in accordance with the approved plans. No additional compensation for undercutting will be made unless provided for in the Special Conditions.

All roadway excavation in rock shall be undercut no less than twelve (12) inches for the full width of the roadway and backfilled with suitable soil or granular material. Undercut shall be unclassified excavation.

1105 EMBANKMENT - GRADING. The embankments shall be formed with suitable materials procured from excavations made on the project site or from approved borrow pits

Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than one (1) vertical to six (6) horizontal, the existing slope shall be benched or stepped in approximately eighteen (18) inch rises as the new fill is brought up in eight (8) inch lifts. Benching shall be of sufficient width to accommodate placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Materials thus cut out shall be recomacted to the required density along with the new embankment material. Material cut out, bladed into place, and compacted shall not be measured and paid for directly but will be considered as incidental work.

Maximum slopes for final grades shall be 4:1. Any steeper slope shall require approval of the

City Engineer. Any slope greater than 3:1 shall require City Engineer approval as well as a geotechnical analysis.

The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material, such as topsoil, peat, mulch, coal seams, disintegrated shale, rubbish, logs or stumps, and unconfined saturated soils, removed in accordance with Section 1000 prior to the embankment work.

Where embankments two (2) feet or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared ground surface shall be compacted at optimum moisture to the specified density. Where embankments greater than two (2) feet in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces not larger than twenty-four (24) inches maximum dimension, left in place and the embankment started thereon.

Earth embankment shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed eight (8) inches in thickness (loose measurement) and shall be compacted to the density specified in Section 1106 before the next layer is placed thereon. As the compaction of each layer progresses, continuous blading will be required to level the surface and to ensure uniform compaction. Embankment construction shall not be performed when the material to be compacted contains frost or is frozen.

Successive horizontal layers of rock embankment not exceeding two (2) feet in depth, shall be made by placing larger stones uniformly over the embankment area. Small stone fragments, sand, earth, or gravel shall be placed between the larger stones to fill all voids. Each layer shall be thoroughly compacted before the next layer is placed.

Large rocks shall be withheld from the top one foot of the embankment and only crushed stone or earth used in this layer. The crushed stone shall be well graded to form a dense mass when compacted.

1106 EMBANKMENT – BACKFILL AND COMPACTION. Embankment material shall be compacted in accordance with the City of Gardner *Technical Specifications and Design Criteria for Public Improvement*.

Backfilling of the curb shall be permitted when the concrete has been placed for a period of five (5) days or when the compressive strength of the concrete has reached seventy-five (75) percent of its mix design strength, unless otherwise directed by the City Engineer. All fill material placed within the right-of-way shall be compacted to ninety-five (95) percent of maximum density at the optimum moisture content as determined by ASTM D698. The material used to backfill the curb shall be free of rock and debris and shall leave no voids when compacted.

The top portion of the backfill in unpaved areas shall be finished with at least twelve (12) inches of topsoil. Topsoil shall be approved by the City Engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled during excavating and grading operations.

Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to placing topsoil, the surface shall be loosened by discing or

scarifying to a depth of two (2) inches to permit bonding of the topsoil to the underlying surface.

1107 STRUCTURE BACKFILL. The Contractor shall be responsible for any damages to the structure caused by his backfilling operations. Uneven loading of the structure during backfilling will not be permitted. Backfill around and outside of structures shall be deposited in layers not to exceed eight (8) inches in uncompacted thickness and brought to 95% of maximum density at optimum moisture content as determined by ASTM D698. The Contractor shall be required to uniformly adjust the moisture of the material as necessary to comply with the optimum moisture range specified. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

Material for structure backfill shall be composed of earth only and shall contain no organic materials, broken concrete, stones, trash, or debris of any kind.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose, earth having a moisture content such that maximum density of the compacted soil will be obtained. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance that proper moisture distribution and compaction will be obtained.

Backfill around and outside of structures that will ultimately lie under proposed pavements shall be compacted to the requirements of Section 1205 "*Compaction Requirements*".

1108 SHEETING AND SHORING. The Contractor shall be responsible for the safety of the excavation which shall comply with all OSHA regulations pertaining to trench safety, except where banks are cut back on a stable slope, excavation for structures shall be properly and substantially sheeted, braced, and shored, as necessary, to prevent any caving or sliding. Sheeting, bracing, and shoring shall be designed and constructed to withstand all loads caused by earth movement or pressure.

1109 FINAL GRADING. All areas which area to be finish graded shall be brought to the indicated elevations, slopes, and contours. The use of suitable equipment for final area grading and dressing of slopes will be required. The Contractor shall be required to re-grade any areas that are not in accordance with the approved plans.

1110 CLEANUP. Cleanup shall follow the work progressively and final cleanup shall follow immediately behind the finish grading. The contractor shall remove all equipment, tools, and discarded materials, and other construction items. The entire right-of- way or easement shall be left in a finished, mowable, and neat condition. Cleanup shall be considered a subsidiary obligation of the grading work.

In the event the contractor does not promptly comply with the terms of such instructions, the city may have the defective work corrected or the rejected work removed and replaced and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by the contractor. The contractor will also bear the expenses of repairing work of others destroyed or damaged by his correction, removal or

replacement of defective work.

- 1111 SETTLEMENT.** The contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within two (2) years after final completion of the contract under which the work was performed.

The Contractor shall repair or replace settlement deficiencies within thirty (30) days of receiving notice from the City Engineer. The Contractor shall be responsible for all costs associated with the repair work.

- 1112 TEMPORARY SURFACING.** Temporary aggregate surface shall be provided for ingress and egress during construction at the direction of the City Engineer. Temporary aggregate surfacing shall meet the requirements of the applicable sections of these Technical Specifications unless otherwise approved by the City Engineer.

Temporary surfacing for sidewalk, bikeways, trails, and other walkways shall be asphaltic concrete or Portland cement concrete, with a minimum width of four (4) feet and minimum thickness of four (4) inches.

Temporary surfacing shall be subsidiary to other grading items unless stated otherwise in the approved plans.