

## **SECTION 200**

### **EARTHWORK**

#### **SECTION 201 - CLEARING AND GRUBBING**

##### **201-1 DESCRIPTION**

This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the ENGINEER.

Clearing shall consist of the cutting and removal of all trees, stumps, brush, and hedges, as well as the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required under clearing. Clearing, when so designated, shall consist of the cutting and removal of isolated single trees or isolated groups of trees. The cutting of all the trees of this classification shall be in accordance with the requirements for the particular area being cleared or as shown on the plans or as directed by the ENGINEER.

Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, rubbish of any nature, natural obstructions, or such material which in the opinion of the ENGINEER is unsuitable for the foundation of pavements or other required structures. This shall also include the grubbing of stumps, roots, and foundations and the disposal from the project of all spoil materials resulting from clearing and grubbing.

##### **201-2 CONSTRUCTION REQUIREMENTS**

**201-2.1 GENERAL.** The areas denoted on the plans to be cleared and grubbed under this item shall be staked on the ground by the ENGINEER. The clearing and grubbing shall be done at a satisfactory distance in advance of the grading operations.

All spoil materials removed by the clearing or by clearing and grubbing shall be disposed at an approved disposal area.

As far as practicable waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry which cannot be used in construction, and all other materials not considered suitable for use elsewhere, shall be disposed of by the CONTRACTOR. In no case shall any discarded materials be left in windrows or piles adjacent to or within the work or project limits. The manner and location of disposal of materials shall be subject to the approval of the ENGINEER and shall not create an unsightly or objectionable view.

Any blasting necessary shall be done at the CONTRACTOR's responsibility. The utmost care shall be taken not to endanger life or property.

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a utility pole, pipeline, conduit, cable, sewer, roadway, or other utility is encountered and must be removed or relocated, the CONTRACTOR shall advise the ENGINEER who will notify the proper authority or Owner and attempt to secure prompt action.

**201-2.2 CLEARING.** The CONTRACTOR shall clear the staked or indicated area of all objectionable materials. Trees unavoidably falling outside the specified limits must be cut up, removed, and disposed of in a satisfactory manner. In order to minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The CONTRACTOR shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut to a height of not more than 12 inches above the ground. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of or salvaged as directed by the ENGINEER.

All tree removal shall be done utilizing a contractor licensed with the City of Mandan's Forestry Department.

**201-2.3 CLEARING AND GRUBBING.** In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed except where embankments exceeding 3 1/2 feet in depth are to be made outside of paved areas. In cases where such depths of embankments are to be made, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off within 6 inches above the ground and allowed to remain. Roots and other projections over 1 1/2 inches in diameter shall be grubbed out to a depth of at least 18 inches below the finished subgrade or slope elevation.

When isolated trees are designated for clearing, the trees shall be classed in accordance with the diameter size as measured at point 54 inches above the ground level or at a designated height specified in the proposal.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials therefrom shall be removed from the site. The remaining foundations, wells, cesspools, and all like structures shall be destroyed by breaking out or breaking down the materials of which the foundations, wells, cesspools, etc., are built and removing the footing and walls or as specified on the plans. Any broken concrete, blocks, or other objectionable material which cannot be used in backfill shall be removed and disposed of by the CONTRACTOR. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes remaining after the grubbing operation in embankment areas shall have the sides broken down to flatten out the slopes and shall be filled with acceptable material, dried or moistened, and properly compacted in layers to the density required in Subsection 202-3.7. The same construction procedure shall be applied to all holes remaining after grubbing in excavation areas where the depth of holes exceeds the depth of the proposed excavation.

All tree removal done within clearing and grubbing shall be done utilizing a contractor licensed with the City of Mandan.

**201-2.4 TREE ROOT CUTTING.** The CONTRACTOR shall be responsible for the prevention of damage to trees, shrubs, bushes, and hedges.

When tree roots are found larger than 3 inches in diameter during construction, the CONTRACTOR must contact the City of Mandan's Forestry Department to determine if such roots shall be cut and/or if the tree shall be removed before continuing any further construction.

When the City Forester determines that the roots may be cut, all roots shall be cut cleanly to avoid jagged rough ends. A visual inspection of tree root cuts shall be made by the City Forester.

All roots greater than 3 inches in diameter shall be cut using a hand pruner, hand saw, power saw, or stump grinder.

### **201-3 MEASUREMENT AND PAYMENT**

**201-3.1 CLEARING.** Clearing shall be measured by the square yard (SY) or considered a lump sum and shall be paid for at the unit price bid for "Clearing" completed and approved by the ENGINEER.

**201-3.2 CLEARING AND GRUBBING.** Clearing and Grubbing shall be measured by the square yard (SY) or considered a lump sum and shall be paid for at the unit price bid for "Clearing and Grubbing" completed and approved by the ENGINEER.

**201-3.3 TREE REMOVAL.** When the proposal indicates measurement by individual unit basis, the accepted quantities of "Tree Removal" shall be measured and paid for at the unit price bid for the following item:

<u>Pay Item</u>	<u>Unit</u>
Trees (0" to 2")	Incidental to other items
Trees (2" to 6")	Each
Trees (7" to 12")	Each
Trees (13" to 24")	Each
Trees (over 24")	Each

Tree sizes shall be determined by measuring the diameter at a point 54 inches above the ground.

**201-3.4 TREE ROOT CUTTING.** Tree root cutting shall be measured on an individual basis for each root cut (Ea.) and accepted by the ENGINEER. There shall be no payment of tree root cuttings less than 3 inches in diameter. Tree root cutting shall be paid for at the unit price for "Tree Root Cutting" completed and approved by the City Forester.

**201-3.5 BUILDING REMOVAL.** Building removal shall be measured by the individual unit basis (Ea.) and paid for at the unit price bid for "Building Removal" including the foundation complete and approved by the ENGINEER.

**201-3.6 FOUNDATION REMOVAL.** Foundation Removal shall be measured by the individual unit basis (Ea.) and paid for at the unit price bid for "Foundation Removal" complete and approved by the ENGINEER.

## **SECTION 202 - EXCAVATION AND EMBANKMENT**

### **202-1 DESCRIPTION**

This item shall consist of excavating, removing, and satisfactorily disposing of all materials within the limits of the work in accordance with these specifications and in conformity with the dimensions and typical sections shown on the plans and with the lines and grades established by the ENGINEER.

"Unstable," "Suitable," "Unsuitable," and "Unsatisfactory" soil or aggregate items shall be defined as follows:

#### **a. UNSTABLE SOILS**

Unstable soils are those soils which in their natural or existing condition require manipulation, aeration, or wetting and recompaction to obtain the required density for a suitable subgrade foundation. This condition is usually caused by too high a moisture content for cohesive soils and too loose and/or dry for granular soils.

In the case of cohesive soils where in their natural state the moisture content exceeds optimum moisture, they begin to behave as plastic rather than solid. Scarifying or windrowing to a depth of 9 to 12 inches and recompacting the soil in 6-inch lifts to prescribed density requirements will usually correct this condition. The other alternative is to subcut to prescribed depth and replace the cohesive material in accordance with specifications.

In the case of granular soils that are too loose, usually subcutting those and replacing them in 6-inch lifts to prescribed density soil will correct this condition.

In either case, it is not that these soils have to be replaced with more desirable soil, it is merely that in their natural state they are unstable but not unsuitable for subgrade foundation.

#### **b. UNSUITABLE SOILS**

Unsuitable soils are those soils which in their natural state are unsuitable for subgrade foundation due to a high organic content such as vegetation, matted roots, peat, or muck. Soils of these types are very susceptible to consolidation due to the decaying of this organic matter. Other unsuitable soils are those which contain decomposable debris and ashes.

The frozen condition of any soil or material shall not constitute a basis for a change of classification. Although frozen material shall not be allowed in the trench unless otherwise indicated, it shall be recompact after it has thawed as directed by the ENGINEER.

### **c. SUITABLE MATERIALS**

Suitable materials are those materials which have been determined to be satisfactory for subgrade foundations and includes all stable or unstable soils and any other materials deemed satisfactory by the ENGINEER for use in subgrades or embankments.

### **d. UNSATISFACTORY MATERIALS**

Unsatisfactory materials are those materials which have been determined to be unsuitable for subgrade foundations and includes all unsuitable soils, rock, shale hardpan, loose rock, boulders, concrete chunks or slabs, debris, and any other materials deemed unsatisfactory by the ENGINEER for use in subgrades or embankments.

All suitable material taken from excavation shall be used in the formation of embankment, subgrade, and for backfilling as indicated on the plans or as directed by the ENGINEER.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or wasted as directed. When the volume of excavation is not sufficient for constructing the fill to the grades indicated by the ENGINEER at locations designated on the plans, or the Special Provisions, the additional material required shall be identified by the ENGINEER and paid as "Borrow Excavation."

### **202-2 CLASSIFICATION**

All material excavated shall be defined as "Unclassified Excavation" unless, in the proposal form, prices are asked and bids are taken for "Rock Excavation" and "Borrow Excavation."

"Unclassified Excavation" shall include all excavation performed under this item regardless of the material encountered.

"Rock Excavation," when provided in the proposal, shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they present all the characteristics of solid rock and which cannot be removed without drilling and blasting. All rock not allowed to be placed in the backfill or embankment, as directed by the ENGINEER, shall be considered "Rock Excavation."

"Borrow Excavation" shall consist of approved material required for the construction of embankments or for other portion of the work and shall be obtained from approved sources. Unless otherwise designated in the contract, the CONTRACTOR shall pay all costs involved.

The CONTRACTOR shall notify the ENGINEER in advance of opening any borrow areas so that the borrow material can be tested before being used. Sufficient time for testing the borrow shall be allowed.

### **202-3 CONSTRUCTION REQUIREMENTS**

**202-3.1 GENERAL.** The rough excavation shall be carried to the necessary depth to obtain the specific depth of subgrade compaction shown on the plans. Likewise, on embankments the depth of subgrade compaction shall be as shown on the plans. Should the CONTRACTOR through negligence or other fault excavate below the designated lines, the excavation shall be replaced with approved materials in an approved manner and condition at the CONTRACTOR's own expense.

The ENGINEER shall have complete control over the excavation, moving, placing, and disposition of all material and shall determine the suitability of material to be placed in embankments. All material determined unsuitable shall be disposed of in waste areas or as directed. Topsoil shall not be used in fills or in subgrades but shall be handled and placed as directed.

The CONTRACTOR shall inform and satisfy himself as to the character, quantity, and distribution of all materials to be excavated. No payment will be made for any excavated material which is used for purposes other than those designated. All spoil areas shall be leveled to a uniform line and section and shall present a neat appearance before project acceptance. The surface elevation of spoil areas shall not extend above the surface elevation of adjacent or contiguous usable areas unless approved by the ENGINEER.

The ENGINEER shall provide centerline stakes to prepare the grading. The CONTRACTOR shall be responsible for staking all other grades necessary to complete grading as per plans or specifications.

The ENGINEER shall verify that finished grading for roadway is within one (1) inch of the final subgrade elevation specified. If grading does not meet tolerance, the CONTRACTOR shall be responsible for regrading to meet tolerance.

Those areas outside of the pavement areas in which the top layer of soil material becomes compacted due to hauling or to any other activity of the CONTRACTOR, shall be scarified and disked to a depth of 4 inches, as directed, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers, or underdrainage, conduits, utilities, or similar underground structures, or parts thereof, the CONTRACTOR shall be responsible for and shall take all necessary precautions to

protect and preserve or provide temporary services. When such facilities are encountered, the CONTRACTOR shall notify the ENGINEER, who shall arrange for their removal, if necessary. The CONTRACTOR shall assume all costs to repair all damage to such facilities or structures which may result from operations of the CONTRACTOR during the period of the contract.

The CONTRACTOR shall engage an independent soils testing laboratory approved by the ENGINEER to determine the soil proctors and perform the required compaction testing to be determined by the ENGINEER.

The compaction control tests for this section are based on one individual compaction test per 200 cubic yards of fill and 750 square yards of area. The CONTRACTOR shall be responsible for all retesting of failed tests and a proctor determined to represent each soil condition to be encountered on the project. The time, locations, depths, and frequency of compaction testing shall be at the discretion of the ENGINEER during construction. Should it become necessary to conduct an additional number of initial compaction tests, over and above the number specified for bidding purposes, the CITY OF MANDAN shall be responsible for all costs associated with additional testing performed by an independent soils testing laboratory. The CONTRACTOR, however, will be required to assume the cost of all retesting of failed tests, regardless of the total number required during construction.

Compaction testing to determine densities may be accomplished with a nuclear density testing apparatus and/or the sand cone method. Should disputes arise concerning test results, they will be resolved by using only the sand cone method of testing.

Written reports of all test results shall be supplied to the ENGINEER and the CONTRACTOR by the testing laboratory as soon as possible. To expedite construction progress it is necessary that the CONTRACTOR and ENGINEER be furnished with the results of all tests as soon as testing is completed. The availability of the independent testing laboratory when needed and speed of testing and reporting are to be considered the responsibility of the CONTRACTOR.

Compaction Control Test as stated above shall be incidental to the price bid for 202-4.1 Unclassified Excavation and/or 202-4.3 Borrow Excavation.

**202-3.2 EXCAVATION.** Excavation shall be performed as indicated on the contract plans to the lines, grades, and elevation shown or as directed by the ENGINEER, and shall be made so that the requirements for formation of embankments can be followed. No excavation or stripping shall be started until the ENGINEER has taken cross-sectional elevations and measurements of the existing ground surface and has staked out the proposed work. All material encountered within the limits indicated shall be removed and disposed of as directed. During the process of excavation, the grade shall be maintained so that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the work.

If, at the time of excavation, it is not possible to place any material in its proper section of the permanent construction, it shall be stockpiled in approved areas for later use.

Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for subgrades, streets, roads, shoulders, intermediate areas, or any areas intended for turfing shall be excavated to a minimum depth of 12 inches, or to the depth specified by the ENGINEER, below the contemplated surface of the subgrade or the designated grades. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified to provide a satisfactory foundation. Unsatisfactory materials shall be disposed of at locations designated by the ENGINEER. All material so excavated shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation" or for "Rock Excavation," as the case may be, when the classification for the last two items is provided in the proposal. The portion so excavated shall be refilled with suitable selected material as specified, obtained from the grading operations or borrow area and thoroughly compacted by rolling. The necessary refilling will constitute a part of the embankment. Where rock cuts are made and refilled with selected material or where trenching out is done to provide for a course of pavement, the depths thus created shall be ditched at frequent intervals to provide drainage.

The CONTRACTOR shall make the distribution as indicated on the plans. Widening or narrowing of the section and raising or lowering of the grade to avoid haul will not be permitted. The ENGINEER reserves the right to make minor adjustments or revisions in lines or grades, if found necessary, as the work progresses due to discrepancies in the plans or to obtain satisfactory construction.

Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the ENGINEER. The ENGINEER, whose decision shall be final, shall determine if the displacement of such material was unavoidable. All overbreak shall be removed by the CONTRACTOR and disposed of as directed; however, payment will not be made for the removal and disposal of overbreak which the ENGINEER determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by local agencies unless otherwise shown on the plans. All existing foundations or footings shall be excavated by the CONTRACTOR and the material disposed of as directed. All foundations thus removed shall be backfilled with suitable material and compacted.

In cut areas the subgrade under areas to be paved shall be compacted to the depths and to the densities at optimum moisture as shown on the plans or as specified in the specifications or when not otherwise shown or specified, to a minimum depth of 6 inches and to a density of not less than 90% of the maximum dry density at optimum moisture as determined by the compaction control tests specified in ASTM D1557. Any unsuitable materials encountered shall be removed and paid for as specified.

No payment or measurement for payment will be made for suitable materials removed, manipulated, and replaced in order to obtain density. Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the excavation and embankment operations and shall be performed by the CONTRACTOR at no additional cost to the project.

Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations conforming to the typical cross section shall be completed and maintained at least one block ahead of the paving operations.

In cut areas all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All cut-and-fill slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the plans or as directed by the ENGINEER.

Blasting, when necessary, will be permitted only when proper precautions are taken for the protection and safety of all persons, the work, and the surrounding property. All damage done to the work or property shall be repaired at the CONTRACTOR's expense. All operations of the CONTRACTOR in connection with the transportation, storage, and use of explosives shall be approved by the City of Mandan Fire Department. Any approval given will not relieve the CONTRACTOR of responsibility in blasting operations.

**202-3.3 BORROW EXCAVATION.** When provided for in the proposal, borrow excavation shall consist of excavation made from borrow areas outside the normal grading limits. Borrow excavation shall be made only at the designated locations and within the horizontal and vertical limits as staked or as directed. Upon completion of borrow operations, the borrow area shall be finished to a neat and uniform grade acceptable to the ENGINEER.

The borrow excavation shall be handled and placed as specified in these specifications for excavation and embankment.

**202-3.4 DITCH EXCAVATION.** Ditch excavation shall consist of excavating for drainage ditches such as intercepting, inlet or outlet, temporary levee construction, or any other type as designated or as shown on the plans. The work shall be performed in the proper sequence with the other construction. The location of all ditches or levees shall be established on the ground. All satisfactory material shall be placed in fills; unsatisfactory material shall be placed in spoil areas as shown on the plans or removed from the project area as directed by the ENGINEER. Waste or surplus material shall be disposed of as shown on the plans or as directed by the ENGINEER. Intercepting ditches shall be constructed prior to the start of adjacent excavation operation. All necessary handwork shall be performed to secure a finish true to line, elevation, and cross section, as designated.

Ditches constructed on the project shall be maintained to the required cross section and shall be kept free from debris or obstructions until the project is accepted. Where necessary, sufficient openings shall be provided through spoil banks to permit drainage from adjacent lands. Unless otherwise specified, no separate payment will be made for ditch excavation other than for the material removed which will be paid for at the unit price for "Unclassified Excavation" or "Rock Excavation," as the case may be, if the proposal includes classification of these excavated materials.

**202-3.5 EMBANKMENT FOUNDATION PREPARATION.** Immediately prior to the placing of the fill materials, the entire area upon which the embankment is to be placed, except where limited by rock, shall be scarified and broken by means of a disk harrow or plow or other approved equipment to a minimum depth of 6 inches or as specified by the ENGINEER. Scarifying shall be done approximately parallel to the axis of the fill. All roots, debris, large stones, or objectionable material that would cause interference with the compaction of the foundation or fill shall be removed from the area and disposed of as directed by the ENGINEER. A thin layer (approximately 3 inches) of all the fill material shall be spread over the scarified foundation and the whole area compacted as required in the specifications. Payment will be made for the material excavated for the embankment foundation at the unit price for "Unclassified Excavation."

Where embankments are to be placed on natural slopes steeper than 3-to-1, horizontal benches shall be constructed as shown on the plans or as directed by the ENGINEER. Payment will be made for the material excavated on the embankment slopes at the unit price for "Unclassified Excavation."

**202-3.6 STRIPPING.** All vegetation such as brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and any other unsuitable material within the area upon which embankment is to be placed shall be stripped or otherwise removed before the embankment is started, and in no case shall such objectionable material be allowed in or under the embankment. No direct payment will be made for stripping. The yardage removed and disposed of shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

**202-3.7 FORMATION OF EMBANKMENTS.** Embankments shall be formed of satisfactory materials placed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross section.

The grading operations shall be conducted and the various soil strata shall be placed to produce a soil structure as shown on the typical cross section or as directed by the ENGINEER. All materials placed in the embankment shall be reasonably free of organic matter such as leaves, grass, roots, and other objectionable material. Soil, granular material, shale, and any other material permitted for use in embankment shall be spread in successive layers as specified.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions of the

field. The CONTRACTOR shall drag, blade, or slope the embankment to provide proper surface drainage.

The material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Sprinkling shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times. Samples of all embankment materials for testing, both before and after placement and compaction, shall be completed as per Subsection 202-3.1. Based on these test results, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

Rolling operation shall be continued until the embankment is compacted to not less than 85% of the maximum dry density at optimum moisture as determined by ASTM Compaction Control Test Designation D1557. Under all areas to be paved, the embankment shall be compacted to a density of not less than 90% of the maximum dry density with a moisture content falling within plus or minus 4 percent of the optimum moisture as determined by ASTM Compaction Control Test Designation D1557. On all areas outside of the pavement, curb and gutter, and sidewalk areas, no compaction will be required on the top 4 inches. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers.

During construction of the embankment, the CONTRACTOR shall route equipment at all times, both when loaded and when empty, over the layers as they are placed and shall distribute that travel evenly over the entire width of the embankment. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of embankments, starting layers shall be placed in the deepest portion of the fill; as placement progresses, layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmented rock larger than 2 inches in their greatest dimension will not be allowed in the top 6 inches of the subgrade. Rock fill shall be brought up in layers as specified or as directed, and every effort shall be exerted to fill the voids with the finer material to form a dense, compact mass. Rock or boulders shall not be disposed of outside of the excavation or embankment areas, except at places and in the manner designated by the ENGINEER.

Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material.

The CONTRACTOR shall be responsible for the stability of all embankments made under the contract and shall replace any portion which, in the opinion of the ENGINEER, has become displaced due to carelessness or negligence on the part of the CONTRACTOR.

There will be no separate measure or payment for compacted embankment. All costs incidental to placing in layers, compacting, disking, watering, mixing, sloping, and other necessary operations of the embankments will be included in the contract price for excavation, borrow, or other items.

When stockpiling of excavated material and later rehandling of such material is directed by the ENGINEER in order to produce the specified subgrade structure, the material shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

**202-3.8 EQUIPMENT.** The CONTRACTOR may use any type of earth-moving, compaction, and watering equipment, provided the equipment is in a satisfactory condition and is of such capacity that the construction schedule can be maintained as planned by the CONTRACTOR and as approved by the ENGINEER in accordance with the total days or working days bid for the construction. The CONTRACTOR shall furnish, operate, and maintain such equipment as is necessary to control uniform density, layers, section, and smoothness of grade.

**202-3.9 PREPARATION AND PROTECTION OF THE TOP OF THE SUBGRADE.** On areas to be paved, the specified depth in cut areas and the top of embankment shall be compacted to the density specified. The typical section for areas to be paved shall be graded such that the roadway is graded to 6 inches below the elevation of the future top of curb. The remaining area behind the curb and gutter to property line shall be graded to the elevation of the future top of curb. When completed the surface shall be true to the lines, grades, and cross section shown on the plans or as directed by the ENGINEER. After all drains, structures, ducts, and other underground appurtenances along the edges or under the pavement have been completed, the subgrade shall be compacted to the depth specified at not less than 90% of the maximum dry density, at optimum moisture, as determined by ASTM Compaction Control Test Designation D1557. Any irregularities or depressions that develop during rolling shall be corrected by loosening the material at these places and adding, removing, or replacing material until the surface is smooth and uniform. Any portion of the area which is not accessible to a roller shall be compacted in lifts not to exceed 6 inches to the required density by approved mechanical tampers. The material shall be sprinkled with water during rolling or tamping, when directed by the ENGINEER.

All soft and yielding material and material which will not compact readily when rolled or tamped shall be removed as directed by the ENGINEER and replaced with suitable material. After grading operations are complete, all loose stones larger than 2 inches in

their greatest dimension shall be removed from the surface of all proposed graded paving areas and disposed of as directed by the ENGINEER.

At all times the top of the subgrade shall be kept in such condition that it will drain readily and effectively. In handling materials, tools, and equipment, the CONTRACTOR shall protect the subgrade from damage by laying planks when directed and shall be reshaped and recompact to required density. Storage or stockpiling of materials on the top of the subgrade will not be permitted. Until the subgrade has been checked and approved, no subbase, surface course, or pavement shall be laid thereon.

**202-3.10 HAUL.** No payment will be made separately or directly for haul on any part of the work. All hauling will be considered a necessary and incidental part of the work, and its cost shall be considered by the CONTRACTOR and included in the contract unit price for the pay items of work involved.

**202.3.11 TOLERANCES.** In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 16-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 of a foot from true grade as established by grade hubs or pins. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials, reshaping and recompact to required density by sprinkling and rolling.

On areas to be turfed under the project or in the future, outside the sidewalk, curb and gutter and pavement limits the surface shall be of such smoothness that it will not vary more than 0.10 of a foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

## **202-4 MEASUREMENT AND PAYMENT**

**202-4.1 UNCLASSIFIED EXCAVATION.** Unclassified Excavation shall be measured by the cubic yard (CY) in its original position by the method of average end areas of materials acceptably excavated and stripped as specified. Measurements shall not include the yardage of material excavated without authorization beyond normal slope lines, or the yardage of material used for purposes other than those directed. The plans shall state an assumed shrinkage factor to be used to compute embankment volume placed using "Unclassified Excavation."

Payment shall be made at the unit price bid per cubic yard (CY) for "Unclassified Excavation."

**202-4.2 ROCK EXCAVATION.** All rock found in the excavation and not allowed to be placed in the backfill or embankment shall be classified as Rock Excavation, measured by the cubic yard (CY) and disposed of by the CONTRACTOR or as directed by the ENGINEER.

The CONTRACTOR shall place all rocks not allowed to be placed in the backfill or embankment and less than 1 cubic yard in a pile to be measured by the ENGINEER. The total volume of the stockpile shall be reduced by 25% to account for voids in the rock stockpile.

All rock greater than 1 cubic yard shall be individually measured by the ENGINEER.

Payment shall be made at the unit price bid per cubic yard (CY) for "Rock Excavation."

**202-4.3 BORROW EXCAVATION.** Borrow Excavation shall be measured by the cubic yard (CY) in its original position. Borrow Excavation in its original position shall include an assumed shrinkage factor to be used to compute embankment volume placed. Borrow excavation in a stockpile shall not include an allowance for shrinkage. Payment shall be made at the unit price bid per cubic yard (CY) for "Borrow Excavation."

## **SECTION 203 - WATERING**

### **203-1 DESCRIPTION**

This item shall consist of applying CITY OF MANDAN furnished water required in the compaction of embankments, subgrades, subbases, base courses, and for other purposes in accordance with the requirements of these specifications or as directed by the ENGINEER.

### **203-2 CONSTRUCTION REQUIREMENTS**

Water, when required, shall be applied at the locations, in the amounts, and during the hours, including nights, as approved by the ENGINEER. An adequate water supply shall be provided by the CITY OF MANDAN. The equipment furnished and used by the CONTRACTOR for watering shall be of ample capacity and of such design as to assure uniform application of water in the amounts directed by the ENGINEER.

The CONTRACTOR shall furnish all fittings, hoses, and equipment used in the loading of CITY furnished water. If a water hydrant is used for furnishing water, the CONTRACTOR shall furnish a gate type control valve, approved by the ENGINEER, to control water flow. The hydrant valve shall be fully opened and under no circumstances will the hydrant valve be used for water flow control. The CONTRACTOR shall apply for a hydrant meter supplied and installed by the City of Mandan Public Works Department and shall pay all installation and usage fees unless waived by the contract documents.

### **203-3 MEASUREMENT AND PAYMENT**

**203-3.1 WATERING.** Watering shall be measured in the vehicle at the point of delivery by 1,000 gallon ("M" Gal.) units or by a meter supplied by the City of Mandan and paid for at the unit price bid for "Watering."

## **SECTION 204 - SUBGRADE PREPARATION**

### **204-1 DESCRIPTION**

This work shall consist of shaping and compaction of the subgrade prior to construction of a subbase, base, or surface course and shall include excavation and/or shifting of materials resulting from rough grading, trenching or other prior construction activities. Subgrade preparation shall include all work to the depths specified on the plans or in the Special Provisions. When Subgrade Preparation depths are not specified, the depth shall be assumed to be a minimum of 6 inches below the surface of the finished subgrade.

Prior to subgrade preparation, the ENGINEER shall verify that the grading is within tolerance specified in Subsection 202-3.1. Work shall not begin on the subgrade preparation until the ENGINEER has approved that the grading has met the tolerances.

The CONTRACTOR responsible for subgrade preparation shall be required to grade a 4-foot minimum wide strip centered at the future face of curb to the elevation 0.1 foot above the bottom of curb section. Payment for curb and gutter grading shall be measured by the cubic yard and paid for at the unit price for "Unclassified Excavation" completed and accepted by the ENGINEER.

"Unstable," "Suitable," "Unsuitable," and "Unsatisfactory" soil or aggregate items are referred to in Section 202-1.

### **204-2 CONSTRUCTION REQUIREMENTS**

**204-2.1 GENERAL.** In all areas, prior to placing any of the base course specified under Section 300, the entire subgrade surface shall be scarified to a specified depth of not less than 6 inches and dried or uniformly moistened to obtain required compaction. Excess suitable excavated material shall be stockpiled and reused whenever possible in the project. Stockpiled material which is reused shall be measured in its final section and paid for as Unclassified Excavation.

Excavation of material for curb and gutter installation shall be measured by the cubic yard (CY) and paid for at the unit price for "Unclassified Excavation" completed and accepted by the ENGINEER.

Excavation and hauling of material from one point to another point on the roadbed to adjust the grade line and stockpiling excess material, if any, adjacent to the project shall be considered incidental to the "Subgrade Preparation" bid items.

All rocks larger than 2 inches in size and other unsuitable material shall be removed and replaced with approved backfill material. Any portions of the subgrade not easily accessible to machine operations, such as valley gutters, shall be brought to the proper elevation and compacted by methods approved by the ENGINEER.

During the course of preparing the subgrade and until the curb and gutter and pavement courses have been constructed, it shall be the CONTRACTOR's responsibility to protect the subgrade against and repair any damage caused by adverse weather, public traffic, and the CONTRACTOR's own operations. The subgrade shall at all times be completed for a sufficient distance ahead of hauling and spreading base or surface material to allow adequate opportunity for inspection. No materials shall be placed on the subgrade until it has been checked and approved by the ENGINEER.

**204-2.2 COMPACTION.** The subgrade shall be compacted by approved compaction equipment. Approved compaction equipment shall include sheepsfoot rollers, pneumatic packers, mechanical packers, mechanical rammers, vibratory equipment, trucks, tractors, scrapers, motor graders, and all other types of equipment used in excavating, transporting, and placing the subgrade. Subgrade preparation depths specified on the plans or special provisions or the minimum 6 inches required below the surface of the finished subgrade shall be compacted to 90 percent of Maximum Dry Density as determined by ASTM Compaction Control Test Designation D1557 with a moisture content falling within plus or minus 4 percent of the Optimum Moisture Content as determined by said testing method. The surface after compaction shall be true to line, grade, and cross section.

The CONTRACTOR shall engage an independent soils testing laboratory, approved by the ENGINEER, to determine the soil proctors and perform the required compaction testing to be determined by the ENGINEER.

The compaction control tests for this section are based on one individual compaction test per 750 square yards of area. The CONTRACTOR shall be responsible for all retesting of failing tests and a proctor determination to represent each soil condition to be encountered on the project. The locations and depths of compaction testing shall be at the discretion of the ENGINEER during construction. Should it become necessary to require an additional number of initial compaction tests, over and above the number specified for bidding purposes, the City of Mandan shall be responsible for all costs associated with additional testing performed by an independent testing laboratory. The CONTRACTOR, however, will be required to assume the cost of all retesting of failed tests regardless of the total number required during construction.

Compaction testing to determine densities may be accomplished with a nuclear density testing apparatus and/or the sand cone method. Should disputes arise concerning test results they will be resolved by using the sand cone method of testing.

Written reports of all test results shall be supplied to the ENGINEER and the CONTRACTOR by the testing laboratory as soon as possible. To expedite construction progress it is necessary that the CONTRACTOR and ENGINEER be furnished with the results of all tests as soon as testing is completed.

The availability of the independent testing laboratory when needed and speed of testing and reporting are to be considered the responsibility of the CONTRACTOR.

Compaction control tests as stated above shall be incidental to the price bid for 204-3.1 Subgrade Preparation.

No payment or measurement for payment will be made for suitable materials removed, manipulated, and replaced to obtain density in the specified depth of subgrade preparation. The moisture content of the subgrade materials shall fall within the range of plus or minus four (4) percent of the Optimum Moisture Content before any attempt is made to obtain the specified density. Any removal, manipulation, aeration, replacement, watering and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the subgrade preparation operation and shall be performed by the CONTRACTOR at no additional cost to the project.

If the desired compaction cannot be obtained by manipulation, wetting or drying of the specified depth of the subgrade because the material is found to be "Unsuitable" or "Unsatisfactory," as defined in Section 202-1, or when the ENGINEER directs manipulation and wetting or drying below the specified subgrade preparation depth or when materials below the specified subgrade preparation depth must be removed because they are found to be "Unsuitable", or "Unsatisfactory", thus hampering subgrade operations, this work will be paid for in accordance with Section 126, "Extra Work" of said Construction Specifications unless a "Subcut Excavation" item is included as a bid item on the proposal for the particular unit of the project.

If the instability of suitable materials below the specified subgrade preparation depth is a result of excessive moisture from rains, surface runoff or frost action, the ENGINEER reserves the right to suspend the work to allow the materials to recover strength without any liability for the costs that may be claimed by the CONTRACTOR due to the suspension of work. Extension of time, however, will be granted in this case.

**204-2.3 TOLERANCES.** In those areas upon which a subbase, base, or surface course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 16-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 of a foot from true grade established by grade hubs or pins.

The CONTRACTOR shall perform all surveying required to prepare the subgrade, to the tolerances specified, incidental to other bid items. The CONTRACTOR shall place a survey stake at the crown line on 50-foot intervals on all streets at the elevation approved by the ENGINEER. Additional staking may be required on sharp vertical and horizontal curves and at intersections and valley gutters as determined by the ENGINEER.

Staking shall not be the responsibility of the CONTRACTOR for curb and gutter construction.

### **204-3 MEASUREMENT AND PAYMENT**

**204-3.1 SUBGRADE PREPARATION.** Subgrade Preparation shall be measured by the square yard (SY) and paid for at the unit price for "Subgrade Preparation" complete and accepted by the ENGINEER.

**204-3.1A SUBGRADE PREPARATION (1 FOOT DEEP).** Subgrade Preparation shall be measured by the square yard (SY) and paid for at the unit price for "Subgrade Preparation (1 Foot Deep)" complete and accepted by the ENGINEER.

**204-3.1B SUBGRADE PREPARATION (1.5 FEET DEEP).** Subgrade Preparation shall be measured by the square yard (SY) and paid for at the unit price for "Subgrade Preparation (1.5 Feet Deep)" complete and accepted by the ENGINEER.

## **SECTION 205 – EROSION AND SEDIMENT CONTROL**

### **205-1 DESCRIPTION**

The CONTRACTOR shall be responsible for installing and maintaining all of the erosion and sediment control measures shown on the plans or as deemed necessary by the ENGINEER to effectively control pollution of waterways and sedimentation onto adjacent properties or into any downstream drainage facilities. Installation shall be done in accordance with the North Dakota Department of Health, Division of Water Quality “Guide to Temporary Erosion Control Measures” or plan details.

Erosion control measures shall be sufficient to contain sediments within the construction limits. If any excavation or embankment material does flow onto adjacent properties or downstream, the CONTRACTOR shall immediately rectify the problem and repair any damages.

Any failure of the erosion and sedimentation control measures shall be repaired within 48 hours of the runoff event along with any erosion damages at the CONTRACTOR’s expense. The CONTRACTOR shall be required to maintain erosion and sediment control installations until such time as the project is accepted as complete by the ENGINEER.

If directed by the ENGINEER, the CONTRACTOR shall remove and dispose of the silt fence or weighted fiber roll installed before the end of the warranty period. Cleanup shall be according to Section 121 Finishing and Cleanup. All removal and cleanup items shall be considered incidental to other bid items.

**205-1.1 PROTECTION OF WATER RESOURCES.** The CONTRACTOR shall dispose of all fuels, lubricants, and other organic or inorganic wastes at locations approved by regulatory agencies. Fueling, lubricating, and overhauling of all equipment shall be accomplished at locations and in such a manner that contaminants can be controlled and disposed of without polluting surface or subsurface waters.

Surface drainage from cuts and fills within the project limits, whether or not complete, and from borrow and waste disposal areas, shall be held in suitable sedimentation ponds or shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, silt fences, bales, and sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are complete and operative.

The CONTRACTOR will be required to maintain all excavating, embankments, stockpiles, haul roads, plant sites, waste areas, borrow areas, and all other work areas free from dust which would cause a hazard or nuisance to others. The CONTRACTOR must have sufficient, competent equipment on the job to control dust. Dust control will be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

The CONTRACTOR shall maintain all facilities constructed for pollution control for as long as the operations creating the particular pollutant are being carried out or until the materials of concern become stabilized to the extent that pollution is no longer being created.

All other erosion and sediment control measures other than 205-3.1 "Silt Fence" and 205-3.2 "Silt Fence with Wire Backing" necessary to meet the requirements of Section 205 shall be considered incidental to other bid items.

## **205-2 MATERIALS**

**205-2.1 FILTER FABRIC.** Silt fence fabric shall conform to AASHTO M 288 silt fence specification. Filter fabric shall be composed of fibers consisting of long chain synthetic polymers composed of at least 95% by weight of polyolefins, polyesters, or polyamides. The fibers shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other. The filter fabric shall be free of any treatment or coating which might adversely alter its physical properties after installation. The fabric shall be free of defects or flaws that significantly affect its physical and/or filtering properties. The fabric shall have a minimum width of 36 inches. The filter fabric shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Installation shall be done in accordance with the North Dakota Department of Health, Division of Water Quality "Guide to Temporary Erosion Control Measures" or plan detail.

**205-2.2 POSTS.** Either wood or steel posts may be used. Wood posts shall be treated (Penta or Green Treated) and shall be a minimum of 5 feet long with minimum dimensions of 2 inches diameter for round posts or 1½ inches by 1½ inches for rectangular posts. Steel posts shall be a minimum of 5 feet long, weigh a minimum of 1.3 lbs/ft and have projections to aid in fastening the wire or fabric. Steel posts should also have a metal plate welded near the bottom such that when the post is driven to the proper depth, the plate will be below the ground level for added stability. Installation shall be done in accordance with the North Dakota Department of Health, Division of Water Quality "Guide to Temporary Erosion Control Measures" or plan detail.

**205-2.3 WOVEN WIRE.** When backing for a filter fabric silt fence is required, a steel wire fence fabric shall be used. A woven wire fence shall conform to ASTM A 116, Class 1 zinc coating for wire. The woven wire support fence shall be at least 32 inches high and a maximum opening size of 6 inches by 6 inches. The wire shall be a minimum of 14 gauge grade 60. Installation shall be done in accordance with the North Dakota Department of Health, Division of Water Quality "Guide to Temporary Erosion Control Measures" or plan detail.

**205-2.4 WEIGHTED FIBER ROLL.** Weighted fiber roll shall be a photodegradable, extruded netting tube filled with wood curled excelsior and a weighted inner core. The roll diameter shall be six inches and the lengths shall be as required. The weight shall be a minimum of eight and one-third pounds per foot. An adequate number of weighted fiber rolls shall be placed around an inlet to provide complete protection. Approximately

3 to 6 inches shall be left between the weighted fiber rolls and the inlet. The ends shall overlap 12 inches. When silt is one-third the height of the roll, the CONTRACTOR shall remove and dispose of the silt and debris to allow the device to function properly. The CONTRACTOR shall check the operation and maintenance of the weighted fiber roll after rainfall events until final acceptance of the contract, incidental to the price bid for "Weighted Fiber Roll."

### **205-3 MEASUREMENT AND PAYMENT**

**205-3.1 SILT FENCE.** Payment for the installation and maintenance of silt fence shall be per linear foot (LF) based on a one-time installation (i.e., repair and maintenance is incidental) as measured in the field by the ENGINEER. The reuse of silt fence materials without prior approval by the ENGINEER will not be allowed.

**205-3.2 SILT FENCE WITH WIRE BACKING.** Payment for the installation and maintenance of silt fence with wire backing shall be per linear foot (LF) based on a one-time installation (i.e., repair and maintenance is incidental) as measured in the field by the ENGINEER. The reuse of silt fence materials with wire backing without prior approval by the ENGINEER will not be allowed.

**205-3.3 WEIGHTED FIBER ROLL.** Weighted Fiber Roll shall be measured by the linear foot (LF) and paid for at the unit price for "Weighted Fiber Roll" complete and accepted by the ENGINEER.