
SECTION 2100	SITE DEVELOPMENT AND EARTHWORK
2101	SITE CLEARING AND RESTORING..... 3
2101.1	Description..... 3
2101.2	Materials 3
2101.3	Construction Methods..... 3
2101.4	Special Requirements..... 5
2102	EARTHWORK..... 6
2102.1	Scope..... 6
2102.2	Definitions 6
2102.3	General Construction Methods 7
2102.4	Top Soiling 8
2102.5	Excavation 8
2102.6	Under Grading 9
2102.7	Embankment 9
2102.8	Application of Test Requirements 10
2102.9	Borrow Material..... 11
2102.10	Finishing 11
2102.11	Cleanup 12
2103	TEMPORARY EROSION, SEDIMENT, AND POLLUTION CONTROL PLAN..... 12
2103.1	Description..... 12
2103.2	Pre-Construction Submittals 12
2103.3	Construction Requirements..... 12
2104	SODDING AND SEEDING..... 14
2104.1	Scope..... 14
2104.2	Products 14
2104.3	Construction Methods..... 15

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 2100

SITE DEVELOPMENT AND EARTHWORK

2101 SITE CLEARING AND RESTORING

2101.1 Description

- A. The work shall consist of the removal, disposal and reconstruction or replacement of all obstructions (including, but not limited to trees, brush, fences, retaining walls, patios, trash burners, signs, mail boxes, lamp posts, outbuildings and landscaping) affected by construction above the ground level, with the exception of sidewalk, curb, street, parking lot, road, alley surfacing, gravel and oiled surfaces which will be removed and repaired under Paragraph 2403.6, Pavement Removal and Replacement.
- B. Additionally, the work shall include the removal and disposal of all obstructions at or below the ground level (including, but not limited to stumps, boards, logs and other organic materials) affected by the construction of the project as noted on the plans.

2101.2 Materials

- A. Waste material: All waste material and debris resulting from the cleaning operation or occurring within the right-of-way shall be disposed of in such a manner consistent with air pollution and solid waste disposal regulations while protecting private and public property. Permission in writing from the property owner must be obtained by the Contractor if waste material is placed on private property. A copy of this permission shall be furnished to the Engineer. Under no circumstance, shall debris or extra material be left in the right-of-way.
- B. Plant material replacement: Shrubs or trees in the right-of-way or dedicated City easements scheduled for replacement shall be marked by the Engineer. When encountered, these items shall be removed, preserved, or replaced with like type shrubs or trees. Under the supervision of the Engineer, the Contractor may make arrangements with the property owner to replace items. Arrangements with property owners shall be in writing only with a copy furnished to the Engineer.
- C. Salvageable material: Material removed from the right-of-way or easements, such as bricks, signs, manhole frames and covers which are City property, which may in the opinion of the Engineer be suitable for reuse by the City, shall be returned to the City as directed by the Engineer.
- D. Existing improvements: Protection shall be provided during the clearing process to prevent property damage to the existing improvements. Property damaged during the clearing process shall be replaced to its original condition.

2101.3 Construction Methods

- A. General:
 - 1. The Contractor shall clear and remove from the construction site all trees marked for removal, brush, roots, stumps, hedges, fences, rock, rubbish, and any other objectionable materials within or over-hanging the right-of-way or dedicated City easements, as directed by the Engineer.

B. Clearing:

1. Tree removal/protection: No trees shall be removed until they have been specifically marked or flagged by the Engineer. Trees to be removed shall be felled in such a manner as not to injure other trees which are to remain, either in the right-of-way or adjacent thereto. Trees or plants which are to remain in place and which may be in danger of injury by construction operations or equipment shall be suitably boxed, fenced or otherwise protected. Boxing and fencing shall be constructed and removed at the direction of the Engineer. The Contractor shall repair all injuries to bark, trunk limbs, and roots or remaining trees and shrubs by proper dressing, cutting and painting according to accepted methods, using only accepted tools and materials.
2. Obstruction removal: All obstructions in the designated right-of-way or dedicated City easements shall be removed and disposed of by the Contractor in a method suitable for the obstruction.

C. Reconstruction:

1. All obstructions to be replaced or reconstructed shall be restored to original condition as existed prior to construction. The Contractor will adhere to the following guidelines:
 - a. Sodding: When the area being worked crosses the front or side yard of an existing residence or commercial establishment, the disturbed area will be sodded upon completion of other restoration activities. When sod is required in backyards it will be called for on the plans. For subdivision development a 2-foot strip of slab sod shall be provided along the back of all new curbs. This requirement shall be included in the erosion control plan referenced herein.
 - b. Seeding: All disturbed areas, except for those scheduled for sod will be mulched and seeded with grass. Initial grass growth shall be established on the seeded areas for acceptance of work. The areas will be seeded with grasses matching that of surrounding grasses. During the winter months either rye or winter wheat will be mixed with seed that matches the surrounding grass to establish ground cover. Seeding shall be performed in accordance with Subsection 2104.

D. Sediment control plan:

1. The Contractor shall provide sedimentation and erosion control throughout the construction of the project and during the maintenance period.
 - a. Ditches: Straw bales shall be placed and anchored in bar ditches at 500 feet intervals on relatively flat grades and at 200 feet intervals on grades exceeding 5%. Sediment sumps shall be placed upstream of the straw bales and cleaned on a regular basis.
 - b. Roadways: In areas where runoff can enter the gutter of a roadway, silt fences shall be constructed along the perimeter of the site to keep siltation from entering the gutter lanes. Straw bales may be used as long as they are offset at least five (5) feet from the roadway edge to keep from being a hazard.

- c. Storm drainage: In areas where storm drainage inlets are present, straw bales or sandbags shall be constructed around the perimeter of the structure. Bales shall be secured so that flood conditions shall not affect the purpose of the barrier conforming to Standard Detail STRM-19.
 - d. Open areas: In open areas, straw mulch shall be unrolled and secured over the disturbed area to prevent erosion. Mulch shall be installed at a rate of 1.5 tons/acre and securely anchored in place.
- E. Debris disposal:
- 1. Burning: Burning of materials within the City limits is not allowed. Burning material off-site and outside of City limits must comply with all county, state, and federal requirements.
 - 2. Removal: Materials not burned off-site shall be removed and disposed of within 48 hours of accumulation. Removal site must be approved by the City if site is within the City limits.

2101.4 Special Requirements

- A. Notification of landowners:
- 1. Privately held land: It shall be the Contractor's responsibility to notify all landowners prior to entering into their property. If an owner has an obstruction that will be affected, they will be notified sufficiently in advance of construction operations so that they may make such arrangements as they may desire for the protection, removal or relocation of property in advance of construction.
 - 2. Publicly owned land or utilities: If an obstruction is of public ownership, the Contractor shall notify the appropriate agency, and obtain any necessary permit or license 48 hours before beginning any operations affecting the obstruction. All work shall conform to the current standard and specifications of the agency, and shall be reviewed by the agency before the work is started.
- B. Clearing limits: The Contractor shall limit the clearing operation to an area which will not impede construction operation and shall follow up with restoration immediately after completion of construction.
- C. Protection of areas outside of construction: Areas outside of the construction area shall be preserved in their natural state. If the Contractor damages an area outside of the construction area, the damage will be repaired to its original condition in a timely manner.
- D. Compliance with easements: The Contractor shall comply with the restriction placed on all easements and shall be responsible for all associated costs.
- E. Maintaining access: Passable surfaces across or along the construction site shall be maintained at all times with gravel, steel mat or plate, or temporary bituminous surfacing material where a sidewalk, driveway, parking lot, street, road, or alley previously existed.

- F. Maintaining streets: The Contractor will be responsible for preventing trucks from scattering debris, petroleum products, mud, and/or soil on public roads. If this occurs the Contractor is to immediately clean-up debris as required by the Engineer.
- G. Preservation of trees:
1. Tree removal: No trees which are located outside of the excavation or embankment areas shall be removed unless the Engineer authorizes the removal.
 2. Tree trimming: Trimming of standing trees hindering construction shall be under the direction of the Engineer. If no authorization is granted, the Contractor assumes full responsibility for replacement of the tree as deemed necessary by the Engineer.
 3. Tree damage: Trees not scheduled for removal but damaged shall be replaced by the Contractor. The Contractor shall be responsible for maintaining the trees until final acceptance of the project. All trees showing any sign of damage shall be replaced with healthy stock by the Contractor and maintained until acceptance. Overall final acceptance will be delayed until all trees are accepted by the Engineer.
- H. Unauthorized excavation: Except where authorized, all materials excavated below the bottom of concrete footings, slabs on grade, foundations and pavements shall be replaced at the Contractor's expense. The backfill shall consist of 1500-psi flowable fill placed monolithically with the above concrete floor.
- I. Water removal: The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and groundwater entering excavations, trenches or other parts of the work. Each excavation shall be kept dry during subgrade preparation, and continually thereafter until the backfill is installed.

2102 EARTHWORK

2102.1 Scope

This section governs the performance of all work required to excavate, remove, dispose or compact all materials encountered within the limits of the project, as shown on the approved plans. Work is to be performed in accordance with the requirements of any applicable sections of the General Conditions of the Construction Contract and covenants, and as provided for in any Special Conditions. No work under this paragraph is authorized until the requirements under Subsection 2103 have been fulfilled.

2102.2 Definitions

- A. Borrow: Borrow is acceptable material excavated from an area outside of the project limits and required for the construction of the embankment.
- B. Embankment or backfill: Embankment or backfill is the placing and compacting of material in the construction area to the lines and grades shown on the approved plans.
1. Unsuitable material: Unsuitable material is muck, frozen material, organic material, top soil, rubbish, silt, clay and rock with a maximum dimension greater than 24 inches.

2. Suitable material: Suitable material is inert material passing the No. 40 Sieve having a liquid limit not exceeding 40 and a plastic index not exceeding 20, when testing in accordance with ASTM D423 and D424, respectively.
 - a. Rock embankment: Material for rock embankments shall be free of unsuitable material and shall contain, by volume, greater than ten (10) percent rock or gravel having a maximum dimension greater than 3 inches but not greater than 24 inches.
 - b. Earth embankment: Material for earth embankment shall be free of unsuitable material and shall, contain by volume, less than ten (10) percent rock or gravel having a maximum dimension greater than 3 inches.
- C. Excavation: Excavation is the removal of materials from the construction area to the lines and grades shown on the approved plans.
 1. Unclassified excavation: Unclassified excavation is the removal of all material encountered regardless of its nature. All material excavated will be considered unclassified excavation unless specified as classified materials in the project contract documents.
 2. Rock excavation: Rock excavation is the removal of all rock materials which cannot be excavated with a trenching machine, drag line, bulldozer, high lift, or similar excavating equipment without the use of explosives, rock rippers, rock hammers or jack hammers.
 3. Earth excavation: Earth excavation is defined as the removal of all material not defined as rock.
- D. Grading: Grading shall mean the performance of all excavation, embankment, and backfill in connection with the construction of all improvements.
- E. Structures: Structures refer to bridges, culverts, storm sewer and/or sanitary appurtenances, retaining walls and similar construction.
- F. Waste: Waste is excavation material not used in the embankment and disposed of outside of the embankment areas.

2102.3 General Construction Methods

- A. The Contractor shall adhere to any and all statutes regarding the notification of utilities prior to beginning any work within public right-of-way. The relocation and/or protection of any utility that lies within a utility easement and is endangered by this construction shall be the responsibility of the Contractor.
- B. The Contractor shall make every reasonable effort to protect private facilities. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary arrangements for repairs to the facilities for continuous service prior to the close of that workday.
- C. It shall be the responsibility of the Contractor to protect all property lot corners and control monuments. Should it be necessary to disturb any such monument, whether stake, pin, bar, disk, box, or other, it remains the responsibility of the Contractor to reference such markers prior to removal, reset them, and file such relocations or

documents as the law may require. Any such references, removal, replacement and certification of monuments shall be performed by a registered licensed surveyor. A copy of all such certification documents shall be provided to the Engineer. Any monument destroyed or improperly reset by the Contractor may be replaced by the Engineer to the standards required by law at the expense of the Contractor.

- D. Grading, excavation and backfilling for all improvements shall be made to the lines, grades and cross sections indicated by the approved plans.
- E. The Contractor shall schedule and conduct his operations in such a manner and shall provide any necessary control facilities to protect downstream and adjacent properties from pollution, sedimentation or erosion caused by the grading operation. Requirements stated in Subsection 2103 (Temporary Erosion, Sediment and Pollution Control Plan) shall apply. Any pollution or damage occurring shall be the responsibility of the Contractor.
- F. During construction, the graded area shall be maintained by the Contractor in such condition that it will be well drained at all times. Roadway ditches, channel changes, inlet and outlet ditches and other ditches in connection with the roadway shall be cut and maintained to the required cross section. All drainage work shall be performed in proper sequence with other operations. All ditches and channels shall be kept free of debris or obstructions.

2102.4 Top Soiling

- A. The Contractor shall remove and stockpile sufficient topsoil to surface (to a minimum depth of four (4) inches all fills, embankments and any other area on the work site where the original topsoil will be damaged or covered. Topsoil shall be free of trash, debris and surface vegetation more than six (6) inches in height.

2102.5 Excavation

- A. All suitable material removed by excavation shall be used as far as practicable in the formation of embankment as required to complete the work. The Contractor shall sort all excavated material and stockpile, when necessary, so as to provide suitable materials for embankments.
- B. All excavated material which is suitable for topsoil shall be used before any topsoil is obtained from a borrow source. Topsoil material secured from excavations shall be stockpiled at locations acceptable to the Engineer.
- C. After removal of roadway excavation material to the required cross-section, all material between lines 12 inches outside of the curbs and within the top 6 inches of the subgrade shall be compacted to 95 percent of maximum density for the material. Compaction shall follow any subgrade stabilization treatment that is required.
- D. Rock encountered within the full width of the roadway, toe of slope to toe of slope, shall be under-graded to an elevation of 6 inches below the finished subgrade elevation. Care shall be taken to avoid overshooting when blasting. Rock shall be removed in such a manner as to leave no excessive water pockets in the surface.
- E. Areas of under grading or over-break in rock which lie beyond 12 inches outside of the curbs shall be backfilled with spalls, rock fragments or a granular type material. Backfill

materials shall have a plasticity index not to exceed 14 and a gradation such that at least 50 percent of the material will be retained on the No. 4 sieve.

2102.6 Under Grading

- A. Where materials are encountered which are deemed as unsuitable by the Engineer for use in the work, they shall be removed to the depth and limits as ordered by the Engineer. Areas under graded shall be backfilled with one of the following materials:
 - 1. Rock fragments or spalls.
 - 2. A granular type material having a plasticity index not to exceed 10 and a gradation such that at least 50 percent of the material will be retained on the No. 4 sieve and not more than 40 percent will pass the No. 10 sieve.
 - 3. A material meeting the requirements of ASTM D448, Size No. 67.

2102.7 Embankment

- A. General: Embankments shall be constructed using suitable materials, as herein defined, procured from excavations made on the project site or from borrow areas as required to complete the grading work.
- B. Starting the Embankment:
 - 1. Where embankments are placed against hillsides or existing embankments with greater than 1 vertical to 4 horizontal, the existing slope shall be stripped of topsoil to a 3-inch depth and benched or stepped in approximately 6-inch tiers. The embankment material being placed shall be compacted to the required density. Areas where unsuitable material is removed and replaced with select material and compacted shall not be measured and paid for directly but will be considered as incidental work. The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material removed before starting the embankment work.
 - 2. Where embankments 24 inches or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared and the ground surface shall be compacted to the specified density. Where embankments greater than 24 inches in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces not larger than 12 inches maximum dimension, left in place, compacted with a vibratory roller and the embankment started thereon.
- C. Placing earth embankment: Earth shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed 8 inches in thickness (loose state) and shall be compacted to not less than the required density before the next layer is placed thereon. Contractor may request placement of layers thicker than 8 inches if he can demonstrate the ability to obtain proper compaction for the full layer thickness. The surface of each compacted layer shall be scarified prior to placement of the succeeding layer. As the compaction of each layer progresses, continuous blading, or dozing will be required to level the surface and to insure uniform compaction. Embankment construction shall not be performed when material contains frost, is frozen or is snow covered.

- D. Placing earth and rock embankments: When earth, stone or rock fragments are mixed in the embankment, all stones or rock fragments exceeding the thickness of the compacted lift shall be disposed of by being incorporated into the embankment outside the limits of the proposed surfaced areas. The thickness of the layer in these areas may be increased if necessary to accommodate the rocks, but shall not exceed 15 inches in thickness (loose state). The stones or rock fragments are to be placed so there will be no nesting.
- E. Consolidated rock embankment:
1. When the excavated material consists predominantly of stone or rock fragments of such size that the material cannot be placed in layers of the thickness prescribed, such material shall be placed in the embankment in layers having a thickness of the approximate average size of the larger rocks but not to exceed 24 inches. Layer shall be reduced in size as necessary to permit placement. Rock shall not be dumped in-place but shall be distributed by blading or dozing in a manner to insure proper placement in final position in the embankment. The spalls and smaller stone fragments shall be left on the surface of each layer as formed. Each layer shall be thoroughly consolidated before the next layer is placed.
 2. The top 12 inches of the embankment shall not contain material having a maximum dimension greater than 3 inches. The rock fragments or crushed stone shall be well graded to form a dense mass when compacted.
- F. Compacting the embankment:
1. Before placing any embankment, the surface of the existing ground shall be prepared as heretofore specified, moistened as required, and the top 12 inches compacted to a density of 90 percent.
 2. All embankment shall be compacted to a density of at least 90 percent of the maximum density for the material used as determined by ASTM D-698 and within a tolerance of minus 3 percent and plus 2 percent of the optimum moisture at maximum density as determined by the Moisture Density Curve obtained. In addition to the above required compaction, the subgrade between lines 12 inches outside of the curbs and within the top 6 inches of the subgrade shall be compacted to a density of at least 95 percent of the maximum density for material used as determined by ASTM D-698 and with a tolerance of minus 3 percent and plus 2 percent of the optimum moisture at maximum density as determined by the Moisture Density Curve obtained.
 3. All the work involved in either adding moisture to or removing moisture from embankment materials to within these moisture limits shall be considered incidental to the completion of the grading operation.
- G. Moisture-density determination: In-place density and moisture content of the embankment will be determined by the ASTM D-1556; ASTM D-2167; or by ASTM D-2922.

2102.8 Application of Test Requirements

- A. General: Unless otherwise specified, testing materials and workmanship using these specifications will comply with this section. The Contractor shall provide the equipment, materials, and labor necessary to conduct the required tests. The Contractor will coordinate with the project inspector for appropriate test dates and the inspector will

observe tests as required. When tests are conducted off site or by a testing laboratory, the Contractor will provide certified copies of the test results. If a project or portion of a project fails to meet the required test results, the Contractor will take appropriate corrective action and the test shall be conducted again on the corrected work. Corrections to work and additional testing shall be at the Contractor expense.

- B. Test specimens: The Contractor shall furnish evidence to the City/Authority that the quality of the materials and workmanship entering into the work complies with the plans and specifications. The minimum schedule of satisfactory tests listed herein shall be performed by a certified testing laboratory licensed to practice by the Oklahoma State Board of Registration for Professional Engineers and Land Surveyors. When tests reveal that the quality of materials or workmanship does not meet the requirements of the specifications, additional tests shall be made as directed by the Engineer/Inspector until the number of satisfactory tests called for in the schedule has been made. The Contractor will pay for of all testing of work. The developer of a subdivision with public improvement shall pay the cost of all testing, including, but not limited to: subgrade densities, paving densities, concrete strength tests and paving thickness cores.

2102.9 Borrow Material

- A. The Contractor shall locate and determine the quantity and quality of borrow material required to construct all fills, backfills, and embankments, if such borrow material is required. Once the borrow site is selected, the Contractor shall provide such test information, as required by the Engineer, to determine the approval of the borrow site.
- B. Once approved, the Contractor shall excavate, load, haul, transport, and place the borrow material in the proper location at the project site. Borrow material shall be placed and compacted as required.
- C. The Contractor shall restore the borrow area to neat grades to preclude erosion and in accordance with the terms and conditions agreed to by the owner or tenant of the borrow site.
- D. The Contractor shall adequately provide dust control measures along all haul routes or clean spilled materials along the haul routes.
- E. The Contractor shall use the cross-sections to determine if borrow material will be needed.

2102.10 Finishing

- A. In areas where sodding or seeding is proposed, the upper 12 inches of the surface area shall be earth material. The top 6 inches shall be suitable for sustaining grass.
- B. Except where other permit or utility work is in progress, the graded surface shall be made free of rock, concrete, and brick, or fragments thereof, or rubbish and shall be finished to the lines, grades, and cross-section indicated on the approved plans, including shoulder, berm an sidewalk spaces.
- C. The Contractor shall repair any damaged surface, and shall not use any finishing equipment that will leave a marred surface. When the subgrade preparation is included as a part of the finishing, the work shall be accomplished according to the requirements of Section 2400, Streets and Drainage, and shall be considered incidental to finishing the grading work.

2102.11 Cleanup

Cleanup shall follow the work progressively and final clean up shall follow immediately behind the finishing. The Contractor shall remove from the site of the work all equipment, tools and discarded materials and other construction items. The entire right-of-way or easement shall be left in a finished and neat condition. Cleanup shall be considered as incidental to the completion of the grading work.

2103 TEMPORARY EROSION, SEDIMENT, AND POLLUTION CONTROL PLAN

2103.1 Description

This section consists of temporary soil erosion sediment and water pollution control measures in accordance with the City of Owasso Engineering Design Criteria and the National Pollutant Discharge Elimination System (NPDES). The temporary pollution control provisions contained herein shall be coordinated with the approved permanent soil erosion control features specified elsewhere in the contract to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post construction period. These control measures shall at no time be used as a substitute for the permanent control measures unless otherwise directed by the Engineer and they shall not include measures taken by the Contractor at his expense under Paragraph 2103.3 to control conditions created by his construction operations. The temporary measures shall include dikes, dams, berms, sediment basins, fiber mats, jute netting temporary seeding, straw mulch, asphalt mulch, plastic liners, rubble liners, baled hay retards, dikes, slope drains and other devices approved by the Engineer.

2103.2 Pre-Construction Submittals

Prior to the start of the applicable construction, the Contractor shall submit a copy of the Storm Water Pollution Prevention Plan and Notice of Intent. The Contractor shall submit schedules for accomplishment of soil-erosion control work, the proposed method of soil erosion control on construction and haul roads and the plan for disposal of waste materials. No work shall be started until the soil erosion control schedules and methods of operations have been reviewed and accepted by the Engineer.

2103.3 Construction Requirements

- A. In conformance with federal criteria, a Notice of Intent (NOI) shall be filed with the Stormwater Notice of Intent Center in Washington, DC, two days before the start of construction.
- B. The Engineer has the authority to define erodible earth and the authority to limit the surface area of erodible earth material exposed by preparing right-of-way, clearing and grubbing, the surface area of erodible earth material exposed by excavation, borrow and embankment construction operations and to direct the Contractor to provide temporary pollution control measures to prevent contamination of adjacent streams, other water courses, lakes, ponds or other areas of water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains and use of temporary mulches, mats seeding or other control devices or methods accepted by the Engineer as necessary to control soil erosion.
- C. The Contractor will be required to incorporate all permanent soil erosion control features into the project at the earliest practicable time. Temporary pollution control measures

shall be used to prevent or correct erosion that may develop during construction prior to installation of permanent pollution-control features, but are not associated with permanent control features on the project.

- D. The Engineer will limit the area of preparing right-of-way, clearing and grubbing, excavation, borrow and embankment operations (other than in commercially operated sources) to be proportional to the Contractor's capability and progress in keeping the finish grading, mulching, seeding, sodding, and other such permanent pollution control measures current in accordance with the schedule. Should seasonal conditions make such limitations unrealistic, temporary soil erosion control measures shall be provided.
- E. The Contractor shall maintain the top of the earthwork through all construction stages in such a manner as to permit the runoff of precipitation to the outer edges. When directed by the Engineer, earth berms shall be constructed along the top and/or bottom edges of embankment or cuts to intercept the runoff water at the close of the day's grading operations. Earth berms shall be compacted to the satisfaction of the Engineer. Temporary slope drain facilities shall be provided to carry the runoff to the bottom of the slopes. The slope drains may be of flexible or rigid construction, but shall be capable of being readily shortened or extended as the cut or fill progresses. Pipe and/or sheeting shall be provided at the entrance to the temporary slope drains, and, where necessary, energy dissipaters shall be provided at the outlet. Open drains shall be stabilized as necessary to prevent erosion. On embankments with flat slopes where slope drains are impractical, temporary grasses and/or mulch stabilization shall be constructed concurrently with the embankment formation.
- F. When, in the opinion of the Engineer, preventative measures fail to function effectively, the Contractor will be required to act immediately to bring erosion and siltation under control by whatever additional temporary means are necessary.
- G. The Contractor shall also conform to the following practices and controls:
 - 1. Waste or disposal areas and construction roads shall be located and constructed in a manner that will minimize the amount of sediment entering streams.
 - 2. Frequent fording of live streams will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings are necessary. Unless permission is granted in advance and in writing by the Engineer, mechanized equipment shall not be operated in live streams.
 - 3. When work areas or material sources are located in or adjacent to live streams, such areas shall be separated from the stream by a dike or other barrier to keep sediment from entering a flowing stream. Care shall be taken during the construction and removal of such barriers to minimize the muddying of a stream.
 - 4. All waterways shall be cleared as soon as practicable of false work, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.
 - 5. The Contractor shall take sufficient precautions to prevent pollution of streams, lakes and reservoirs with fuels, oils, bitumens, calcium chloride or other harmful materials. He shall conduct and schedule his operations so as to avoid or minimize siltation of streams, lakes and reservoirs and to avoid interference with movement of migratory fish.

- H. In conformance to federal criteria, a Notice of Termination (NOT) will be filed with the EPA upon completion of work.

2104 SODDING AND SEEDING

2104.1 Scope

The work covered under this section includes all supervision, labor, materials and equipment needed for establishing a permanent, erosion preventing vegetation cover. All areas disturbed by the construction of this project shall be fertilized and seeded and/or sodded as specified herein and where noted on the approved plans.

2104.2 Products

A. Seed

1. Seed labeled in accordance with the applicable portions of U.S. Department. of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.
2. The kind and quantity of seed to be furnished and planted shall be as follows:

Type	Lbs. per 1,000 Sq. Ft.	Lbs. per Acre
Bermuda Grass, hulled	0.50	22
Bermuda Grass, unhulled	0.75	33
Fescue KY31	1.00	44
Old World Blue Stem	0.14	6.1
Rye	5.00	45
Winter Wheat	5.00	45

B. Sod

1. Bermuda grass sod to be used as source material shall be a thick stand of common bermuda grass growing on fertile topsoil. Types of bermuda grass other than "Common" may not be used unless accepted by the Engineer. The vegetative parts (rhizomes, stolons, and roots) of bermuda grass shall be viable as indicated by a dense, deep rooted stand.
2. The source for sod shall be free of reproducing parts of weeds classified as "Prohibited Noxious" and shall be as free of other legally "Restricted Noxious" plant materials as required by the Oklahoma Department of Agriculture Seed Law. The proposed source of sod will be accepted by the Engineer before the beginning of sodding operations. Prior to acceptance, the area shall not be tilled or mowed. However, all vegetative growth exceeding 3 inches in height shall be mowed and the residue removed prior to harvesting the sod or sprigs.
3. The sod shall be moist when excavated from the source and shall be kept moist until planted. Sod in storage which becomes dry shall not be moistened and used, but shall be discarded.

4. Sod material shall consist of vegetative parts (rhizomes, stolons, and roots) of bermuda grass with an appreciable quantity of adhering soil.
 5. Solid slab sod shall be rectangular slabs of bermuda grass. Bermuda grass vegetative parts shall exist throughout the slab, and shall be obtained from soils with a minimum plasticity index of 3. The slab must have a dense vegetative growth and be capable of being transported in a condition closely resembling its original state.
- C. Fertilizer: Fertilizer of 10-20-10 grade and ammonium nitrate (33.5% N), uniform in composition, free flowing, and suitable for application with accepted equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.
- D. Vegetative Mulch: Vegetative mulch shall be native prairie hay, slough grass hay, or other grass-like material that may be accepted. Hay from leguminous plants and straw from threshed cereal grains will not be acceptable. While the grade of the hays is unimportant, it shall be of a pliable nature that can be anchored in the soil satisfactorily. It shall not be so rotten or moldy that it will deteriorate rapidly. The hay shall not exist in, or be broken into, lengths that are too short to be adequately held in place on the soil. Hay cut with a rotary-type cutter will not be accepted. The hay shall have been baled dry, in bales of uniform size and relative weight, and shall be dry when used. The hay shall be suitable for spreading with standard mulch blower equipment. The material shall be free from the seeds and other reproductive parts of weeds whose seeds are classed as "prohibited" by the Oklahoma State Board of Agriculture; shall contain no Johnson grass and other weeds on said Board's noxious weed list, and shall be practically free of any plants that could interfere with roadside turf or increase the cost of maintenance. All vegetative mulching material in storage shall be fully protected against wet weather.

2104.3 Construction Methods

- A. Preparation: Unless otherwise specified, the entire construction area and other disturbed areas (including borrow areas) shall be spread with a minimum 3 inches thick layer on topsoil which is free of trash, shrubs, trees, and other foreign matter. Grubbed and scarified material earlier removed and stockpiled may be used as topsoil material if sufficiently free of such foreign matter.
- B. Application:
1. Seed
 - a. The area shall be seeded with bermuda or fescue grass at a rate seed at a rate as shown in Paragraph 2104.2A.2. Seed shall be mixed with an equal amount of fertilizer at least twelve (12) hours prior to seeding. The admixture shall be seeded by mechanical hand seeder or accepted power equipment. Whenever grass begins to sprout, an application of 200 lbs. of 10-20-10 commercial fertilizer per acre shall be applied to the area, preferably after the ground has been thoroughly saturated. After two or three months of planting, the seeded site shall be top dressed with 8 lbs. per 1,000 sq. ft. or 350 lbs per acre of 33-0.
 - b. The Contractor shall water or reseed the areas as often as necessary until the grass appears live over the entire area. After the grass appears live over the entire area and when, in the opinion of the Engineer, the grass is living and

growing, it shall be the Contractor's responsibility to water the grass until completion and final acceptance of the project by the City. Established growth must be over 95% of the entire area.

2. Sod

- a. The slabs of sod shall be placed soil side down. They shall be placed in rows, which on slopes shall run perpendicular to the flow of water. Each slab shall fit tightly against the edge of the adjoining slabs and shall be placed so that the vertical joints are not continuous across adjoining horizontal rows. Voids shall be filled with additional sod. All slabs shall be rolled to obtain firm contact with the soil underneath. All sodded slopes greater than 1 on 4 and inverts of ditches shall be pinned at the required spacing per industry standards.
 - b. After the slabs have been placed, the sodded area shall be thoroughly watered. When sufficiently dry, additional voids shall be filled with good soil and watered again. The area shall then be thoroughly watered daily for a period of at least seven (7) days after placement.
 - c. Soil moisture shall exist throughout the zone from 1 inch below the surface to a least 5 inches below the surface at the time of planting. The required moisture content of the soil may be estimated and judged closely by the hand-squeeze test. The soil should readily form a tight cast when squeezed in the hand. The cast should break into two pieces without crumbling and without leaving excess water on the hand after casting.
 - d. Fertilizer shall not be placed on hard or glazed surfaces. Fertilizer shall be applied in accordance the manufacturers instructions.
 - e. When satisfactory results can be obtained, discing for soil preparation, weed removal, and incorporation of fertilizer may be accomplished on one operation.
 - f. If a fertilizer containing phosphorus is specified, one half of the fertilizer shall be applied before placement of solid slab sod and shall then be incorporated into the soil by disking. After placement and compaction of the sod, the remaining half of the fertilizer shall be applied and immediately incorporated into the soil with water.
 - g. Fertilizer containing nitrogen only shall be applied after the sodding and sprigging operations have been completed.
- C. Season: If the construction work is not completed during the normal planting season (April 15 through September 1) for bermuda and/or fescue, the Contractor shall seed the entire area with an accepted temporary vegetative cover, such as wheat, oats or rye grass to prevent erosion until the following spring at which time the Contractor will be required to return and prepare the area to be seeded as specified above and seed the entire area with bermuda grass as specified in Paragraph 2104.2A2. All areas which have eroded will at this time be brought back to original line and grade as directed by the Engineer.
- D. Water supply: The Contractor must make provisions to obtain water for this operation at this own expense. It will be the Contractor's responsibility to transport the water to the area where it is needed.

END OF SECTION