

## SECTION 310000 – EARTHWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Soil Materials
  - a. Sub base Material
    - 1) Building porous fill
    - 2) Pavement sub base course
  - b. Backfill and fill materials
  - c. Drainage fill
  - d. Impervious fill
  - e. Topsoil
2. Protection
  - a. Existing improvements protection
    - 1) Salvageable improvements
    - 2) Existing utilities protection
3. Site Clearing
  - a. Clearing and grubbing
  - b. Topsoil stripping
4. Excavation
  - a. Excavation classifications
  - b. Shoring, bracing, and underpinning
    - 1) Underpinning
    - 2) Shoring and bracing
  - c. Dewatering
  - d. New structures
  - e. Pavements
  - f. Ditches
  - g. Pipe Trenches
5. Compaction
6. Backfill and Fill
  - a. Preparation for backfill
  - b. Ground surface preparation for fill
  - c. Placement and compaction
7. Grading
  - a. Grading at existing trees
    - 1) Lowering grades at existing trees
    - 2) Raising grades at existing trees
      - a) Minor fills at existing trees
      - b) Moderate fills at existing trees
  - b. Grading outside building lines
  - c. Grading surface of fill under building slabs

#### 1.2 RELATED SECTIONS

- A. Related work specified elsewhere includes, but is not limited to:
  - 1. Section 311100, Clearing and Grubbing
  - 2. Section 312323.14, Fill

- B. All embankment and fill shall conform to ODOT Item 203.

### 1.3 SUBMITTALS

- A. All submittals shall conform completely to the requirements of Section 017800, Submittals.

- B. Site Plan showing:

- 1. Vegetation removal limits.
- 2. Areas for temporary construction and field offices.

- C. Project Record Documents:

- 1. Accurately record actual locations of capped and active utilities and subsurface construction.

- D. Reference Submittals

- 1. Material Certification

- a. Building porous fill
- b. Gravel fill
- c. Pavement sub base course
- d. Other material certification as required

- 2. Test Reports (if required by Engineer)

- a. General

- 1) Test soil materials proposed for use in the Work and promptly submit test result reports.
- 2) The Engineer may require one optimum moisture-maximum density curve for each type of soil encountered in sub grade and fills under:
  - a) Building slabs
  - b) Foundations
  - c) Paved areas.
- 3) Determine maximum densities in accordance with ASTM D698.
- 4) The Engineer will determine the suitability of materials to be used as fill.
- 5) For borrow materials, perform a mechanical analysis (AASHTO T88), plasticity index (AASHTO T91), and a moisture-density curve (AASHTO T99 or ASTM DG98).

- b. Backfill and fill materials

- c. Verification of each footing sub grade

- d. Field density test reports.

- e. One optimum moisture-maximum density curve for each type of soil encountered.

- f. Other tests as required

- g. If a soil testing is not performed, contractor assumes responsibility for adequate foundations for each structure.

#### 1.4 JOB CONDITIONS

- A. Minimize production of dust due to operations; do not use Water if it will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- B. Comply with other requirements specified in Section 017700.
- C. Use of Explosives: The use of explosives will not be permitted.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

##### A. Soil Materials:

- 1. Gravel Fill: Naturally or artificially graded mixture of crushed limestone or gravel. The gradation shall conform to ASTM C33 size # 57.
- 2. Pavement Subbase Course: ODOT Item 304.
- 3. Backfill and Fill Materials:
  - a. Provide soil materials for backfill and fill free of clay, debris, waste, frozen materials, vegetation and other deteriorious matter.
  - b. Rock or gravel shall not be larger than 3" in any direction.
  - c. Backfill and fill shall consist of materials classified as "SC" or coarser by ASTM D2487.
  - d. Materials finer than "SC" may be used when a registered Geotechnical Engineer is engaged to analyze proposed fill material for its suitability as fill material and its ability to be compacted in accordance with this section. The material shall be such that the required compaction percentages of maximum density, listed in paragraph "Compaction" in Part 3 of this Section, can be reasonably achieved.
    - 1) Materials classified as "ML" or finer by ASTM D2487 shall not be permitted, except when a registered Geotechnical Engineer is engaged.
- 4. Alternate and Fill Material
  - a. Contractor may, at his option, substitute a specially manufactured material upon approval.
  - b. The material shall have a cement base and is combined with other admixtures, fly ash, or other materials specifically designed for the product.
  - c. The material must have been successfully used in the completion of mass fills having a minimum of 20,000 cubic yards in the past 5 years.
  - d. Similar materials must have been successfully used for at least 10 years.
  - e. Material must have a minimum cast density of 30 pcf and a minimum compressive strength of 4,000 psi.
  - f. Material shall be Elastize II EF, or approved equal.

### PART 3 - EXECUTION

### 3.1 PROTECTION

#### A. General

1. Protection of Persons and Property
  - a. Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  - b. Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout and other hazards created by excavation operations.

#### B. Existing Improvements Protection

1. General
  - a. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
  - b. Protect improvements on adjoining properties and on the Owner's property.
  - c. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.
2. Existing Utilities Protection
  - a. Locate existing underground utilities in the areas of Work. Utilities on plans are shown to the best available information but are not warranted to be accurate. Contractor shall call the Ohio Utilities Protection Services and have utilities located 48 hours prior to any construction. If utilities are to remain in place, provide adequate means of protecting during excavation operations.
  - b. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer or Owner immediately. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Owner.
  - c. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer or Owner and then only after acceptable temporary utility services have been provided.

### 3.2 SITE CLEARING

#### A. Clearing and Grubbing

1. Clear the Site of trees, shrubs and other vegetation, except for that indicated to be left standing.
2. Trees, Shrubs and Plants
  - a. Remove all trees, shrubs and plants.
  - b. Remove trees, shrubs and plants not designated to remain.
  - c. Remove roots larger than 3" in diameter and matted roots existing in an area within 5' of construction.
  - d. Remove larger than 3" depth to 18" below sub grade in paved areas.
  - e. Remove roots larger than 3" to sub grade in turf areas.
  - f. Completely remove stumps, roots, and other debris.

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
  - a. Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to a density equal to adjacent original ground.

B. Topsoil Stripping

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, silt lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable materials.
2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with the underlying subsoil or other objectionable material.
3. Strip topsoil to its entire depth from areas to be graded and areas to be occupied by building, roadways, parking areas, walks, etc.
4. Stockpile topsoil in storage piles. Construct storage piles to freely drain surface water. Cover storage piles to prevent windblown dust.

### 3.3 EXCAVATION

A. General

1. Excavation consists of the removal and disposal of materials encountered when establishing the required grade elevations.
2. Unauthorized excavation consists of removal of materials beyond indicated sub grade elevation or side dimensions without the specific direction of the Engineer.
  - a. Under footings, foundation bases, or retaining walls, unauthorized excavation may be filled by extending the indicated bottom elevation of the footing or base to the excavation bottom (Engineer must be notified and approval given before commencing), without altering the required top elevation. Lean concrete fill (1500 psi minimum) may be used to bring elevations to the proper position, only when acceptable to the Engineer and/or the Owner and when approval has been given.
  - b. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer and/or the Owner.

B. Excavation Classifications: All excavation is unclassified.

C. Stability of Excavations

1. Slope the sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
3. The maximum slope ratio from bottom edge of foundation to the next foundation and/or any other excavation shall be one (1) vertical to two (2) horizontal, except where approved by a registered Geotechnical Engineer to be less than a 1 to 2 slope.

#### D. Shoring and Bracing and Underpinning

1. General
  - a. Design and provide shoring and bracing and underpinning to comply with local codes and authorities having jurisdiction.
2. Shoring and Bracing
  - a. Provide materials for shoring and bracing, such as sheet piling, soldier beams, stringer, rakes, whalers and cross-braces, etc., in good serviceable condition.
  - b. Maintain shoring and bracing in excavations regardless of the period excavations will be open. Carry down shoring and bracing as the excavation progresses.
    - 1) Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit the lateral movement of soil under adjacent structures. Cut-off tops as required and leave permanently in place.
  - c. Excavations shall be shored and sheeted with members of sizes and arrangement sufficient to prevent injury to persons, damage to structure, injurious caving, or erosion; shoring, sheeting and bracing shall be removed as the excavations are backfilled; care shall be exercised to prevent injurious caving during the removal of the and/or sheeting.

#### E. Dewatering

1. Prevent surface water and subsurface or groundwater from flowing into the excavations and flooding the Project Site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of sub grades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey the water away from excavations.
3. Convey water removed from excavations and rainwater to collecting or runoff areas. Provide and maintain temporary drainage ditches and other diversions outside the excavation limits for each structure. Do not use trench excavations for Site utilities as temporary drainage ditches.

#### F. Material Storage

1. Stockpile excavated materials classified as satisfactory soil material where indicated by the Engineer or Owner, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
2. Locate and retain fill materials away from edges of excavations.
3. Dispose of excess soil material and waste materials as specified hereinafter.

#### G. Removal of Unsatisfactory Soil Materials

1. Excavate unsatisfactory soil materials encountered that extend below the required elevations, to the additional depth as indicated by the ENGINEER or Owner.
2. Such additional excavation, provided it is not due to the fault or neglect of the Contractor, shall be measured as indicated by the ENGINEER or Owner, and paid for as a change in the Work.

## H. Cold Weather Protection

1. Protect excavation bottoms against freezing when the atmospheric temperature is less than 35 deg F.

## I. Existing Improvements

1. General
  - a. Remove above-grade and below-grade improvements necessary to permit construction, and other Work as indicated.
  - b. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.
2. Surface Structures
  - a. Remove buildings, curbs, gutters, walls, fences, walks, drives, etc., where indicated.
3. Subsurface Structures
  - a. Subsurface Structures Inside or Beneath New Structure.
    - 1) Remove during excavation where necessary to reach required elevations.
    - 2) Remove vertical projections and/or horizontal structures to a distance of 4'-0" below any part of new construction such as foundations, slabs, tie beams, grade beams and utilities.
    - 3) Existing horizontal surfaces below new construction shall be thoroughly fractured to ensure drainage.
  - b. Subsurface Structures Outside of New Structure and within 3' of New Footing Edges - Remove all horizontal and vertical structures.
  - c. Subsurface Structures Beyond 3' of New Footing Edges
    - 1) Remove structures to a level at least 2' below new finish grades.
    - 2) Horizontal surfaces existing below finished grade shall be thoroughly fractured to ensure drainage.
4. Abandoned Underground Utilities
  - a. Demolish and completely remove from the Site existing underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
  - b. Any lines to be abandoned that extend beyond the excavation must be capped or plugged.
  - c. Abandoned underground utilities under structures to be constructed (concrete, masonry, cast iron, ceramic clay, etc.) that are no longer in use shall be filled solid with concrete, or remove and backfill as specified herein.
  - d. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for the type of material and size of pipe. Do not use wood plugs.
  - e. Close open ends of concrete and masonry utilities with not less than 8" thick brick masonry bulkheads, constructed to completely fill the opening.
  - f. Wet brick before laying, and lay brick in mortar so as to form a full bed with ends and side joints in one operation and joints not more than 3/8" wide. Protect fresh masonry from freezing or from rapid drying and maintain protection until mortar has set.

## J. New Structures

1. Conform to the elevations and dimensions shown on the Drawings, within a tolerance of  $\pm 0.10'$ , and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction required, and for inspection.
2. In excavating for footings and foundations, take care not to disturb the bottom of the excavation. Excavate by hand to final grade just before reinforcement is placed. Trim bottoms to the required lines and grades to leave a solid base to receive concrete.

K. Pavements

1. Cut surface under pavements to comply with grades indicated.

L. Ditches

1. Cut ditches to cross-sections and grades as shown. Deposit excavated materials to prevent cave-ins or material falling or sliding into ditch. Keep ditches free of debris until final acceptance of the Work.

### 3.4 COMPACTION

A. General: Control soil compaction during construction for compliance with the percentage of maximum density specified for each area classification.

B. Percentage of Maximum Density Requirements

1. In fill areas, provide not less than the following percentages of maximum density of soil material compacted at optimum moisture content, according to standard proctor ASTM D69B dry density.
  - a. Structures: Compact each 8" layer of backfill or fill material at a minimum 98% density. Fill shall be in compliance with tank manufacturer requirements for structural loads.
  - b. Building slabs and steps: Compact each 8" layer of backfill or fill material at 98% density
  - c. All other areas: No specific density requirements are listed. Finished construction must not settle appreciably. Contractor may be required to refill any settled areas.
2. Contractor may be required, at the Engineer's discretion, to test the soil density.

C. Moisture Control

1. Where the sub grade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to the surface of sub grade, or layer of soil material, to prevent free water appearing on the surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  - a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing, until the moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.



### 3.5 BACKFILL AND FILL

#### A. General

1. Place acceptable soil material in layers to required sub grade elevations, for each area classification listed below.
  - a. In all excavations: Excavated or borrow backfill and fill materials
  - b. Under grassed areas: Excavated or borrow backfill and fill materials.
  - c. Under walks and pavements: Approved sub base material.
2. All soil materials shall be sampled and tested for compliance with all requirements of Part 2 of this Section.

#### B. Preparation for Backfill

1. Backfill excavations as promptly as the Work permits, but not until completion of the following:
  - a. Acceptance by ENGINEER or Owner of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation
  - b. Inspection, testing, approval, and recording locations of underground utilities
  - c. Removal of concrete formwork
  - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in a manner to prevent settlement of the structure or utilities, or leave in place if required.
  - e. Removal of trash and debris
  - f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
  - g. Do not backfill against walls until slab on grade and first framed floor is complete and concrete has attained its design strength.

#### C. Placement and Compaction

1. Place backfill and fill materials in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Pipe backfill: Roadways, Sidewalks and Drive; 100% Standard Proctor compaction; lawn areas; 95% Standard Proctor compaction. Contractor shall place backfill materials evenly adjacent to structures, to the required elevations. Contractor shall take care to prevent wedging action and unequal horizontal pressures of the backfill against structures by placing the material uniformly on all sides of the structure to approximately the same elevation in each lift ( $\pm 1'-0''$ ).
3. Where utility facilities and structures are supported in place, use special equipment and techniques as required to achieve the specified compaction under and around them.

#### D. Alternate Backfill and Fill Material

1. The installer shall be certified by the manufacturer of the material and approved by the Engineer.
2. All equipment used in batching, mixing, and placement must be approved by the manufacturer.
3. A representative of the manufacturer must be on site for the initial placement of materials and make any appropriate changes in operations.
4. Five (5) samples will be taken for testing from each 200 cubic yards of material placed. Testing will be conducted in accordance with Section 01400.

### 3.6 GRADING

- A. General: Uniformly grade areas within the limits of grading under this Section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Building Lines
  1. Grade areas outside building lines to drain away from structures and to prevent ponding of water. Compact as specified.
  2. Finish the surfaces free from irregular surface changes, and as follows:
    - a. Grassed Areas: Finish areas to receive topsoil to within not more than 0.10' above or below the required sub grade elevations.
    - b. Walks: Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.10' above or below the required sub grade elevation.
    - c. Pavements: Shape the surface of areas under pavement to line, grade and cross-section indicated, with the finish surface not more than 1/2" above or below the required sub grade elevation, and graded to prevent ponding of water after rains. Include such operations as plowing, dicing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material.
    - d. Ditches: Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform and smooth cross-section.
- C. Grading Surface Under Building Slabs
  1. Grade the surface of fill under building slabs smooth and even, free of voids, compacted a specified, and to required elevation.
  2. Provide final grades within a tolerance of 1/4" when tested with a 10' straightedge; the maximum out-of-level tolerance for the entire length of grade for slabs in either direction shall be  $\pm 2"$ .

### 3.7 FIELD QUALITY CONTROL

- A. Compact each 8" layer of backfill to levels stated previously or fill material at 98% density Quality Control Testing Construction

1. Testing service, if required by the Engineer, must inspect, and the Geotechnical Engineer must approve, existing ground surface, fill layers and sub grades before further construction Work is performed thereon. Tests will be taken as follows:
  - a. Footing Sub grade: For each stratum of existing soil on which footings will be placed, provide visual verification and any tests that are required to verify that design bearing capacities have been met. This verification shall be made by a qualified Soil Engineer. The Engineer or Owner reserves the right to order more or fewer inspection tests as required.
  - b. Paved Areas and Building Slab Subgrade: Make at least one field density test of the subgrade surface in cut areas for every 2,000 sq. ft. of paved area or building slab, but in no case less than three tests. In each compacted fill layer, make one field density for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than three tests. The Engineer or Owner reserves the right to order more or less inspection tests as required.
2. If, in the opinion of the Engineer or Owner, based on reports of the testing service and inspection, the subgrade or fills, which have been placed, are below the specified density, provide additional compaction and testing at no additional expense to the Owner.
  - a. The results of the density tests shall be equal to or greater than the specified density except that 1 density test out of 5 consecutive density tests for the same area being tested may have a test result of 2% below specified density.

### 3.8 MAINTENANCE

#### A. Protection of Graded Areas

1. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

#### B. Reconditioning Compacted Areas

1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities and under floor sub drains, if any.

### 3.9 DISPOSAL OF EXCESS AND WASTE MATERIALS

#### A. Burning on Owner's Property: Not permitted.

#### B. Removal from Owner's Property: Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, from the Owner's property and legally dispose of it.

END OF SECTION 310000

## SECTION 311100 – CLEARING AND GRUBBING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of trees, shrubs, and other plant life.
- C. Topsoil excavation.

#### 1.2 RELATED SECTIONS

- A. Specifications sections related to this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, Division 1 and all other applicable sections in this manual.

#### 1.3 REGULATORY REQUIREMENTS

- A. Conform to all applicable and local codes for environmental requirements, disposal of debris, burning debris on site, use of herbicides, and other applicable items.
- B. Coordinate clearing work with utility companies.
- C. Work shall conform to the requirements of ODOT-CMS Item 201 Clearing and Grubbing.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Herbicide, if required shall conform to applicable and local codes per environmental requirements

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Identify a waste area and/or salvage area for placing removed materials.

#### 3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain, from damage.

- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Do not disturb any area that is not necessary for completion of this project. Disturbance shall be in accordance with projects Storm Water Pollution Prevention Plan.
- D. Protect benchmarks, survey control points, and existing structures from damage or displacement. Wetlands areas are not to be disturbed.

### 3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas or as indicated. Remove stumps, main root ball, root system for complete removal of surface rock and other as indicated on drawings.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

### 3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.

### 3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, marked areas, entire site, without mixing with foreign materials.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.
- D. Install perimeter silt fence around stockpile area to prevent erosion and sediment transport from occurring.
- E. Stockpiled topsoil shall be used for final grading around proposed improvements.

END OF SECTION 311100

## SECTION 312316.13 - TRENCH EXCAVATING, BEDDING AND BACKFILL

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work Included: All trench excavations and fills to the lines and grades given for conduits, pipelines, etc. as required for proper completion of the work of this contract as shown on the Contract Drawings.
- B. The trench excavation work item in this contract shall include the removal, handling, rehandling, filling, and disposal of any and all materials (whether they be wet or dry) found unsuitable by the Engineer encountered within the limits of the work and the transportation and placing thereof, and shall include all pumping, bailing, draining, sheeting and shoring, backfill, refill and protection, and sand backfill, together with rolling and tamping where such is required by these specifications and is not specifically included in another item of work in this contract.
- C. Existing ground elevations of the work site(s) are shown by figures and/or by contours on the Contract Drawings. The contours and elevations of the present ground are believed to be reasonably correct, but do not purport to be absolutely so, and are presented only as an approximation. The Contractor shall satisfy himself, however, by his own actual examination of the site of the work, as to both the existing elevations and the amount of work required under this Section. If the Contractor is not willing to accept the ground surface elevations indicated upon the Drawings for payment, he shall notify the Engineer prior to the starting of any excavation work.

#### 1.2 QUALITY ASSURANCE

- A. State and local code requirements shall control the construction specified herein.
  - 1. Ohio Department of Transportation (latest edition) for the products specified herein.
- B. Compaction testing shall be performed by a soil testing laboratory as specified in Section 013319. Testing shall be in accordance with ASTM Standards:
  - 1. C33 Specification for Concrete Aggregates.
  - 2. D698 Tests for Moisture – Design of Relations of Soils.
  - 3. D1556 Test for Density of Soil-in-Place by the Sand Cone Method.
  - 4. D2922 Test for Density of Soil and Soil Aggregates in Place by Nuclear Methods.

#### 1.3 SUBMITTALS

- A. Certifications attesting that the composition analysis of pipe protection and material stone backfill materials meet specification requirements.
- B. Reference Submittals:

1. Material Certification: Provide material certification for the items below:
2. Granular backfill material.
3. Pipe bedding material.
4. Test Reports: Provide two copies of test reports.

#### 1.4 JOB CONDITIONS

##### A. Control of Traffic

1. The Contractor shall provide all traffic control measures in accordance with the Ohio Department of Transportation as prescribed by the Ohio Manual of Uniform Traffic Control Devices.

##### B. Utility Services

1. The Contractor shall be responsible for maintaining all building utility service connections during the excavation and backfill process.
2. Immediately report to the utility company and the Engineer any break, leak or other damage to the lines or protective coatings made or discovered.
3. Allow free access to utility company personnel at all times for purposes of maintenance, repair and inspection.

### PART 2 - PRODUCTS

#### 2.1 PIPE BEDDING MATERIAL

- A. Granular material shall be crushed stone size as shown on Table 703-01 (ODOTCMS), No. 57, 6, 67, 68, or 7.

#### 2.2 BACKFILL MATERIAL

- A. Backfill materials shall be either natural materials or granular materials as specified below.
  1. Type A. Granular material as specified in ODOT Item 304.
  2. Type B. Natural soil free from stones larger than 2 inches across their greatest dimension, top soil, vegetation, debris, rubbish or frozen material. When approved by the Contract Administrator, stones no larger than 8" across their greatest dimension may be deposited at least 2 feet above the top of the pipe.
  3. Type C. Low Strength Mortar as specified in ODOT Item 613.
- B. The backfill under and/or within five feet of existing or proposed roadways, paved shoulders, curbs, existing parking areas and drives shall be Type A granular material.

## 2.3 UTILITY MARKING TAPE

- A. Three (3) inch wide detectable utility marking tape bearing wording based upon the utility involved permanently printed on the tape. Tape color shall comply with the APWA color code.

## 2.4 TRACER WIRE

- A. Metallic detectable underground wire shall be located as shown on standard details. Tracer wire shall be 12 AWG Solid Copper Wire designed specifically for detecting underground utilities and direct burial use.
- B. At all valves, line beginnings and ends, the wire shall be clamped to a 3-foot-long piece of ½-inch rebar with a brass clamp. The rebar shall be placed vertically next to the valve or structure and extend 2 inches above finished grade.
- C. Tracer Wire shall be installed on top of pipe bedding or 12 inches above pipe crown on all force mains and non-metallic pipe.

## PART 3 - EXECUTION

### 3.1 GENERAL PREPARATION

- A. Trench Excavation shall follow lines and grades as indicated on the plans. Exact positions shall be subject to and adjusted to interferences with related work and real-world conditions.
- B. Leave Trenches open until inspected by Engineer.
- C. Prior to beginning excavation, notify the Ohio Utilities Protection Service as required and notify all utilities on the project of the intended work schedule.
- D. Locate all existing utilities or other structure of critical location in advance of excavation.
- E. Uncover existing pipes and cables ahead of trenching for new work.
- F. Whenever existing items such as sewer pipes, water pipes, gas mains, culverts, or other pipes or structures are encountered in or near the lines of trenches being excavated, use proper care in preserving operation of such items intact and immediately repair any damage to such items.

### 3.2 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to insure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the street is authorized.
- B. Maintain access to all streets and private drives.



- C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with state and local codes, permits and regulations.

### 3.3 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.
- C. The requirement for neat line cuts, in other than state highways, may be waived if the final paving restoration indicates overlay beyond the trench width.

### 3.4 BLASTING

- A. Blasting will not be permitted.

### 3.5 METHOD OF TRENCH EXCAVATION

- A. All excavation shall be in open cut, unless otherwise permitted by the Engineer.
- B. Excavation shall be made to undisturbed finish subgrade six (6) inches below the bottom of the pipe or structure, unless otherwise shown on the Drawings.
- C. Where unsuitable bearing material is encountered the trench shall be excavated to an additional depth below the excavation for the bottom of the pipe barrel of six (6) inches for pipe of twenty-four (24) inches diameter and smaller and of nine (9) inches for pipe greater than twenty-four (24) inches in diameter. This additional excavation is to be refilled with suitable material in a satisfactory manner to provide the proper foundation for the conduit bed.
- D. Trench must be excavated with vertical sides from the bottom of the trench to one (1) foot above the top of the pipe, from which point sides may slope to ground surface, except that, in streets or roadways, trenches must be excavated with vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to provide free forking space on each side of the piping according to the size of the pipe and the character of the ground. In every case there shall be sufficient space between the pipe and the sides of the trench to make it possible to thoroughly compact the backfill around the pipe and to secure tight joints, but in no case more than one (1) foot on either side of pipe. In no case, however, shall the width of the trench at the top of the pipe exceed the dimensions as shown on the Contract Drawings. In no case will it be permitted to excavate pipe trenches with sides sloping to the bottom.
- E. Bottom of trench bed must give a full, firm but slightly yielding support to the lower section of the pipe and so that the pipe barrel is firmly supported in the cradle throughout

its entire length, in such manner as to prevent any subsequent settlement of the pipe. Boulders or loose rocks which might bear against the pipe will not be permitted in the trench bottom or sides below two (2) feet above the pipe. Bell holes must be excavated to assure full length bearing of the pipe barrel.

- F. Trenches must be kept free from water until the material in the joints has sufficiently set.
- G. At no time shall the Contractor advance trenching operations more than 400 feet ahead of completed pipeline, including backfill, except as approved by the Engineer.
- H. Where the Contractor, by error or intent, excavates beyond the minimum required depth, the trench shall be brought to the required pipeline grade with bedding material.

### 3.6 SUPPORT OF EXCAVATION

- A. The Contractor shall be responsible for supporting and maintaining all excavations required hereunder utilizing a trench box and even to the extent of sheeting, shoring the sides and ends of excavations with timber or other satisfactory supports. If the sheeting, braces, shores, and stringers or walling timbers or other supports are not properly placed or are insufficient, the Contractor shall provide additional or stronger supports. The requirements of sheeting or shoring, or of the addition of supports, shall not relieve the Contractor of this responsibility for their sufficiency. All trench protection and sheeting and shoring must conform to the regulations of the Federal Occupations Safety and Health (OSHA) and will be subject to conform to their respective inspections. All orders of the OSHA representatives must be complied with by the Contractor.
- B. All timbering shall be removed where and when required and, upon its removal, all voids carefully and compactly filled. If any timber is ordered in writing to be left in place, it shall be cut-off as directed and will be paid for with a Change Order. No payment will be made for wasted ends or for timber left in place without specific written authorization by the Engineer.

### 3.7 REMOVAL OF WATER

- A. The Contractor shall pump out or otherwise remove and dispose of, as fast as it may collect any water, sewage, or any other liquids which may be found or may accumulate in the excavation, regardless of whether it be water or liquid wastes from his own contract or from existing conduits and works.
- B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Preclude trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- D. There shall be, upon the work at all times during the construction, proper and approved pumps and machinery of sufficient capacity to meet the maximum requirements for the removal of water or other liquids and their disposal.

- E. Dewatering operations shall in no way violated the conditions of the storm water pollution prevention plan (SWPPP), or the EPA regulations for Construction Storm Water.

### 3.8 BEDDING

- A. Bedding material below the pipe and that under and around the pipe to spring line shall be well tamped. That above spring line shall be placed in six (6) inch layers and be well tamped to a minimum height of twelve (12) inches above the top of the pipe.
- B. Where foundation conditions are such that the above types of bedding cannot be provided, as in quicksand, etc., special provisions shall be made as called for by the Drawings or as directed by the Engineer by providing concrete cradle or lumber foundations.

### 3.9 UNAUTHORIZED EXCAVATIONS

- A. All excavations carried outside of the lines and grades given or specified, together with the disposal of such material, and all excavations and other work resulting from slides, cave-ins, swellings or upheavals shall be at the Contractor's own cost and expense. All spaces resulting from unauthorized excavations or from slides or cave-ins shall be refilled at the Contractor's expense with concrete or other suitable material.

### 3.10 ADDITIONAL EXCAVATION

- A. It is expected that satisfactory foundations will be found at the elevations shown on the Drawings, but in case the material encountered is not suitable, or in case it is found desirable or necessary to go to additional depth, the excavation shall be carried to an additional depth as ordered and refilled as directed by the Engineer.

### 3.11 THRUST RESTRAINT

- A. Provide pressure and vacuum pipe with concrete thrust blocking at all bends, tees, valves, and changes in direction, in accordance with the Contract Drawings.

### 3.12 BACKFILLING

- A. As the various pipelines, conduits, etc. or parts of same are completed and inspected, the Contractor shall refill the space under, around and over with material as specified herein. Unless otherwise directed, all forms, bracing and lumber shall be removed during backfilling and the cavities and voids resulting from the removal shall be thoroughly backfilled.
- B. The bedding material shall be as specified and placed in accordance with the standard details. The limits of bedding shall be as indicated on the Standard Details for the respective pipes. The Contractor must use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe when compacting the backfill. When the backfill has progressed to the limits shown on the Standard Details for the respective pipe, the work of backfilling shall be stopped, and the backfill in place shall be tamped or puddled as directed. Care shall be taken to prevent floating of the pipe.

- C. No cinders, rubbish, rocks, boulders, shale or other objectionable material shall be used as backfill against the pipe or in any part of the trench when, in the opinion of the Engineer, it will be injurious to the work. No backfilling shall be done with frozen materials upon frozen materials.
- D. Over sewers and other arched structures built in place and after the structure is completed and before the supports or centers are struck, the trenches shall be carefully filled by depositing without shock and by tamping suitable earth or other selected material at the sides and to a height not less than two (2) feet above the top of the pipe. This backfill shall be graded evenly across the trench. This backfilling must be done as the work progresses, and before any filling is deposited directly from a machine, bucket, cars, wagon, or other vehicles. The backfilling shall then be brought up evenly and all eccentric loading shall be avoided. In no case shall material dumped from bucket, truck or bulldozer be allowed to fall directly upon any conduit, pipe or other structure, and, in all cases, the bucket must be lowered so that the shock of the falling material will not injure the structure.
- E. The backfill shall be placed and compacted, using power driven mechanical tampers in layers of six (6) inch compacted thickness unless approved by the Engineer. Final paving shall be as shown on the Contract Drawings and Standard Details.

### 3.13 DISPOSAL OF WASTE

- A. A selected portion of the excavate material will be used for backfilling or filling about the pipe as ordered. Excavated material in excess of that needed for backfilling and filling and unsuitable material shall be disposed of by the Contractor at his own expense, and the cost of such disposal shall be deemed as having been included in the unit or lump sum prices bid.
- B. Prior to disposal, the Contractor shall obtain and submit to the Engineer written permission from the owner of the property upon which the material and debris are to be placed.

### 3.14 COMPACTION REQUIREMENTS

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698.
- B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Engineer:
  1. Structures, Pavements, Walkways, Curbs and Steps:
    - a. Compact the subgrade and each layer of fill material or backfill material at 98% of maximum density.
  2. Lawn and Unpaved Area:
    - a. Compact each layer of fill material or backfill material at 90% of maximum density.

C. Moisture Control:

1. Where subgrade or layer of soil material must be moisture conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
  - a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to specified density.
  - b. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the test laboratory.

D. Unsuitable Backfill Material:

1. Where the Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material stone backfill or suitable foreign backfill material.
2. Compaction testing shall be required every 100 cubic yards or as required by the Engineer. Backfill found to be deficient shall be removed and re-compacted until compliant at no additional cost to the Owner.

3.15 UTILITY MARKING TAPE

- A. Install detectable utility marking tape above all plastic pipelines, eighteen (18) to twenty-four (24) inches below final grade.

3.16 ROUGH GRADING

- A. Rough grade areas disturbed by construction to a uniform finish. Form the bases for terraces, banks, lawns and paved areas.
- B. Grade areas to be paved to depths required for placing sub-base and paving materials.
- C. Rough grade areas to be seeded three (3) inches below indicated finish contours.

3.17 RESTORATION OF UNPAVED SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 329200.19, Seeding and Mulching.

3.18 MAINTENANCE

- A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
  2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

END OF SECTION 312316.13

## SECTION 312323.14 – COMPACTED GRANULAR BACKFILL

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. The Contractor shall furnish all the materials from the top of bedding to the pavement sub grade and shall properly place and compact gravel backfill, as approved, over conduits, pipelines and elsewhere, when ordered by the Engineer, when they are located under pavement or cross under roads, drives and elsewhere when backfill is required to be accomplished without future settlement, and only when and as called for by the Drawings or as may be ordered by the Engineer.
- B. Gravel, or other granular material that is excavated from the project area as part of the excavation shall not be used for the purposes of this specification.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Backfill material shall be crushed limestone granular material meeting the requirements of ODOT CMS Item 304.

### PART 3 - EXECUTION

#### 3.1 PLACING

- A. Granular backfill, when called for by the Drawings, or ordered by the Engineer, for trench backfill shall be properly graded and placed in layers not over six (6") inches in depth, with voids reduced to a minimum, and thoroughly compacted with power driven mechanical tampers, or as directed by the Engineer. The placing of this material shall be continued until the required depth is compacted, and the top of this backfill shall be finished to the lines and grades called for by the Drawings, or as ordered by the Engineer. Should settlement occur, the Contractor must add and compact additional fill, and he must maintain the backfill at the required sub grade until the project is satisfactorily completed.

#### 3.2 COMPACTION

- A. Minimum compaction for compacted granular material shall be 98 percent of the maximum dry density of the backfill material.
- B. At the beginning of compaction operations, the Contractor shall construct a test section in accordance with ODOT CMS Supplement 1015. Utilizing the test section, the Contractor shall establish the minimum compactive effort required to achieve the required trench compaction.

- C. Utilizing the minimum compactive effort established via the test section, installation of the compacted granular material may proceed without further compaction tests so long as the following conditions are maintained:
  - 1. The established minimum compactive effort is utilized throughout the installation area.
  - 2. Maximum lift thicknesses are maintained.
  - 3. Material and or the supporting materials are not appreciably different from those utilized in performance of the test section.
  - 4. Observation of the material within the trench does not reflect any areas where compaction visually appears inadequate.
  
- D. In areas where, in the judgement of the Owner or his designated representative, the compaction of the material within the trench appears to be inadequate, the Owner or his designee may require a compaction test to be performed by the Contractor. Testing to demonstrate the compaction of the in-place material shall be the responsibility of the Contractor.
  
- E. It shall be the responsibility of the Contractor to perform compaction tests according to ODOT CMS Supplement 1015, or as required by the Owner or his designated representative. Tests shall be performed by competent personnel and with equipment made for the purposes intended and kept in good repair and working order. When, in the judgement of the Owner or his designated representative that the personnel performing the tests are not competent to do so or the equipment provided is not adequate, the Owner may order, at his sole discretion, that a certified soils testing laboratory perform tests and provide test reports to establish that the material and work conform with Project requirements.
  
- F. When material and/or the supporting materials change appreciably, placing the performance of the initial test section in question, the Contractor shall construct a new test section in accordance with ODOT CMS Supplement 1015 to establish revised compactive effort requirements for the project.

END OF SECTION 312323.14



## SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

### PART 1 - GENERAL

#### 1.1 REFERENCE

- A. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.
- B. All requirements of the Storm Water Pollution Prevention Plan and Erosion Control Plan included in the project plans.

#### 1.2 DESCRIPTION OF WORK

- A. Work of this section includes, but is not limited to:
  - 1. Construction of sediment control measures
  - 2. Periodic cleanout of sediment traps and disposal of silt
  - 3. Maintenance of public and private travel ways in clean condition
  - 4. Removal of sediment control devices
  - 5. Temporary stabilization, including stockpiles

#### 1.3 QUALITY ASSURANCE

- A. All pre-packaged standard products shall have the Manufacturer's certified analysis affixed and conform to regulatory requirements.
- B. Sediment control measures depicted on the Drawings are intended to be minimum requirements to meet anticipated site conditions.
- C. When no sediment control facility is shown on the Drawings, the Contractor shall provide and design the facility to prevent salutation of adjacent property or streams.
- D. All erosion and sediment control measures shall be installed per specifications of Ohio Department of Natural Resources: Rainwater and Land Development; Ohio's Standards for Storm Water Management and Land Development and Urban Stream Protection. All construction shall conform to the requirements thereof.

#### 1.4 SCHEDULE

- A. Required sediment control facilities must be in operation prior to land clearing and/or other construction, to ensure that sediment-laden water does not enter the natural drainage system.
- B. Sediment control measures shall be maintained in a satisfactory condition until such time that cleaning and/or construction is completed, and approval received by the Engineer.
- C. Construction sequence shall be as specified on the Drawings and as specified in

applicable portions of these Specifications.

- D. The implementation, maintenance, replacement and additions to sediment control measures shall be the responsibility of the Contractor.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Materials shall meet the requirements of the Ohio EPA and Ohio Department of Natural Resources and as specified in applicable portions of these Specifications.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Sediment control provisions shall meet or exceed the requirements of the Ohio EPA Division of Surface Water.
- B. As construction progresses and seasonal conditions dictate, more sediment control facilities may be required. It shall be the responsibility of the Contractor to address new conditions that may be created and to provide additional facilities over and above minimum requirements as may be required.
- C. Wherever possible, the Contractor shall limit grading to only those areas involved in current construction activities and will limit the length of time of exposure and unprotected graded areas. The Contractor shall accomplish either temporary or permanent stabilization of these areas at the earliest opportunity.
- D. The Contractor shall provide all labor, materials, equipment and supervision to install erosion and sediment controls as shown on the Contract Drawings and/or specified herein. Work shall include but not be limited to excavation and shaping of existing ground, placement of silt fence, or as required complying with the U.S. Soil Conservation Service (USSCS) requirements. Work shall include furnishing, installing and maintaining all facilities and procedures necessary to maintain compliance with the local County Erosion and Sedimentation Control Ordinance and the USSCS Handbook.
- E. The work described herein and/or noted on the Contract Drawings shall be the first work performed under this Contract and no other work shall be performed until this work is completed and ready for use.
- F. The Contractor shall take all necessary precautions and measures to protect all properties from damage. He shall repair all damage caused by his operations to all public and private property including roads, walks, curbs, utilities, trees, shrubs, plantings, etc. and leave each property in good condition and/or at least equivalent to the condition found.

### 3.2 PROTECTIVE MEASURES

- A. Temporary silt fence shall be provided at the locations deemed necessary by the Owner, Engineer or Contractor.
- B. No debris or obstruction shall be left unstabilized in flood plains or stream areas beyond the period of project construction.
- C. The method of construction in flood plains shall provide for daily protection of all disturbed areas. Any cross-drainage through flood plains shall be safely channeled through disturbed areas to protect outlets.
- D. Storm drainage systems shall be kept operable and free of all excavated material.
- E. When the season permits, permanent vegetation stabilization of disturbed areas shall immediately follow the construction work. If permanent vegetative measures cannot be applied, temporary controls shall be used until the appropriate planting season.
- F. The Contractor shall maintain the silt fence until the project is completed and the threat of erosion and sedimentation from project construction is no longer present. Any displacement, ruptures, breaks or failure of the silt fence during the contract period shall be immediately repaired by the Contractor before resumption of construction activities with no additional cost to the Owner.
- G. Additional measures required by agencies having inspection authority for sediment and erosion control not outlined herein or detailed on the Contract Drawings shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 312500

SECTION 312514 – STABILIZATION MEASURES FOR EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Water, erosion, and sediment control.

1.2 REFERENCES

- A. Rainwater and Land Development Manual, 2006, prepared by the Ohio Department of Natural Resources.
- B. Ohio Department of Transportation Construction and Material Specifications (ODOT-CMS).
- C. Section 329219 – Seeding and Mulching.

PART 2 - PRODUCTS

2.1 SILT FENCE MATERIALS

- A. Silt fence fabric shall be ODOT Type C Geotextile fabric or as described in the chart below:

Fabric Properties	
Minimum Tensile Strength	120 lbs
Maximum Elongation at 60 lbs	50%
Minimum Puncture Strength	50 lbs
Minimum Tear Strength	40 lbs
Minimum Burst Strength	200 psi
Apparent Opening Size	≤ 0.84mm
Minimum Permittivity	1x10 <sup>-2</sup> sec. <sup>-1</sup>
Ultraviolet Exposure Strength Retention	70%

- B. Fence Posts – The length shall be a minimum of 32 inches long. Wood posts will be 2 inch by 2 inch hardwood of sound quality. The maximum spacing between posts shall be 10 feet.

2.2 MULCH MATERIALS

- A. Straw – Straw shall be unrotted small grain applied at the rate of 2 tons/acre or 90 pounds/1,000 square feet (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 square foot sections and place two

45 pound bales of straw in each section.

- B. Hydroseeders – Wood cellulose fiber should be used at 2,000 pounds/acre or 46 pounds/1,000 square feet.
- C. Other – Other acceptable mulches include mulch matting applied according to manufacturer's recommendations or wood chips applied as 10-20 ton/acre.

### 2.3 MATTING MATERIALS

- A. Excelsior matting shall be 48 inches wide and weigh an average of 0.75 pound/square yard or greater.
- B. Jute matting shall be 48 inches wide and weigh an average of 0.75 pounds/square yard or greater.
- C. Matting made of other material and providing equal or greater stabilization than the above may be submitted.

### 2.4 FILTER BERM MATERIALS

- A. Compost used for filter berms shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 1/4" to 3".

### 2.5 FILTER SOCK MATERIALS

- A. Compost used for filter socks shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 3/8" to 2".
- B. Filter Socks shall be 3 or 5 mil continuous, tubular, HDPE 3/8" knitted mesh netting material, filled with compost passing the above specifications for compost products.

## 2.6 TEMPORARY SEED MIXTURES

A. Temporary seeding mixtures shall comply with the following table:

Seeding Dates	Species	Lb./1000 ft <sup>2</sup>	Lb/Acre
March 1 to August 15	Oats	3	128 (4 Bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Perennial Ryegrass	1	40
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Annual Ryegrass	1.25	55
	Perennial Ryegrass	3.25	142
	Creeping Red Fescue	0.4	17
	Kentucky Bluegrass	0.4	17
	Oats	3	128 (3 bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
August 16th to November	Rye	3	112 (2 bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Wheat	3	120 (2 bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Perennial Rye	1	40
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Annual Ryegrass	1.25	40
	Perennial Ryegrass	3.25	40
	Creeping Red Fescue	0.4	40
	Kentucky Bluegrass	0.4	
November 1 to Feb. 29	Use mulch only or dormant seeding.		
Note: Other approved species may be substituted.			

## 2.7 GEOTEXTILES FOR CONSTRUCTION ENTRANCES

A. Geotextiles utilized in the installation of construction entrances shall meet the following parameters:

Minimum Tensile Strength	200 lbs.
Minimum Puncture Strength	80 psi.
Minimum Tear Strength	50 lbs.
Minimum Burst Strength	320 psi.
Minimum Elongation	20%
Equivalent Opening Size	EOS < 0.6 mm.
Permittivity	$1 \times 10^{-3}$ cm/sec.

## PART 3 - EXECUTION

### 3.1 GENERAL WATER, EROSION AND SEDIMENT CONTROL

- A. CONTRACTOR shall grade site to drain and shall maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. CONTRACTOR shall protect site from puddling or running water.
- C. CONTRACTOR shall provide erosion control measures as necessary to control discharge of sediment-laden water to surface waters and wetlands.
- D. CONTRACTOR shall use jute or synthetic netting, silt fences, straw bales, dikes, channels, check dams and other applicable measures to prevent erosion of soils disturbed by its construction operation.

### 3.2 INSTALLATION OF SEDIMENT BASINS

- A. Sediment basins shall be constructed and operational before upslope land disturbance begins.
- B. Site Preparation - The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared as needed to facilitate sediment cleanout. Gullies and sharp breaks shall be sloped to no steeper than 1:1. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
- C. Cut-Off Trench -The cutoff trench shall be excavated along the centerline of the embankment. The minimum depth shall be 3 ft. unless specified deeper on the plans or as a result of site conditions. The minimum bottom width shall be 4 ft., but wide enough to permit operation of compaction equipment. The trench shall be kept free of standing water during backfill operations.
- D. Embankment -The fill material shall be free of all sod, roots, frozen soil, stones over 6 in. in diameter, and other objectionable material. The placing and spreading of the fill material shall be started at the lowest point of the foundation and the fill shall be brought up in approximately 6 in. horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over each layer in a way that will result in the required compaction. Special equipment shall be used when the required compaction cannot be obtained without it. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
- E. Pipe Spillway -The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Connections between the riser and barrel, the anti-seep collars and barrel and all pipe joints shall be watertight. Selected backfill material shall be placed around the conduit in layers and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 ft. of the pipe spillway will be accomplished with hand-operated tamping equipment.

- F. Riser Pipe Base -The riser pipe shall be set a minimum of 6 in. in the concrete base.
- G. Trash Racks -The top of the riser shall be fitted with trash racks firmly fastened to the riser pipe.
- H. Emergency Spillway – The emergency spillway shall be cut in undisturbed ground. Accurate construction of the spillway elevation and width is critical and shall be within a tolerance of 0.2 ft.
- I. Seed and Mulch – The sediment basin shall be stabilized immediately following its construction. In no case shall the embankment or emergency spillway remain bare for more than 7 days.
- J. Sediment Cleanout -Sediment shall be removed and the sediment basin restored to its original dimensions when the sediment has filled one-half the pond's original depth or as indicated on the plans. Sediment removed from the basin shall be placed so that it will not erode.
- K. Final removal - Sediment basins shall be removed after the upstream drainage area is stabilized or as indicated in the plans. Dewatering and removal shall NOT cause sediment to be discharged. The sediment basin site and sediment removed from the basin shall be stabilized.

### 3.3 INSTALLATION OF SEDIMENT TRAPS

- A. Work shall consist of the installation, maintenance and removal of all sediment traps at the locations designated on the drawings.
- B. Sediment traps shall be constructed to the dimensions specified on the drawings and operational prior to upslope land disturbance.
- C. The area beneath the embankment shall be cleared, grubbed and stripped of vegetation to a minimum depth of six (6) inches. The pool shall be cleared as needed to facilitate sediment cleanout.
- D. Fill used for the embankment shall be evaluated to assure its suitability and it must be free of roots or other woody vegetation, large rocks, organics or other objectionable materials. Fill material shall be placed in six (6) inch lifts and shall be compacted by traversing with a sheepsfoot or other approved compaction equipment. Fill height shall be increased five (5) percent to allow for structure/foundation settlement. Construction shall not be permitted if either the earthfill or compaction surface is frozen.
- E. The maximum height of embankment shall be five (5) feet. All cut and fill slopes shall be 2:1 (H:V) or flatter.
- F. A minimum storage volume below the crest of the outlet of 67 yd<sup>3</sup>. for every acre of contributing drainage area shall be achieved at each location noted on the drawings with additional sediment storage volume provided below this elevation.



- G. Temporary seeding shall be established and maintained over the useful life of the practice.
- H. The outlet for the sediment trap structure shall be constructed to the dimensions shown on the drawings.
- I. The outlet shall be constructed using the materials specified on the drawings. Where geotextile is used, all overlaps shall be a minimum of two (2) feet or as specified by the manufacturer, whichever is greater. All overlaps shall be made with the upper most layer placed last. Geotextile shall be keyed in at least 6" on the upstream side of the outlet.
- J. Warning signs and safety fence shall be placed around the traps and maintained over the life of the practice.
- K. After all sediment-producing areas have been permanently stabilized, the structure and all associated sediment shall be removed. Stable earth materials shall be placed in the sediment trap area and compacted. The area shall be graded to blend in with adjoining land surfaces and have positive drainage. The area shall be immediately seeded.

#### 3.4 INSTALLATION AND MAINTENANCE OF SILT FENCE

- A. Silt fence shall be constructed before upslope land disturbance begins.
- B. All silt fence shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions that may carry small concentrated flows to the silt fence are dissipated along its length.
- C. Ends of the silt fences shall be brought upslope slightly so that water ponded by the silt fence will be prevented from flowing around the ends.
- D. Silt fence shall be placed on the flattest area available.
- E. Where possible, vegetation shall be preserved for 5 feet (or as much as possible) upslope from the silt fence. If vegetation is removed, it shall be reestablished within 7 days from the installation of the silt fence.
- F. The height of the silt fence shall be a minimum of 16 inches above the original ground surface.
- G. The silt fence shall be placed in an excavated or sliced trench cut a minimum of 6 inches deep. The trench shall be made with a trencher, cable laying machine, slicing machine, or other suitable device that will ensure an adequately uniform trench depth.
- H. The silt fence shall be placed with the stakes on the downslope side of the geotextile. A minimum of 8 inches of geotextile must be below the ground surface. Excess material shall lay on the bottom of the 6-inch deep trench. The trench shall be backfilled and compacted on both sides of the fabric.
- I. Seams between sections of silt fence shall be spliced together only at a support post with

a minimum 6-in. overlap prior to driving into the ground.

- J. Silt fence shall allow runoff to pass only as diffuse flow through the geotextile. If runoff overtops the silt fence, flows under the fabric or around the fence ends, or in any other way allows a concentrated flow discharge, one of the following shall be performed, as appropriate: 1) the layout of the silt fence shall be changed, 2) accumulated sediment shall be removed, or 3) other practices shall be installed.
- K. Sediment deposits shall be routinely removed when the deposit reaches approximately one-half of the height of the silt fence.
- L. Silt fences shall be inspected after each rainfall and at least daily during a prolonged rainfall. The location of existing silt fence shall be reviewed daily to ensure its proper location and effectiveness. If damaged, the silt fence shall be repaired immediately.

### 3.5 INSTALLATION OF STORM DRAIN INLET PROTECTION – EXCAVATED DROP INLET SEDIMENT PROTECTION

- A. The excavated trap should be sized to provide a minimum storage capacity calculated at the rate of 135 cubic yards for one (1) acre of drainage area. A trap should be no less than one (1) foot, nor more than two (2) feet deep measured from the top of the inlet structure. Side slopes should not be steeper than 2:1.
- B. The slopes of the trap may vary to fit the drainage area and terrain.
- C. Where the area receives concentrated flows, such as in a highway median, provide the trap with a shape having a 2:1 ratio of length to width, with the length oriented in the direction of the flow.
- D. Sediment should be removed and the trap restored to the original depth when the sediment has accumulated to 40% the design depth of the trap. Removed sediment should be spread in a suitable area and stabilized so it will not erode.
- E. During final grading, the inlet should be protected with geotextile-stone inlet protection. Once final grading is achieved, sod or a suitable temporary erosion control material shall be implemented to protect the area until permanent vegetation is established.

### 3.6 INSTALLATION OF STORM DRAIN INLET PROTECTION – GEOTEXTILE INLET PROTECTION

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the storm drain becomes operational.
- B. The earth around the inlet shall be excavated completely to a depth of at least 18 inches.
- C. The wooden frame shall be constructed of 2 inch by 4 inch construction grade lumber. The 2 inch by 4 inch posts shall be driven 1 foot into the ground at four corners of the inlet and 2 inch by 4 inch frame assembled using a lap joint. The top of the frame shall be at least 5 inches below adjacent road if ponded water would pose a safety hazard to

traffic.

- D. Wire mesh shall be of sufficient strength to support fabric with water fully impounded against it. It shall be stretched tightly around the frame and fastened securely to the frame.
- E. Geotextiles shall have an equivalent opening size of 20-40 sieve and be resistant to sunlight. It shall be stretched tightly around the frame and fastened securely. It shall extend from the top of the frame to 18 inches below the inlet notch elevation. The geotextile shall overlap across one side of the inlet so the ends of the cloth are not fastened to the same post.
- F. Backfill shall be placed around the inlet in compacted 6 inch layers until the earth is even with notch elevation on ends and top elevation on sides.
- G. A compacted earth dike or check dam shall be constructed in the ditch line below the inlet if the inlet is not in a depression and if runoff bypassing the inlet will flow to setting pond. The top of earth dikes shall be at least 6 inches higher than the top of the frame.

### 3.7 INSTALLATION OF STORM DRAIN INLET PROTECTION – GEOTEXTILE-STONE INLET PROTECTION

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the inlet becomes functional.
- B. Geotextile and/or wire material shall be placed over the top of the storm sewer and approximately six (6) inches of 2-inch or smaller clean aggregate placed on top. Extra support for geotextile is provided by placing hardware cloth or wire mesh across the inlet cover. The wire should be no larger than ½" mesh and should extend an extra 12 inches across the top and sides of the inlet cover.
- C. Maintenance must be performed regularly, especially after storm events. When clogging of the stone or geotextile occurs, the material must be removed and replaced.

### 3.8 STORM DRAIN INLET PROTECTION – GEOTEXTILE-STONE INLET PROTECTION FOR CURB INLETS

- A. Inlet protection shall be constructed either before upslope land disturbance begins or before the inlet becomes functional.
- B. Construct a wooden frame of 2-by-4-in. construction-grade lumber. The end spacers shall be a minimum of 1 ft. beyond both ends of the throat opening. The anchors shall be nailed to 2-by-4-in. stakes driven on the opposite side of the curb.
- C. The wire mesh shall be of sufficient strength to support fabric and stone. It shall be a continuous piece with a minimum width of 30 in. and 4 ft. longer than the throat length of the inlet, 2 ft. on each side.
- D. Geotextile cloth shall have an equivalent opening size (EOS) of 20-40 sieve and be resistant to sunlight. It shall be at least the same size as the wire mesh.

- E. The wire mesh and geotextile cloth shall be formed to the concrete gutter and against the face of the curb on both sides of the inlet and securely fastened to the 2-by-4-in. frame.
- F. Two-inch stone shall be placed over the wire mesh and geotextile in such a manner as to prevent water from entering the inlet under or around the geotextile cloth.
- G. This type of protection must be inspected frequently and the stone and/or geotextile replaced when clogged with sediment.

### 3.9 INSTALLATION OF STORM DRAIN INLET PROTECTION – BLOCK AND GRAVEL DROP INLET FILTER

- A. Place 4-inch by 8-inch by 12-inch concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending upon the design needs, by stacking combinations of the same size blocks. The barrier of blocks should be at least 12-inches high but no greater than 24-inches high.
- B. Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the block cores. Hardware cloth or comparable wire mesh with ½-inch openings should be used.
- C. Two-inch stone should be piled against the wire to the top of the block barrier, as shown below.
- D. If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, pull stone away from the blocks, clean and/or replace.

### 3.10 INSTALLATION AND MAINTENANCE OF FILTER BERM

- A. Filter berms will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional berms shall be provided at the top and as needed mid-slope.
- B. Filter berms are not to be used in concentrated flow situations or in runoff channels.
- C. Maintenance – Inspect filter berms after each significant rain, maintaining the berms in a functional condition at all times. Remove sediments collected at the base of the filter berms when they reach 1/3 of the exposed height of the practice. Where the filter berm deteriorates or fails it will be, it will be repaired or replaced with a more effective alternative.
- D. Removal – Filter berms no longer needed will be dispersed on site in a manner that will facilitate seeding.

### 3.11 INSTALLATION AND MAINTENANCE OF FILTER SOCK

- A. Filter socks will be placed on a level line across slopes, generally parallel to the base of

the slope or other affected area. On slopes approaching 2:1, additional socks shall be provided at the top and as needed mid-slope.

- B. Filter socks intended to be left as a permanent filter or part of the natural landscape, shall be seeded at the time of installation for establishment of permanent vegetation.
- C. Filter Socks are not to be used in concentrated flow situations or in runoff channels.
- D. Routinely inspect filter socks after each significant rain, maintaining filter socks in a functional condition at all times.
- E. Remove sediments collected at the base of the filter socks when they reach 1/3 of the exposed height of the practice.
- F. Where the filter sock deteriorates or fails, it will be repaired or replaced with a more effective alternative.
- G. Filter socks will be dispersed on site when no longer required in such a way as to facilitate and not obstruct seedings.

### 3.12 INSTALLATION OF ROCK CHECK DAMS

- A. The check dam shall be constructed of 4-8 inch diameter stone, placed so that it completely covers the width of the channel. ODOT Type D stone is acceptable, but should be underlain with a gravel filter consisting of ODOT No. 3 or 4 or suitable filter fabric.
- B. Maximum height of check dam shall not exceed 3.0 feet.
- C. The midpoint of the rock check dam shall be a minimum of 6 inches lower than the sides in order to direct across the center and away from the channel sides.
- D. The base of the check dam shall be entrenched approximately 6 inches.
- E. Spacing of check dams shall be in a manner such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- F. A Splash Apron shall be constructed where check dams are expected to be in use for an extended period of time, a stone apron shall be constructed immediately downstream of the check dam to prevent flows from undercutting the structure. The apron should be 6 in. thick and its length two times the height of the dam.
- G. Stone placement shall be performed either by hand or mechanically as long as the center of check dam is lower than the sides and extends across entire channel.
- H. Side slopes shall be a minimum of 2:1.

### 3.13 INSTALLATION OF SLOPE DRAINS

- A. The slope drain shall be constructed on a minimum slope of 3 percent.

- B. All points along the top of the dike/earthfill for the storage area shall be at least one (1) foot higher than the top of the inlet pipe.
- C. The pipe drain may be constructed of corrugated metal or PVC pipe. All pipe connections shall be watertight. Flexible tubing may be used, provided rigid pipe is use for the inlet, the flexible tubing is of the same diameter as the inlet, and pipe connections are made with metal strapping or watertight connecting collars. The flexible pipe shall be constructed with hold down apparatus spaced on 10 foot centers for anchoring the pipe.
- D. The entrance to the pipe shall be a hooded type.
- E. The soil around and/or under the pipe shall be placed in 4-inch layers and hand compacted to the top of the earth dike.
- F. A riprap apron shall be installed at the pipe outlet where clean water is discharged into a stabilized area or drainageway.

### 3.14 INSTALLATION OF TEMPORARY DIVERSIONS

- A. Drainage area should not exceed 10 acres. Larger areas require a more extensive design.
- B. The channel cross section may be parabolic or trapezoidal. Disk the base of the dike before placing fill. Build the dike 10% higher than designed for settlement. The dike shall be compacted by traversing with tracked earth-moving equipment.
- C. The minimum cross section of the levee or dike will be as follows: (Minimum design freeboard shall be 0.3 foot.) Where construction traffic will cross, the top width may be made wider and the side slopes flatter than specified below.

Dike Top Width (ft.)	Height (ft.)	Side Slopes	Shape
0	1.5	4.1	Trapezoidal
4	1.5	2.1	Parabolic

- D. The grade may be variable depending upon the topography, but must have a positive drainage to the outlet and be stabilized to be non-erosive.

Temporary Diversion Stabilization Treatment			
Diversion Slope	< 2 acres	2 – 5 acres	5 – 10 acres
0 – 3 %	Seed and straw	Seed and straw	Seed and straw
3 – 5%	Seed and straw	Seed and straw	Matting
5 – 8%	Seed and straw	Matting	Matting
8 – 20%	Seed and straw	Matting	Engineered
Note: Diversions with steeper slopes or greater drainage areas are beyond the scope of this standard and must be designed for stability. Seed, straw and matting used shall meet the Specifications for Temporary Seeding, Mulching and Matting.			

- E. Outlet runoff onto a stabilized area, into a properly designed waterway, grade stabilization structure, or sediment trapping facility.

- F. Diversions shall be seeded and mulched in accordance with the requirements outlined herein as soon as they are constructed or other suitable stabilization shall be applied in order to preserve dike height and reduce maintenance.

3.15 INSTALLATION OF TEMPORARY DIVERSIONS ABOVE STEEP SLOPES

- A. Drainage area should not exceed 5 acres. Larger areas require a more extensive design.
- B. The channel cross section may be parabolic, v-shaped, or trapezoidal. Disk the base of the dike before placing fill. Build the dike 10% higher than designed for settlement. The dike shall be compacted by traversing with tracked earth-moving equipment.
- C. The minimum cross section of the levee or dike will be as follows: (Minimum design freeboard shall be 0.3 foot.)

Dike Top Width (ft.)	Height (ft.)	Side Slopes	Shape
0	1.5	4.1	Trapezoidal
4	1.5	2.1	Parabolic

- D. The grade may be variable depending upon the topography, but must have a positive drainage to the outlet and be stabilized to be non-erosive.

Temporary Diversion Stabilization Treatment			
Diversion Slope	< 2 acres	2 – 5 acres	5 – 10 acres
0 – 3 %	Seed and straw	Seed and straw	Seed and straw
3 – 5%	Seed and straw	Seed and straw	Matting
5 – 8%	Seed and straw	Matting	Matting
8 – 20%	Seed and straw	Matting	Engineered
Note: Diversions with steeper slopes or greater drainage areas are beyond the scope of this standard and must be designed for stability. Seed, straw and matting used shall meet the Specifications for Temporary Seeding, Mulching and Matting.			

- E. Outlet runoff onto a stabilized area, settling pond, or into a drop structure.
- F. Diversions shall be seeded and mulched in accordance with the requirements specified herein as soon as they are constructed or other suitable stabilization shall be applied in order to preserve dike height and reduce maintenance.

3.16 EROSION CONTROL METHODS FOR INSTALLATION OF STREAM UTILITY CROSSINGS

- A. When site conditions allow, one of the following shall be used to divert stream flow or keep the flow away from construction activity.
  1. Drill or bore the utility lines under the stream channel.
  2. Construct a cofferdam or barricade of sheet pilings, sandbags or a turbidity curtain to keep flow from moving through the disturbed area. Turbidity curtains shall be a

- pre-assembled system and used only parallel to flow.
3. Stage construction by confining first one-half of the channel until work there is completed and stabilized, then move to the other side to complete the crossing.
  4. Route the stream flow around the work area by bridging the trench with a rigid culvert, pumping, or constructing a temporary channel. Temporary channels shall be stabilized by rock or a geotextile completely lining the channel bottom and side slopes.
- B. Crossing Width -The width of clearing shall be minimized through the riparian area. The limits of disturbance shall be as narrow as possible including not only construction operations within the channel itself but also clearing done through the vegetation growing on the streambanks.
  - C. Clearing shall be done by cutting NOT grubbing. The roots and stumps shall be left in place to help stabilize the banks and accelerate revegetation.
  - D. Material excavated from the trench shall be placed at least 20 ft. from the streambanks.
  - E. To the extent other constraints allow, stream shall be crossed during periods of low flow.
  - F. Duration of Construction -The time between initial disturbance of the stream and final stabilization shall be kept to a minimum. Construction shall not begin on the crossing until the utility line is in place to within 10 ft. of the streambank.
  - G. Fill Placed Within the Channel -The only fill permitted in the channel should be clean aggregate, stone or rock. No soil or other fine erodible material shall be placed in the channel. This restriction includes all fill for temporary crossings, diversions, and trench backfill when placed in flowing water. If the stream flow is diverted away from construction activity the material originally excavated from the trench may be used to backfill the trench.
  - H. Streambank Restorations -Streambanks shall be restored to their original line and grade and stabilized with riprap or vegetative bank stabilization.
  - I. Runoff Control Along the Right-of-Way -To prevent sediment-laden runoff from flowing to the stream, runoff shall be diverted with water bar or swales to a sediment trapping practice a minimum of 50 ft. from the stream.
  - J. Sediment laden water from pumping or dewatering or pumping shall not be discharged directly to a stream. Flow shall be routed through a settling pond, dewatering sump or a flat, well-vegetated area adequate for removing sediment before the pumped water reaches the stream.
  - K. Dewatering operations shall not cause significant reductions in stream temperatures. If groundwater is to be discharged in high volumes during summer months, it shall first be routed through a settling pond or overland through a flat well-vegetated area.
  - L. Permits -In addition to these specifications, stream crossings shall conform to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 permits) and Ohio Environmental Protection Agency's State Water Quality Certification (401 permits).



### 3.17 INSTALLATION OF CULVERT STREAM CROSSING

- A. Stream Disturbance -Disturbance to the stream shall be kept to a minimum. Streambank vegetation shall be preserved to the maximum extent practical and the stream crossing shall be as narrow as practical.
- B. Clearing shall be done by cutting NOT grubbing. The roots and stumps shall be left in place to help stabilize the banks and accelerate revegetation.
- C. To minimize interference with fish spawning and migration, crossing construction should be avoided where practical from March 15 through June 15.
- D. Water shall not be allowed to flow along the road directly to the stream. Diversions and swales shall direct runoff away from the access road to a sediment-control practice.
- E. Placement -Culverts shall be placed on the existing streambed to avoid a drop or waterfall at the downstream end of the pipe, which would be a barrier to fish migration. Crossings shall be made in shallow areas rather than deep pools where possible.
- F. Culvert Size -Culvert diameter shall be at least three times the depth of normal stream flow at the point of the stream crossing. If the crossing must be placed in deep, slow-moving pools, the culvert diameter may be reduced to twice the depth of normal stream flow. The minimum size culvert that may be used is 18 in.
- G. Number of Culverts -There shall be sufficient number of culverts to completely cross the stream channel from streambank to streambank with no more than a 12-in. space between each one.
- H. Fill and Surface Material -All material placed in the stream channel, around the culverts and on the surface of the crossing shall be stone, rock or aggregate. ODOT No. 1 shall be the minimum acceptable size. To prevent washouts, larger stone and rock may be used and they may be placed in gabion mattresses. No soil shall be used in the construction of a stream crossing or placed in the steam channel.
- I. Removal -Aggregate stone and rock used for this structure does not need to be removed. Care should be taken so that any aggregate left does not create an impoundment or impede fish passage. All pipes, culverts, gabions or structures must be removed.
- J. Stabilization -Streambanks shall be stabilized. Plantings shall include woody vegetation where practical.

### 3.18 INSTALLATION OF TEMPORARY STREAM FORD

- A. Timing -No construction or removal of a temporary stream ford will be permitted on perennial streams from March 15 through June 15 to minimize interference with fish spawning and migration.
- B. Stream Disturbance -Disturbance to the stream shall be kept to a minimum. Streambank vegetation shall be preserved to the maximum extent practical and the stream crossing shall be as narrow as practical. Clearing shall be done by cutting NOT grubbing where

possible.

- C. Surface Runoff -Water shall not be allowed to flow along the road directly to the stream. Diversions and swales shall direct runoff away from the access road to a sediment-control practice.
- D. Fill and Surface Material -All material placed in the stream channel shall be stone, rock or aggregate. ODOT No. 1 shall be the minimum acceptable size. Larger stone and rock may be used. No soil shall be used in the construction of a stream ford or placed in the steam channel.
- E. Removal - Aggregate, stone and rock used for the stream crossing shall NOT be removed but shall be formed so it does not create an impoundment, impede fish passage, or cause erosion of streambanks.
- F. Stabilization -Streambanks shall be stabilized. Plantings shall include woody vegetation where practical.

### 3.19 INSTALLATION OF A WATER BAR

- A. The minimum water bar dimensions shall be:
  - 1. Top width of berm/dike – 2 feet minimum.
  - 2. Height/depth – 18 inches unless otherwise noted on plans.
  - 3. Side Slopes – Sufficiently flat to accommodate the expected traffic.
- B. The spacing between water bars shall be as follows:

Road Grade (%)	Distance (Ft.)
1	400
2	250
5	135
10	80
15	60
20	45

- C. The field location shall be adjusted as needed to provide a stabilized safe outlet.
- D. The diverted runoff shall be directed onto an undisturbed vegetative area, to a settling trap or basin or trap if contributing area is stable.
- E. Diversions/dikes shall be compacted by traversing with equipment during construction.
- F. The water bars shall be angled slightly downslope across the centerline of the travel lane.

### 3.20 EROSION CONTROL METHODS RELATED TO DEWATERING OPERATIONS

- A. A de-watering plan shall be developed prior to the commencement of any pumping activities.

- B. The de-watering plan shall include all pumps and related equipment necessary for the dewatering activities and designate areas for placement of practices. Outlets for practices shall be protected from scour either by riprap protection, fabric liner, or other acceptable method of outlet protection.
- C. Water that is not discharged into a settling/treatment basin but directly into waters of the state shall be monitored hourly. Discharged water shall be within +/- 5° F of the receiving waters.
- D. Settling basins shall not be greater than four (4) feet in depth. The basin shall be constructed for sediment storage as outlined herein for a Sediment Basin Or Sediment Trap. The inlet and outlet for the basin shall be located at the furthest points of the storage. A floating outlet shall be used to ensure that settled solids do not re-suspend during the discharge process. The settling basin shall be cleaned out when the storage has been reduced by 50% of its original capacity.
- E. All necessary National, State and Local permits shall be secured prior to discharging into waters of the state.

### 3.21 TREE AND NATURAL PRESERVATION AREAS

- A. Tree and natural preservation areas shall be fenced prior to beginning clearing operations.
- B. Fence materials shall be metal fence posts with two strands of high tensile wire, plastic fence or snow fence.
- C. Signage shall clearly identify the tree and natural preservation area and state that no clearing or equipment is allowed within it.
- D. Fence shall be placed as shown on plans and beyond the drip line or canopy of trees to be protected.
- E. If any clearing is done around specimen trees it shall be done by cutting at ground level with hand held tools and shall not be grubbed or pulled out. No clearing shall be done in buffer strips or other preserved forested areas.
- F. If any clearing is done around specimen trees it shall be done by cutting at ground level with hand held tools and shall not be grubbed or pulled out. No clearing shall be done in buffer strips or other preserved forested areas.
- G. No filling or stockpiling of materials shall occur within the tree protection area, including deposition of sediment.

### 3.22 TREE PROTECTION DURING UTILITY INSTALLATION

- A. Where utilities must run through a tree's dripline are, tunneling should be used to minimize root damage. Tunneling should be performed at a minimum depth of 24 inches for trees less than 12 inches in diameter or at a minimum depth of 36 inches for larger diameter trees.

- B. Where tunneling will be performed within the dripline of a tree, the tunnel should be placed a minimum of 2 feet away from the tree trunk to avoid taproots.
- C. Minimize excavation or trenching within the dripline of the tree. Route trenches around the dripline of trees.
- D. Roots two inches or larger that are severed by trenching should be sawn off neatly in order to encourage new growth and discourage decay.
- E. Soil excavated during trenching shall be piled on the side away from the tree.
- F. Roots shall be kept moist while trenches are open and refilled immediately after utilities are installed or repaired.

### 3.23 INSTALLATION OF CONSTRUCTION ENTRANCES

- A. Stone Size—ODOT # 2 (1.5-2.5 inch) stone shall be used, or recycled concrete equivalent.
- B. Length—The Construction entrance shall be as long as required to stabilize high traffic areas but not less than 70 ft. (exception: apply 30 ft. minimum to single residence lots).
- C. Thickness -The stone layer shall be at least 6 inches thick for light duty entrances or at least 10 inches for heavy duty use.
- D. Width -The entrance shall be at least 14 feet wide, but not less than the full width at points where ingress or egress occurs.
- E. Geotextile -A geotextile shall be laid over the entire area prior to placing stone. It shall be composed of strong rot-proof polymeric fibers and meet the material specifications outlined above.
- F. Timing—The construction entrance shall be installed as soon as is practicable before major grading activities.
- G. Culvert -A pipe or culvert shall be constructed under the entrance if needed to prevent surface water from flowing across the entrance or to prevent runoff from being directed out onto paved surfaces.
- H. Water Bar -A water bar shall be constructed as part of the construction entrance if needed to prevent surface runoff from flowing the length of the construction entrance and out onto paved surfaces.
- I. Maintenance -Top dressing of additional stone shall be applied as conditions demand. Mud spilled, dropped, washed or tracked onto public roads, or any surface where runoff is not checked by sediment controls, shall be removed immediately. Removal shall be accomplished by scraping or sweeping.
- J. Construction entrances shall not be relied upon to remove mud from vehicles and prevent off-site tracking. Vehicles that enter and leave the construction-site shall be restricted

from muddy areas.

- K. Removal—the entrance shall remain in place until the disturbed area is stabilized or replaced with a permanent roadway or entrance.

### 3.24 DUST CONTROL OPERATIONS

- A. Vegetative Cover and/mulch – Apply temporary or permanent seeding and mulch to areas that will remain idle for over 21 days. Saving existing trees and large shrubs will also reduce soil and air movement across disturbed areas. See Temporary Seeding; Permanent Seeding; Mulching Practices; and Tree and Natural Area Protection practices.
- B. Watering – Spray site with water until the surface is wet before and during grading and repeat as needed, especially on haul roads and other heavy traffic routes. Watering shall be done at a rate that prevents dust but does not cause soil erosion. Wetting agents shall be utilized according to manufacturer’s instructions.
- C. Spray-On Adhesives – Apply adhesive according to the following table or manufacturers’ instructions.

Adhesive	Water Dilution (Adhesive: Water)	Nozzle Type	Application Rate Gal./Ac.
Latex Emulsion	12.5:1	Fine	235
Resin in Water Acrylic Emulsion (No-traffic)	4:1	Fine	300
Acrylic Emulsion (No-traffic)	7:1	Coarse	450
Acrylic Emulsion (Traffic)	3.5:1	Coarse	350

- D. Stone – Graded roadways and other suitable areas will be stabilized using crushed stone or coarse gravel as soon as practicable after reaching an interim or final grade. Crushed stone or coarse gravel can be used as a permanent cover to provide control of soil emissions.
- E. Barriers – Existing windbreak vegetation shall be marked and preserved. Snow fencing or other suitable barrier may be placed perpendicular to prevailing air currents at intervals of about 15 times the barrier height to control air currents and blowing soil.
- F. Calcium Chloride - This chemical may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage. Application rates should be strictly in accordance with suppliers’ specified rates.
- G. Operation and Maintenance - When Temporary Dust Control measures are used; repetitive treatment should be applied as needed to accomplish control.
- H. Street Cleaning - Paved areas that have accumulated sediment from construction should

be cleaned daily, or as needed, utilizing a street sweeper or bucket -type endloader or scraper.

### 3.25 GRADE TREATMENT (SLOPE ROUGHENING) FOR EROSION CONTROL

#### A. Cut Slopes-Greater than 3:1 Slopes

1. Stair-step grading may be carried out on any material soft enough to be ripped with a bulldozer. The ratio of the horizontal distance to the vertical cut distance shall be flatter than 1:1 and the horizontal portion of the "step" shall slope toward the vertical wall. Individual vertical cuts shall not be more than 24 inches on soft soil materials and not more than 36 inches in rocky materials.
2. Grooving may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction. Suggested implements include discs, tillers, spring harrows, and the teeth on a front-end loader bucket. Such grooves shall not be less than 3 inches deep nor further than 15 inches apart.

#### B. Fill Slopes-Greater than 3:1 Slopes - Fill slopes steeper than 3:1 shall be grooved or allowed to remain rough as they are constructed utilizing one of the following methods:

1. Grooving may be made with any appropriate implement which can be safely operated on the slope and which will not cause undue compaction such as discs, tillers, spring harrows, and the teeth on a front-end loader bucket. Grooves left shall not be less than 3 inches deep nor further than 15 inches apart.
2. As lifts of the fill are constructed, soil and rock materials may be allowed to fall naturally onto the slope surface. At no time shall slopes be bladed or scraped to produce a smooth, hard surface.

#### C. Cuts, Fills, and Graded Areas Which Will Be Mowed

1. Mowed slopes should not be steeper than 3:1 and shall avoid excessive roughness. These areas may be roughened with shallow grooves such as those, which remain after tilling, discing, harrowing, raking, or use of a cultipacker-seeder. The final pass of any such tillage implement shall be on the contour (perpendicular to the slope).
2. Grooves formed by implements shall be not less than 1 inch deep and not further than 12 inches apart. Fill slopes that are left rough during construction may be smoothed with a chain harrow or similar implement to facilitate mowing.

#### D. Roughening With Tracked Machinery

1. Avoid tracking clayey soils if possible, due to their potential for compaction. Conversely sandy soils will have low potential for compaction.
2. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. As few passes of the machinery should be made as possible to minimize compaction.

### 3.26 EROSION CONTROL DURING TOPSOILING OPERATIONS

#### A. Salvaging and Stockpiling

1. Determine the depth and suitability of topsoil at the site. (For help, contact your local SWCD office to obtain a county soil survey report).
2. Prior to stripping topsoil, install appropriate downslope erosion and sedimentation controls such as sediment traps and basins.
3. Remove the soil material no deeper than what the county soil survey describes as "surface soil" (ie. A or Ap horizon).
4. Construct stockpiles in accessible locations that do not interfere with natural drainage. Install appropriate sediment controls to trap sediment such as silt fence immediately adjacent to the stockpile or sediment traps or basins downstream of the stockpile. Stockpile side slopes shall not exceed a ratio of 2:1.
5. If topsoil is stored for more than 21 days, it should be temporary seeded, or covered with a tarp.

#### B. Spreading the Topsoil

1. Prior to applying topsoil, the topsoil should be pulverized.
2. To ensure bonding, grade the subsoil and roughen the top 3-4 in. by disking.
3. Do not apply when site is wet, muddy, or frozen, because it makes spreading difficult, causes compaction problems, and inhibits bonding with subsoil.
4. Apply topsoil evenly to a depth of at least 4 inches and compact slightly to improve contact with subsoil.
5. After spreading, grade and stabilize with seeding or appropriate vegetation.

### 3.27 TEMPORARY SEEDING OPERATIONS FOR EROSION CONTROL

- A. Structural erosion and sediment control practices such as diversions and sediment traps shall be installed and stabilized with temporary seeding prior to grading the rest of the construction site.
- B. Temporary seed shall be applied between construction operations on soil that will not be graded or reworked for 21 days or greater. These idle areas shall be seeded within 7 days after grading.
- C. The seedbed should be pulverized and loose to ensure the success of establishing vegetation. Temporary seeding should not be postponed if ideal seedbed preparation is not possible.
- D. Soil Amendments—Temporary vegetation seeding rates shall establish adequate stands of vegetation, which may require the use of soil amendments. Base rates for lime and fertilizer shall be used.
- E. Seeding Method—Seed shall be applied uniformly with a cyclone spreader, drill, cultipacker seeder, or hydroseeder. When feasible, seed that has been broadcast shall be covered by raking or dragging and then lightly tamped into place using a roller or cultipacker. If hydroseeding is used, the seed and fertilizer will be mixed on-site and the

seeding shall be done immediately and without interruption.

### 3.28 MULCHING OF TEMPORARY SEEDING AREAS

- A. Applications of temporary seeding shall include mulch, which shall be applied during or immediately after seeding. Seedings made during optimum seeding dates on favorable, very flat soil conditions may not need mulch to achieve adequate stabilization.
- B. Materials:
  - 1. Straw—If straw is used, it shall be unrotted small-grain straw applied at a rate of 2 tons per acre or 90 lbs./ 1,000 sq. ft. (2-3 bales)
  - 2. Hydroseeders—If wood cellulose fiber is used, it shall be used at 2000 lbs./ ac. or 46 lb./ 1,000-sq.-ft.
  - 3. Other—Other acceptable mulches include mulch mattings applied according to manufacturer's recommendations or wood chips applied at 6 ton/ ac.
- C. Straw Mulch shall be anchored immediately to minimize loss by wind or water. Anchoring methods:
  - 1. Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but left to a length of approximately 6 inches.
  - 2. Mulch Netting—Netting shall be used according to the manufacturers recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
  - 3. Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Track or equivalent may be used at rates recommended by the manufacturer.
  - 4. Wood-Cellulose Fiber—Wood-cellulose fiber binder shall be applied at a net dry wt. of 750 lb./ac. The wood-cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb. / 100 gal.

### 3.29 MULCHING FOR EROSION CONTROL

- A. Mulch and other appropriate vegetative practices shall be applied to disturbed areas within 7 days of grading if the area is to remain dormant (undisturbed) for more than 21 days or on areas and portions of the site which can be brought to final grade.
- B. Mulch shall consist of one of the following:
  - 1. Straw - Straw shall be unrotted small grain straw applied at the rate of 2 tons/ac. or 90 lb./1,000 sq. ft. (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 sq.ft. sections and place two 45-lb. bales of straw in each section.
  - 2. Hydroseeders - Wood cellulose fiber should be used at 2,000 lb./ac. or 46 lb./1,000



- sq. ft.
3. Other - Acceptable mulches include mulch mattings and rolled erosion control products applied according to manufacturer's recommendations or wood mulch/chips applied at 10-20 tons/ac.
- C. Mulch Anchoring - Mulch shall be anchored immediately to minimize loss by wind or runoff. The following are acceptable methods for anchoring mulch.
1. Mechanical - Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but be left generally longer than 6 inches.
  2. Mulch Nettings - Use according to the manufacturer's recommendations, following all placement and anchoring requirements. Use in areas of water concentration and steep slopes to hold mulch in place.
  3. Synthetic Binders - For straw mulch, synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Tack or equal may be used at rates recommended by the manufacturer. All applications of Synthetic Binders must be conducted in such a manner where there is no contact with waters of the state.
  4. Wood Cellulose Fiber - Wood cellulose fiber may be used for anchoring straw. The fiber binder shall be applied at a net dry weight of 750 lb./acre. The wood cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb./100 gal. of wood cellulose fiber.

### 3.30 INSTALLATION OF TEMPORARY ROLLED EROSION CONTROL PRODUCT (EROSION CONTROL MATTING)

- A. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2"-3" of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed RECP will have direct contact with the soil surface.
- B. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.
- C. Slope Installation
1. Excavate top and bottom trenches (12"x6"). Intermittent erosion check slots (6"x6") may be required based on slope length. Excavate top anchor trench 2' x 3' over crest of the slope.
  2. If intermittent erosion check slots are required, install RECP in 6"x6" slot at a maximum of 30' centers or the mid-point of the slope. RECP should be stapled into trench on 12" centers.
  3. Install RECP in top anchor trench, anchor on 12" spacings, backfill and compact soil.
  4. Unroll RECP down slope with adjacent rolls overlapped a minimum of 3". Anchor the seam every 18". Lay the RECP loose to maintain direct soil contact, do not pull taught.
  5. Overlap roll ends a minimum of 12" with upslope RECP on top for a shingle effect.

Begin all new rolls in an erosion check slot if required, double anchor across roll every 12”.

6. Install RECP in bottom anchor trench (12”x6”), anchor every 12”. Place all other staples throughout slope at 1 to 2.5 per square yard dependent on slope. Refer to manufacturer’s anchor guide.

#### D. Channel Installation

1. Excavate initial anchor trench (12”x6”) across the lower end of the project area.
2. Excavate intermittent check slots (6”x6”) across the channel at 30’ intervals along the channel.
3. Excavate longitudinal channel anchor slots (4”x4”) along both sides of the channel to bury the edges. Whenever possible extend the RECP 2’-3’ above the crest of channel side slopes.
4. Install RECP in initial anchor trench (downstream) anchor every 12”, backfill and compact soil.
5. Roll out RECP beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls upstream with a 3” minimum overlap (anchor every 18”) and up each channel side slope.
6. At top of channel side slopes install RECP in the longitudinal anchor slots, anchor every 18”.
7. Install RECP in intermittent check slots. Lay into trench and secure with anchors every 12”, backfill with soil and compact.
8. Overlap roll ends a minimum of 12” with upstream RECP on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12”.
9. Install upstream end in a terminal anchor trench (12”x6”); anchor every 12”, backfill and compact.
10. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

### 3.31 INSTALLATION OF TURF REINFORCEMENT MATTING (PERMANENT ROLLED EROSION CONTROL PRODUCTS)

- A. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2”-3” of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed TRM will have direct contact with the soil surface.
- B. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.
- C. Slope Installation

1. Excavate top and bottom trenches (12”x6”). Intermittent erosion check slots (6”x6”) may be required based on slope length. Excavate top anchor trench 2’ x 3’ over crest of the slope.

2. If intermittent erosion check slots are required install Turf Reinforcement Matting (TRM) in 6"x6" slot at a maximum of 30' centers or the mid point of the slope. TRM should be stapled into trench on 12" centers.
3. Install TRM in top anchor trench, anchor on 12" spacings, backfill and compact soil.
4. Unroll TRM down slope with adjacent rolls overlapped a minimum of 3". Anchor the seam every 18". Lay the TRM loose to maintain direct soil contact, do not pull taught.
5. Overlap roll ends a minimum of 12" with upslope TRM on top for a shingle effect. Begin all new rolls in an erosion check slot if required, double anchor across roll every 12".
6. Install TRM in bottom anchor trench (12"x6"), anchor every 12". Place all other staples throughout slope at 1 to 2.5 per square yard dependant on slope. Refer to manufacturer's anchor guide.

#### D. Channel Installation

1. Excavate initial anchor trench (12"x6") across the lower end of the project area.
2. Excavate intermittent check slots (6"x6") across the channel at 30' intervals along the channel.
3. Excavate longitudinal channel anchor slots (4"x4") along both sides of the channel to bury the edges. Whenever possible extend the TRM 2'-3' above the crest of channel side slopes.
4. Install TRM in initial anchor trench (downstream) anchor every 12", backfill and compact soil.
5. Roll out TRM beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls upstream with a 3" minimum overlap (anchor every 18") and up each channel side slope.
6. At top of channel side slopes install TRM in the longitudinal anchor slots, anchor every 18".
7. Install TRM in intermittent check slots. Lay into trench and secure with anchors every 12", backfill with soil and compact.
8. Overlap roll ends a minimum of 12" with upstream TRM on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12".
9. Install upstream end in a terminal anchor trench (12"x6"); anchor every 12", backfill and compact.
10. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

### 3.32 GENERAL SMALL CONSTRUCTION SITE CONTROLS

- A. Preexisting vegetation shall be retained on idle portions of the building area for as long as construction operations allow. Clearing shall be done so only active working areas are bare.
- B. Temporary seed and/or mulch shall be applied to areas, such as stockpiles and rough graded areas, that are bare and not actively being worked. This shall apply to areas that

will not be reworked for 21 days or more.

- C. Stockpiles created from excavation and grading shall be situated away from streets, swales, or other waterways and shall be seeded and/or mulched immediately.
- D. Silt fence or other sediment barriers shall control sheet flow runoff from the construction area. These shall not be constructed in channels or areas of concentrated flow. Other sediment controls such as sediment traps and inlet protection shall also be used as needed to control sediment runoff. Sediment control practices shall be inspected weekly after storm events, and maintained in good working condition.
- E. Construction vehicle access shall be limited to one route, to the greatest extent practical. The access shall be gravel or crushed rock underlain with geotextile.
- F. Mud tracked onto streets or sediment settled around curb inlet protection shall be removed daily or as needed to prevent it from accumulating. It shall be removed by shoveling and scraping and shall NOT be washed off paved surfaces or into storm drains. Sediment removed shall be placed where it will not be subject to erosion or concentrated runoff.

END OF SECTION 312514