Board of Water and Sewer Commissioners
of the
City of Mobile, Alabama

Update of Standard Specifications
Section 16

Erosion Control

Updated June 2019

TABLE OF CONTENTS

PART 1 GENERAL

16.1.01 SCOPE

A. These Specifications form a part of the Contract Documents and shall govern the erosion control requirements for water mains, sanitary sewers, sewage pumping stations, and appurtenances. These Specifications, in addition to applicable regulatory requirements, shall be accommodated to ensure that the lands in the construction project area are not adversely affected as a result of the constructed improvements.

16.1.02 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

16.1.03 REFERENCED SECTIONS

16.1.04 REFERENCED CODES AND STANDARDS

A. State of Alabama Department of Transportation Standard Specifications for Highway Construction

B. ASTM G94 – Standard Guide for Evaluating Metals for Oxygen Service

16.1.05 EROSION CONTROL AND PROPERTY PROTECTION

A. The Contractor shall adhere to the following provisions at all times for the related construction and maintenance activities:

B. Flow of Drains and Sewers Maintained:

1. Adequate provisions shall be made for the flow of sewers, drains and watercourses encountered during construction. Lines and structures disturbed during construction shall be immediately restored to their original condition.

C. Property Protection: Trees, grass, fences, signboards, poles and all other property shall be protected unless their removal is authorized. Any property damage shall be satisfactorily restored by the Contractor.

D. Maintenance of Erosion Control Measures: The Contractor shall at all times take necessary precautions to prevent erosion or transportation of soil due to natural or induced water flows. Spoil banks and soil stockpiles shall be contained to prevent transportation of soil by run-off waters. All temporary erosion control measures installed and paid for shall be properly maintained for the entire duration of construction. Failing to maintain these structures will be grounds for

the Engineer to recommend to the Owner the halting of construction until the measures are properly restored.

E. Topsoil: The Contractor shall remove a minimum of 4 inches of existing grass and topsoil from within the limits of the new construction. Topsoil obtained from this stripping operation that meets or exceeds topsoil requirements in Section 16.1.06.J shall be stockpiled on the site in areas approved by the Engineer. Stripped material not suitable for use as topsoil or embankment material shall be disposed of away from the construction site by the Contractor at no cost to the Owner. The stockpiled topsoil from the stripping operation shall be used to cover disturbed areas of construction to a minimum thickness of 2 inches, prior to temporary and permanent grassing.

F. Grading: The Contractor shall perform grading of every description regardless of the character of material encountered, within the limits and to the lines and grades shown on the Plans. Minor changes in grades shown on the Plans may be required to allow for final grassing, soil stabilization, and drainage as the work progresses.

G. Permits: The NPDES permit applications will be completed by the Engineer. It will be the Contractor's responsibility to submit this permit application to ADEM and pay necessary fees, unless otherwise specified. Construction shall not begin until all applicable permits have been obtained. The Contractor shall comply with all provisions of construction permits obtained. Contractor shall indemnify Owner in event there is a failure to comply with all provisions of NPDES permit.

16.1.06 MATERIALS AND CONSTRUCTION REQUIREMENTS

A. Erosion Control Plan (Item No. EC-1): The purpose of the Erosion Control Plan is to ensure the Contractor's compliance with state and federal non-point source pollution legislation. Prior to commencement of construction, the Contractor shall submit a detailed erosion control plan to the Engineer for approval. The Contractor shall be responsible for providing a general location drawing of the project with the following items clearly indicated:

1. Locations where construction limits will adjoin or cross drainage paths,

2. Locations where materials for construction will be stockpiled including soils, aggregate, piping, manholes, etc., and

3. Proposed erosion control measures to be employed at the locations identified in (1) and (2) above. These erosion control measures shall include those measures expressly required on the Plans as well as additional Best Management Practice (BMP) items that were included as contingency in the Plans.

    a. The Engineer will recommend payment of this item upon receipt of an acceptable Erosion Control Plan. Should the Engineer find the submitted Erosion Control Plan unacceptable, the Contractor shall resubmit the Erosion Control Plan incorporating any comments from the Engineer.

b. Maintenance and erosion control of the construction site is the sole responsibility of the Contractor at all times during the construction and maintenance periods.

B. Temporary Grassing for Erosion Control (Item No. EC-2): As directed on the Plans, the Contractor shall seed the project according to these seeding requirements. Temporary grassing shall be installed in all areas of the project where clearing and grubbing will be completed at least seven (7) days before the installation of the sewer/water lines. Temporary grassing shall take place immediately after the clearing and grubbing operations in order to reduce the erosion from the construction location.

1. General: The disturbed areas shall be temporarily grassed for erosion control as hereinafter specified. The disturbed areas shall be prepared for grassing by grading and removing and disposing of roots, stumps, or other materials which might be harmful to grass growth. Topsoil shall be spread over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.

2. Seeding: The areas to be grassed shall be seeded with quality seed in the following minimum quantities per acre:

   a. Kentucky 31 Fescue 34 pounds

   b. Common Bermuda 10 pounds

   c. White Dutch Clover 10 pounds

   d. In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Owner reserves the right to change proportions of the various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in Contract Price.

   e. Seed shall be broadcast with hand-operated equipment. When broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may, at the Contractor's option, be used in lieu of the above.

   f. Unless specifically noted otherwise, Pensacola Bahia shall not be used.

   g. When the grassing operation is accomplished after the month of August and before the month of March, in addition to the seeding as outlined above, the entire grassed areas shall also be overseeded with Italian Rye Grass Seed at the uniform rate of 40 pounds per acre at no additional cost to the Owner.

3. Maintenance: The Contractor shall obtain a stand of grass and maintain all temporarily grassed areas until permanent grassing is performed. A satisfactory stand of grass is defined as a cover of living grass in which

gaps larger than 12 inches do not occur. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area until final grassing occurs.

C. Silt Fence (Item No. EC-3): Silt fences shall be constructed at locations approved by the Engineer and installed in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition Type A or Type B, as specified on the Plans, shall be provided by the Contractor.

D. Hay Bales (Item No. EC-4): Hay bales shall be a native hay or any other approved material. The bales shall be securely anchored by the use of stakes and wire or other approved method.

E. Temporary Steel Sheet Pile for Erosion Control (Item No. EC-5): All construction for this item shall be in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, 1992 Edition, Section 505, Piling. Sheet piling shall be used in locations where the stockpiling of materials or the existing banks of watercourses are unstable and potential erosion could occur due to a storm event. The temporary sheet pile structure shall be installed prior to the Contractor constructing a stockpile of material that is erodible or moving equipment on or near an unstable bank. The temporary sheet pile structure shall be left in place until either (1) the stockpile of material has been removed, or (2) No more construction or equipment will be in the vicinity of the unstable watercourse bank.

F. Turbidity Barriers (Item EC-6): Turbidity barriers shall be utilized in locations where specifically required by the Engineer and installed in accordance with the manufacturer's recommendations.

1. Materials: Turbidity barriers shall be composed of polyester reinforced vinyl laminate and shall be Tough Guy floating or staked turbidity barriers as manufactured by AER-FLO Canvas Products, Inc., or approved equal.

2. Installation: Installation shall be in accordance with the manufacturer's specifications. Terminal end anchor points should be located well out of the range of the watercourse on shore and must be strong enough to hold the barrier in place throughout the construction period.

3. The method of furling shall be used to aid in installation and removal of the turbidity barrier, in all cases where the barrier is to be installed in a watercourse. Furling is accomplished by placing light polyester rope ties around the curtain from top to bottom at approximately five (5) feet intervals. Since furling the barrier will also expedite its removal after the work is finished, the lines should be left in place.

G. Clearing and Grubbing (Item No. EC-7): The Contractor shall clear and grub trench lines. Clearing and grubbing shall be confined to the limits of the easements and to the minimum width required for installation of the pipe. All trees, stumps, roots and debris shall be disposed of in an approved manner by the

Contractor in accordance with local, state and federal regulations. Burying of stumps and other debris on the site will not be permitted. Where trees within the easements are indicated on the Plans or designated in the field to be retained, such trees shall be protected from damage at all times. Should, by accident or otherwise, such trees be damaged, they shall be repaired, at the Contractor's expense, by a Certified Arborist.

H. Final Grassing for Erosion Control (Item No. EC-8): The trench lines and other areas disturbed by construction of water and sanitary sewer lines shall be grassed as hereinafter specified where indicated on the Plans or where directed by the Engineer.

1. General: Upon completion of construction of the project, the disturbed areas shall be prepared for permanent grassing by grading to the final grade and removing and disposing of roots, stumps, or other materials which might be harmful to grass growth. Care shall be taken to spread topsoil over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.

2. Fertilizer: After the surface has been prepared for grassing and before any grass or seeds are planted, the soil shall be loosened by harrowing or other approved methods, and the areas specified to be grassed shall be fertilized at a uniform rate of 1,500 pounds per acre with a standard commercial 8:8:8 fertilizer and 3,000 pounds of agricultural lime per acre.

3. Seeding: The areas to be grassed shall be seeded with quality seed in the following minimum quantities per acre:

   a. Kentucky 31 Fescue 34 pounds

   b. Common Bermuda 10 pounds

   c. White Dutch Clover 10 pounds

   d. In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Owner reserves the right to change proportions of the various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in Contract Price.

   e. Seed shall be broadcast with hand-operated equipment. Broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may, at the Contractor's option, be used in lieu of the above.

   f. Unless specifically noted otherwise, Pensacola Bahia shall not be used.

   g. When the grassing operation is accomplished after the month of August, and before the month of March, in addition to the

seeding as outlined above, the entire grassed area shall also be over seeded with Italian Rye Grass Seed at the uniform rate of 40 pounds per acre.

4. Maintenance: The Contractor shall maintain all grassed areas for a minimum two (2) year period following the date of project acceptance unless specified otherwise. If, during the course of the final inspection, the Engineer determines that all work has been satisfactorily completed except for a substantial stand of grass on all or part of the work, he may recommend acceptance if the Contractor provides a bond covering all erosion control and related items. The amount of the bond shall equal replacement costs of the erosion control items as determined by the Engineer. The time period to be covered by the bond will be no longer than the time period of the warranty for the project. It shall be understood by all that such a bond is to ensure replacement of the erosion control items should it become necessary and will in no way relieve the Contractor from the responsibility of damages caused by the lack of erosion control growth.

    a. The Contractor shall reseed and remulch as hereinafter specified in areas in which an established stand of grass is not obtained at no additional cost to the Owner. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger than 12 inches do not occur. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area.

I. Mulching (Item No.EC-9): In areas shown in the Plans or as directed by the Engineer, the surface of sprigged and over seeded slopes of the roadway or embankments shall be protected by the application of a mulch. The mulch shall be spread uniformly in a continuous blanket by hand or by suitable approved equipment, at a rate of 2 tons to the acre. Mulching material which, in the opinion of the Engineer, is too coarse or too short for proper securing in the surface soil will be rejected. Mulching shall be started at the windward side of relatively flat areas or at the upper part of a steep slope and continued uniformly over the entire area.

1. The mulch material shall be anchored to the soil by spraying a light coating of emulsified asphalt over the straw or hay after these materials have been placed. The asphalt shall be applied by hand sprayers attached by hoses to an asphalt spreader or other approved methods. The asphalt adhesive shall be applied to the mulch at a rate of 150 gallons of undiluted (straight emulsion) asphalt per ton of straw or hay (300 gallons per acre). When the straight emulsion is further diluted with water in the ratio of 60 (straight emulsion) to 40 (water), the application rate shall be 250 gallons of asphalt emulsion per ton of straw or hay (500 gallons per acre). This will secure the mulch on the ground to form a soil binding mulch and prevent loss or bunching by wind or water.

2. The asphalt adhesive shall be a bituminous soil cover suitable for mulching of seeded areas and shall contain no petroleum solvents or

other diluents which would be toxic to plant growth. Asphaltic adhesive shall be a homogenous emulsification of especially refined petroleum asphalt suitable for spray application with or without dilution with water. Laykoid Soil Cover, manufactured by American Bitumuls and Asphalt Company, or other commercial types of asphalt specifically designed for mulching of seeded areas for erosion protection against rain or wind, will be acceptable. Cost of the item shall be included in unit price bid for mulching.

J. Topsoil (Item No. EC-10): As indicated on the Plans or specifically required in the Specifications, additional good quality topsoil shall be provided by the Contractor within the construction limits. The required topsoil for this item shall be material obtained from an offsite source. Topsoil shall be workable, friable, loamy soil free from hard lumps, stiff clay, gravel, noxious weeds, brush and other deleterious materials. Lime shall be added to reduce the possibility of odor. Topsoil shall be placed in all areas disturbed by construction, prior to grassing. The topsoil shall be placed to the compacted depth specified on the Plans, but shall not, in any case, be placed at a compacted thickness of less than 2 inches.

1. It is intended that the grassing operation shall follow immediately after the placing of topsoil in which case such grassing operation would require satisfactory compaction in order to prevent erosion. In the event that grassing operations are delayed, the layer of topsoil shall be compacted until satisfactory.

2. The Contractor shall maintain the topsoil that has been placed, without extra compensation, in connection with any seeding, sodding, planting, or other work, until final completion of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

K. Erosion Control Netting (Item No. EC-11): Erosion control netting shall be utilized in locations where specifically required by the Engineer and installed in accordance with the Manufacturer's recommendations using ¾ inch x 2-1/2 inch x 12 inch wedge shaped wooden stakes and/or staples.

1. Materials: The netting material shall be Curlex Excelsior Blanket manufactured by American Excelsior Company. Excelsior Blanket manufactured by Erosion Control Systems, Enkamat 7220 manufactured by AKZO, or approved equal.

2. Installation: All surfaces to be protected shall be graded, fertilized, limed, and seeded or sodded, as specified and where shown on the Plans, so as to be stable and firm.

a. Erosion Control netting used as a ditch liner shall be applied with the length of roll laid parallel to the flow of the water. Where a synthetic mat is used and where more than one width is required, a multi-width welded mat shall be supplied in multiples of 3 feet. All lap joints and upslope edges shall be staked at

intervals of 3 feet or less. Where three-wide mat is required, lap joints to be limited to one every nine feet of width.

b. All wood stakes shall be driven to within 2 inches of the ground surface.

c. An anchor slot shall be placed at the upslope and downslope ends of the mat placement. At least 12 inches of the end of the mat shall be buried vertically in a slot dug in the soil. The mat shall be secured in the anchor slot by staples or stakes at intervals of 3 feet or less prior to burying, except when the ditch is located above the erosion control netting, in which case no stakes or staples shall be used in the anchor slot unless 6 inches separation is maintained between the point of the installed stake or staple, and the netting. The soil shall be firmly tamped against the mat in the slot.

d. Successive lengths of netting shall be overlapped at least 3 feet, with the upstream length on top. Stake or staple the overlap in 3 places evenly spaced across the end of each of the overlapping lengths and in 3 places across the width of the center of overlap area. Check slots shall be spaced so that a check slot occurs within 30 feet.

e. Stake or staple the netting in the check slot at each edge overlap and in the center of the mat, except when the ditch is located above the netting, in which case no stakes or staples shall be used in the check slot, unless 6 inches separation is maintained between the point of the installed stake or staple and the synthetic liner. Beginning and terminal ends to be staked in accordance with installation manual.

f. Upslope edges of netting used as ditch lining shall terminate on 4-inch wide horizontal shelves running parallel to the axis of the ditch for the full length of the ditch. Edges of the netting shall be staked at 3-foot intervals, backfilled with soil, and tamped to original slope.

g. Erosion control netting damaged by the Contractor during installation shall be repaired immediately.

h. The Contractor shall maintain the netting until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damaged by any cause.

L. Solid Sod (Item No. EC-12)

1. Materials: Solid sod may be obtained from any sod producer specializing in sod production harvesting with a minimum of three years experience. The sod shall be St. Augustine or Centipede and shall be placed as suitable growing conditions may require. The sod shall be live,

fresh growing grass, free of weeds and rocks. Solid sod removed from construction site and preserved during construction may be used with the Engineer's approval.

2. Preparation: The Contractor shall prepare the subsoil to a sufficiently loose or pulverized condition and all uneven areas and low spots shall be eliminated prior to planting. All foreign materials and undesirable plants and their roots must be removed from the area. Topsoil shall be spread to a minimum depth of 2 inches over the area to be sodded. Areas to be sodded must be fertilized initially with agricultural limestone and with the type of fertilizer recommended by the sod provider for either Centipede or St. Augustine grass. The fertilizer shall be distributed into the planting areas by approved methods to a depth of at least 2 inches. If the soil is dry, water shall be applied until it is in a workable condition. Immediately following this, the sod shall be placed.

3. Laying Sod: Moisten prepared surface immediately prior to laying sod. To prevent deterioration the sod shall be planted within three days from the time of harvesting.

    a. However, should inclement weather alter this procedure, the grass may be kept in temporary storage if the sod is spread out in a shaded area with the grass side up and kept moist. Any sod allowed by the Contractor to dry out shall be rejected and no payment for such sod will be made.

    b. The sod shall be placed on the prepared surface tightly with no open joints visible and no overlapping. The sod shall be smooth and align with adjoining grassed areas. After installation is complete, the newly sodded areas shall be tamped in place in a satisfactory manner and watered as necessary to enhance growth.

4. Maintenance: The Contractor shall mow grass at regular intervals to maintain a maximum height of 2-1/2 inches. The edges will be neatly trimmed and clipped where necessary. Immediately after mowing and trimming all clippings shall be removed. Watering of the sodded areas shall be applied in the form of a spray or sprinkle, without erosive force in sufficient amounts that will keep the sod in a living and growing condition.

    a. The application of herbicides in accordance with manufacturer's instructions shall be applied for weed control. All sod showing deterioration or bare spots shall be replaced by the Contractor without additional compensation. Additional fertilizer shall be applied after the sod has shown growth (usually approximately forty days).

    b. The Contractor shall be responsible for satisfactory growth of the grass until final acceptance of the sod. Should a grassing bond be required for a particular project, the sod shall be covered under the same terms as the grassing.

5. Acceptance: Acceptance of sodded areas will be based on verification of the establishment of a well knitted, living, growing sod covering the areas designated to be sodded. If an acceptable stand of living and growing sod is not obtained, the area shall be re-sodded at no additional cost to the Owner.

M. Riprap (Item No. EC-13): All stone for riprap shall consist of rough unhewn quarry stone as nearly rectangular in section as practicable. The stone shall be resistant to the action of air, temperature changes, and water. The stone shall be sound and dense, and suitable in all other respects, for the purpose intended. The stone shall be a well-graded mixture with individual classified stones ranging in weight in accordance with Section 814 of the Alabama Department of Transportation Standard Specifications, latest edition.

1. Riprap shall be placed in a manner as to ensure that the larger pieces are distributed uniformly and that the smaller pieces will fill the spaces between the larger pieces. After placing, the riprap shall present a reasonably smooth surface to the thickness shown on the Plans.

N. Filter Blanket for Riprap (Item No. EC-14): Where indicated on the Plans or directed by the Engineer, a filter blanket of crushed stone or a geotextile filter fabric shall be placed as a bed for riprap. Crushed stone and geotextile filter fabric shall be as specified in this Section.

1. Crushed Slag or Crushed Stone: Crushed slag or crushed stone shall be screened, washed and shall be 100 percent retained by a ¼ inch screen. One hundred percent shall pass a 1-1/2 inch opening and shall be uniformly graded from maximum size to minimum size. Foreign matter shall not exceed 3 percent by weight when dry.

2. Geotextile: Geotextile filter blanket shall be Terratex GS or approved equal and shall be installed in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

O. Riprap Gabions (Item No. EC-15): The work under this section consists of furnishing, assembling, typing and filling with approved stones, open mesh wire baskets, constructed in accordance with these Specifications, manufactured by either Maccaferri Gabions, Inc. or Modular Gabion Systems; and placed in reasonably close conformity to the lines, grades, and dimensions shown on the Plans or directed by the Engineer. Other work specified in this section shall include, placing stone (specified for gabion baskets) in the irregular shaped void areas of the ditch between gabions and grouting them.

1. Material:

a. Stone Fill – Stone used in the gabions shall be sound and durable, from any source approved by the Engineer. No stone shall be less than four inches, minimum dimension, nor greater than eight inches. The stone shall be crushed and shall be reasonably well graded between the limiting sizes.

b. Baskets – PVC coated galvanized steel wire gabion basket units shall be of non-raveling construction, fabricated from a triple-twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.105 inches after galvanization; and additionally, shall be coated with a minimum of 0.020 inches of PVC. The steel wire used shall be galvanized and PVC coated prior to fabrication into mesh. The core wire of all gabion diaphragm and frame components shall equal or exceed Fed. Spec. QQ-W-461H, possess medium tensile strength and Finish 5 Class 3 zinc coating of not less than 0.80 oz/sq.ft. of uncoated wire surface. Mesh openings shall be hexagonal in shape and uniform in size, measuring not more than 3-1/4 inches by 4-1/2 inches. Coated wire used for lacing or as internal connecting wire within gabion cells may be of soft tensile strength and an overall diameter (core wire plus PVC coating) of 0.127 inches. The PVC coated wire of all gabion components shall be resistant to the destructive effect of immersion in acidic, salt, or polluted water, exposure to ultraviolet light and abrasion, and retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM Test Designation G-23.

i. Gabions shall be fabricated in such a manner that the sides, ends, lid and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified by the Plans. Gabions shall be of single unit construction. The base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

ii. Where the length of the gabion exceeds its horizontal width, the gabion shall be equally divided by diaphragms of the same mesh and gauge as the body of the gabions, into cells whose length does not exceed the horizontal width. The diaphragms shall be secured into proper position on the base in such a manner that no additional tying at this junction will be necessary.

iii. The field connections between adjacent wire baskets shall be made as recommended by the manufacturer and shall develop a connection strong enough that the failure under test shall occur in the mesh rather than the lacing.

Table for Minimum Strength of Gabion Baskets

Min. Strength	# Linear Feet
Wire mesh pulled parallel to wire test	3,400
Wire mesh pulled perpendicular to wire test	1,000
Connection of selvedge wire to mesh	2,200
Connection of end panels to gabion mesh	1,500

iv. The gabions shall be supplied in the various sizes shown on the Plans and shall be shipped flat. The gabion dimensions are subject to a tolerance limit of ± 3% of the specified sizes. All gabion baskets shall have a width of 3.0 feet; heights of 3.0 feet, 1.5 and 1.0 feet; and lengths of 6.0 feet, 9.0 feet or 12.0 feet.

v. Each shipment of gabions to a job site shall be accompanied by a certification, on company letterhead, and signed by an officer of the company, which states that the material conforms to the requirements of the Contract Specifications.

c. Grout - Grout shall consist of Portland cement concrete. Concrete shall conform to the requirements of ASTM G94 and shall have a minimum compressive strength of 3,000 psi, a maximum nominal aggregate size of ¾ inch, and sufficient admixture to provide from 5 to 7 percent entrained air. At the Contractor's option, a water-reducing admixture, proportioned as per the manufacturer's recommendation, may be used to increase the penetration of the grout. The grout shall be designed to produce a mixture having a consistency such as to permit gravity flow into the interstices of the stone-filled gabion baskets with the help of limited brooming and vibrating.

i. The grout shall be used in the work within a period of one (1) hour after mixing. Retempering of grout will not be permitted. Gabion baskets shall not be grouted when the ambient temperature is below 35 degrees F. or above 89 degrees F., unless approved by the Engineer in writing; nor when the grout, without special preparation, is likely to be subjected to freezing temperatures before final set has occurred. Prior to grouting, all surfaces of gabion baskets shall be wetted.

ii. The gabion baskets shall be grouted in successive longitudinal strips, approximately ten (10) feet in length, commencing at the furthest in-channel edge and working back towards the top-of-bank. Each batch of grout shall be dumped onto the ungrouted part of the strip and worked into the voids between the stones. Grout shall be brought to the place of final deposit by approved means, and in no case will grout be permitted to flow on the gabion basket surface a distance in excess of ten (10) feet.

iii. Immediately after dumping the batch of grout, it shall be distributed over the surface of the strip by the use of brooms, and the grout worked into place between stones with suitable spades, trowels or vibrating equipment.

The grout shall penetrate the gabion basket surface to provide a cap having a thickness of not less than six (6) inches. As a final operation, a stiff stable broom shall be used to give the grout cap a broomed finish; however, the wire of the gabion shall not be uncovered during the finishing operation.

iv. After completion of any strip as specified, no workman or any load shall be permitted on the grouted surface for at least twenty-four (24) hours. The surface of all grouted gabion baskets shall be cured by keeping the surface continuously wet for a period of not less than seven (7) days, during which time the ground surface shall also be protected from flowing water and mechanical injury.

2. Construction Requirements:

a. Foundation Material – Foundation material shall be spread in-the-dry, uniformly on nonwoven plastic filter fabric within the limits and to thicknesses shown on the drawings, or as directed in the field by the Engineer, to form a backing for the gabions. A tolerance of ± one (1) inch from the full depth shown on the drawings will be allowed on the finished surface of the bedding layer, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Placing of bedding material by methods which will tend to segregate particle sizes will not be permitted. Any damage to the filter fabric or prepared foundation surface during bedding placement shall be repaired before proceeding with the work. Compaction of the bedding material will not be required, but it shall be finished to present a reasonably even surface free from mounds, windrows or depressions.

b. Gabion Assembly and Installation – Gabion baskets shall be assembled in such a manner that the sides, ends, lids and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the drawings. Gabions shall be of single unit construction, i.e., the base, lid, ends and sides shall be either woven into a single unit or one edge of these members connected to the base section in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

i. Gabions shall be divided into cells by diaphragms of the same mesh and gauge as the gabion body. Diaphragms shall be placed at three (3) foot nominal spacings in the long direction and shall extend the full width and height of the basket. The gabions shall be furnished with the necessary diaphragms secured in proper position on the

base in such a manner that no additional tying at this junction will be necessary.

ii. All perimeter edges of the mesh forming the gabion shall be securely selvedged so that the joints formed by tying the selvedges have at least the same strength as the body of the mesh. Lacing wire or connecting wire shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

iii. Empty gabion baskets shall be installed according to manufacturer's recommendations and to the details of the Plans. They shall be individually placed in-the-dry on the approved surface to the lines and grades as shown on the drawings or as directed by the Engineer, with the sides, ends and diaphragms erected in a manner that will insure the correct position of all creases and that the tops of all sides are level. All adjoining empty gabion units must be connected by tie wire lacing along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches. All lacing wire terminals shall be securely fastened. The use of clip connections for this purpose and for final lid closing will not be permitted.

iv. The initial line of basket units shall be placed on the prepared bedding layer surface in a direction parallel to stream flow, unless otherwise shown on the drawings, and shall be partially filled with stones by hand to provide anchorage against deformation and displacement during the remainder of the filling operation. After adjoining empty basket units are set to the line and grade, and common sides with adjacent units thoroughly laced, they shall be placed in tension and stretched to remove any kinks from the mesh and to obtain a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling.

v. Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage any galvanized or PVC wire coating, to assure a minimum of voids between the stones, and to assure the maintenance of alignment throughout the filling process. Undue bulging of the mesh shall be avoided. To avoid localized deformation, the gabion units in any row are to be filled in stages consisting of maximum twelve (12) inch courses, and at no time shall any cell be filled to a depth exceeding one (1) foot more than any adjoining

cell. The maximum height from which the stone may be dropped into the gabion units shall be thirty-six (36) inches. For gabion units in excess of two (2) feet in thickness, a minimum of two (2) uniformly spaced connecting wires shall be placed between each stone layer in all cells, connecting compartment faces across the short dimension of the cells. Connecting wires shall be looped around one (1) mesh opening at each basket face and the wire terminals shall be securely twisted to prevent their loosening.

vi. Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to insure a neat and compact appearance. The last layer of stone shall be leveled with the top of the gabion basket to allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Units that become damaged due to placing operations shall be replaced by the Contractor at no additional expense to the Owner. Lids shall be stretched tight over the stone filling using crowbars or lid closing tools, until the lid meets the perimeter edges of the front end panels. The lid shall then be tightly laced with tie wire along all edges, ends and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches. Special attention shall be given to see that all projections or wire ends are turned into the baskets.

vii. Where shown on the drawings, or as directed by the Engineer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely or folded back and neatly wired to an adjacent basket face. The assembling, installation, filling, lid closing and lacing of the reshaped gabion basket units shall be carried out as specified above.

c. Grouted Gabions – Gabions installed as specified herein shall be grouted in areas indicated on the drawings. All grouting of gabions shall be done in-the-dry. Stone for grouted gabion baskets shall conform to the requirements specified hereinbefore. The stone shall be placed in conformance with the general requirements for ungrouted gabion basket units as specified hereinbefore. The Contractor shall take special care to maintain the surface of the gabion units free from becoming choked with any material, such as spilled bedding material, until grouted, so as not to hamper the penetration of the grout. When such choking does occur, the Contractor shall remove the

contaminating material to a minimum depth of 6 inches prior to grouting.

d. Stone – Filled Voids –Irregular shaped areas in the ditch bottom or sides not conforming to an area that will accommodate a gabion basket as shown in the Plans as "stone filled voids" shall be filled with stones in the manner specified for gabion and grouted.

P. Timber Ditch Checks (Item EC-16): Timber ditch checks shall be 2" x 6" rough cut untreated timber and shall be installed as shown on the Erosion Control Details plan sheet.

Q. Temporary Sedimentation Basin (Item No. EC-17): A temporary sedimentation basin is a settling pond with a controlled stormwater release structure used to collect and store sediment produced by construction activities. The purpose of the sedimentation basin is to eliminate transport of sediments off of the construction site during storm events or any events in which stormwater may carry sediments off site.

1. The sedimentation basin shall be constructed before clearing and grading is undertaken and shall be constructed to the dimensions shown on the Plans. The embankment forming the berm shall be well-compacted and stabilized with vegetation. The sedimentation basin shall remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place.

2. The Contractor shall maintain access to the sedimentation basin for periodic maintenance and sediment removal. Basins shall be inspected by the Contractor after each rainfall event and shall be cleaned out when half the stormwater storage capacity volume has been filled with sediment.

16.1.07 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

A. The unit price bid for the various items shall be compensation in full for furnishing, installing, and maintaining each item, complete in place, including all materials, labor, equipment, and incidentals necessary for the completion of the item.

1. **EC-1** **<u>Erosion Control Plan:</u>** The lump sum price bid for this item shall be compensation in full for furnishing and modifying, as required, a complete Erosion Control Plan. Payment shall be made upon approval of the Erosion Control Plan by the Engineer.

2. **EC-2** **<u>Temporary Grassing for Erosion Control:</u>** The unit price for this item shall be compensation in full for one (1) acre of temporary grassing for erosion control complete in place including maintenance until the permanent grassing is installed. Measurement will be made to the nearest tenth of an acre of the area within the project limits actually grassed.

3. **EC-3** **<u>Silt Fence:</u>** The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) linear foot of the type of silt fence specified i.e., Type A or B, properly installed for temporary erosion control.

4. **EC-4** **<u>Hay Bales:</u>** The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) each hay bale properly installed for temporary erosion control.

5. **EC-5** **<u>Temporary Steel Sheet Pile for Erosion Control:</u>** The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) square foot of Temporary Steel Sheet Piling. The sheet pile installation shall be made to the depth and width indicated on the Plans. Payment shall be made for actual square footage installed by the Contractor. Mobilization, equipment, materials, etc. shall be considered subsidiary obligations of this item and no additional compensation shall be provided.

6. **EC-6** **<u>Turbidity Barriers:</u>** The unit price for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) linear foot of turbidity barrier properly installed for erosion control and for reducing the turbidity in adjacent water courses.

7. **EC-7** **<u>Clearing and Grubbing:</u>** Where specified on the construction plans, the unit price bid for this item will be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to perform one (1) acre of clearing and grubbing of project limits as described in Section 16.1.06.G. Measurement will be made to the nearest tenth of an acre of the area within the project limits actually cleared and grubbed. Removal and hauling of debris from site shall be considered a subsidiary obligation of this item, and no additional compensation will be provided.

8. **EC-8** **<u>Final Grassing for Erosion Control:</u>** The unit price bid for this item shall be compensation in full for one (1) acre of grassing for erosion control complete in place including ground preparation, fertilizing, seeding and maintenance. Measurement will be made to the nearest tenth of an acre of the area actually grassed except that grassing areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.

9. **EC-9** **<u>Mulching:</u>** The unit price bid for this item shall be compensation in full for one (1) acre of mulching complete in place. Measurement will be made to the nearest tenth of an acre of the area actually mulched except that mulching of areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.

10. **EC-10** **<u>Topsoil:</u>** The unit price bid for this item shall be compensation in full for furnishing, hauling, spreading, shaping and compacting in its

final position one (1) cubic yard of acceptable topsoil ready for incorporating fertilizer and seed, and for furnishing all equipment, tools, labor and incidentals necessary to complete the work. Measurement of the topsoil shall be made per cubic yard, loose measure, in the delivery vehicle at the point of delivery to the project.

11. **EC-11** **Erosion Control Netting:** The unit price bid for this item will be compensation in full for furnishing and properly installing one (1) square yard of erosion control netting, including all materials, equipment, tools, labor, and incidentals required to complete the item.

12. **EC-12** **Solid Sod:** The unit price bid for this item shall be compensation in full for one (1) square yard of solid sod properly installed and maintained where specified for erosion control.

13. **EC-13** **Riprap:** The unit price bid for this item shall be compensation in full for one (1) square yard, one (1) foot in thickness, of the specified riprap classification complete in place i.e., Class 1, 2, etc. Where depths greater than one (1) foot are shown on the Plans or directed the quantity to be paid for will be increased in the proportions that the thickness bears to one (1) foot i.e., if thickness is 1.5 feet, then the surface area will be multiplied by 1.5 to determine the quantity to be paid.

14. **EC-14** **Filter Blanket for Riprap:** The unit price bid for this item shall be compensation in full for all labor, materials, equipment, and incidentals necessary for the installation of one (1) square yard of filter blanket for riprap complete in place. For crushed stone filter blankets, payment shall be for one (1) square yard of filter blanket complete in place with a thickness of at least 6 inches.

15. **EC-15** **Riprap Gabions:** The unit price bid for this item shall be compensation in full for all labor, materials (including wire mesh and stone), equipment, tools, and incidentals necessary for the installation of one (1) cubic yard of wire-mesh, stone filled gabion or stone-filled voids complete in place.

16. **EC-16** **Timber Ditch Checks:** The unit price bid for this item shall be compensation in full for one (1) each timber ditch check as detailed, complete in place.

17. **EC-17** **Temporary Sedimentation Basin:** The lump sum price bid for this item shall be compensation in full for furnishing all equipment, installing complete in place, maintaining, and removing (if required) one temporary sedimentation basin as shown on the Plans and described in the Specifications. Mobilization, equipment, materials, etc., shall be considered subsidiary obligations of this item and no additional compensation shall be provided.

B. Partial Payment – A percentage of the unit price bid shall be payable in accordance with the following schedule:

1. After the temporary sedimentation basin has been constructed and accepted, 50 percent of the lump sum price bid for the temporary sedimentation basin will be paid.

2. When 50 percent of the original Contract amount is earned, including any payment previously made for the item of temporary sedimentation basin is earned, an additional 25 percent of the lump sum price bid for the temporary sedimentation basin will be paid.

3. Upon completion of all work of the project, payment of the remaining 25 percent of the lump sum price bid for the temporary sedimentation basin will be paid.

C. The sum of all payments shall not exceed the original contract amount bid for the item of temporary sedimentation basin, regardless of the fact that the Contractor may have, for various reasons, cleaned or otherwise maintained the sedimentation basin on as many occasions as required by the Specifications or by the Engineer to properly maintain the capacity of the basin.

END OF SECTION