

SECTION 312500

EROSION AND SEDIMENTATION CONTROLS

PART 1-GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Control measures to prevent all erosion, siltation, and sedimentation of wetlands, waterways, construction areas, adjacent areas and off-site areas.
 - 2. Control measures shall be accomplished adjacent to or in the following work areas:
 - a. Soil stockpiles and on-site storage and staging areas.
 - b. Cut and fill slopes and other stripped and graded areas.
 - c. Constructed and existing swales and ditches.
 - d. Retention ponds.
 - e. At edge of wetlands areas, if applicable, as shown on Drawings.
 - 3. The Contract Drawings indicate the minimum requirements for erosion and sedimentation control. The Contractor shall install all measures needed to control erosion and sediment as required by the Contractor and Sub-contractor's construction methods and operations, the weather conditions, and as directed by the Engineer.
 - 4. Additional means of protection shall be provided by the Contractor as required for continued or unforeseen erosion problems, at no additional cost to the Owner.
 - 5. Periodic maintenance of all sediment control structures shall be provided to ensure intended purpose is accomplished. Sediment control measures shall be in working condition at the end of each day.
 - 6. After any significant rainfall, sediment control structures shall be inspected for integrity. Any damaged device shall be corrected immediately.
- B. Alternates: Not Applicable.
- C. Items to Be Installed Only: Not Applicable.
- D. Items to Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 311000 – SITE CLEARING for protection of existing trees and other vegetation to remain.

2. Section 312000 – EARTH MOVING for soil materials, excavating, backfilling, and site grading and removal of site utilities.

1.3 SUBMITTALS

- A. Refer to Section 013300 – SUBMITTAL PROCEDURES, for submittal provisions and procedures.

At least 20 days prior to the start of the project, the Contractor shall submit an Appendix by a qualified person to the Draft Stormwater Pollution Prevention Plan (SWPPP) indicating project phasing, Contractor operation areas, work areas, stockpile locations, construction staging/sequencing, and sedimentation and erosion control measures to be used. This Appendix shall become part of the SWPPP that is to be updated and maintained by the Contractor.

1. As part of the Contract Closeout procedures, the Contractor is responsible for filing a Notice of Termination with the EPA once the project has been completed and is permanently stabilized. Stabilization is complete when all temporary storm water and erosion controls have been removed, all permanent storm water and erosion controls are in place and functional and all vegetated areas are at least 70% viable.
2. The Contractor shall provide the manufacturer's literature, material specification, and installation instructions for sedimentation and erosion control materials and devices for approval. Do not order materials until approval of certifications or test results has been obtained. Delivered materials shall match the approved submittals.
3. LEED Submittals: Submit LEED supporting documentation as outlined in Section 018110 SUSTAINABLE DESIGN REQUIREMENTS for materials and products that have been extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site.

1.4 QUALITY ASSURANCE

- A. When applicable, comply with the requirements of Stormwater Pollution Prevention Plan prepared for the NPDES permit, which are incorporated herein by reference, and all other applicable requirements of governing authorities having jurisdiction. The specifications and drawings are not represented as being comprehensive, but rather convey the intent to provide complete slope protection and erosion control for both the project site and adjacent property.
 1. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.
- C. The Contractor shall install and maintain sedimentation control devices during construction to prevent the movement of sediment from the construction site to off site areas, into adjacent water bodies via surface runoff or into underground drainage

systems. Measures to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at no additional cost to the Owner.

- D. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.
- E. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.
- F. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.
- G. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.
- H. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.
- I. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- J. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

1.5 REFERENCE STANDARDS

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
 - 1. "Massachusetts Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials", prepared by the Massachusetts Department of Environmental Protection, Bureau of Resource Protection, dated March 1997, reprinted May 2003.
 - 2. United States Environmental Protection's (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit for Stormwater Discharges from Construction Activities (CGP).

1.6 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for themselves during the bidding period and formed their own conclusions as to the full requirements of the work involved.

1.7 PERMITS, CODES, AND REGULATIONS

- A. Comply with all rules, regulations, laws, and ordinances of the City and State, and all other authorities having jurisdiction over the project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner.
- B. Comply with all applicable regulations of the Commonwealth of Massachusetts Department of Environmental Protection (DEP) and the EPA.
- C. Comply with all conditions in the Order of Condition permit for this work as issued by the City of Fitchburg Conservation Commission.
- D. The Contractor shall comply with the requirements of the NPDES CGP for this project.

1.8 STORM WATER POLLUTION PREVENTION PLAN

- A. A professional engineer has prepared a Draft Storm Water Pollution Prevention Plan (SWPPP). The Contractor shall locate the SWPPP and review its contents thoroughly. Upon the award of the Contract, the Contractor becomes responsible for implementing the SWPPP and meeting the requirements and standards detailed within the SWPPP. The Contractor is also responsible for all record keeping associated with maintaining the SWPPP and for maintaining in good operating condition all SWPPP controls. The Contractor shall modify the SWPPP as necessary to reflect changes in project scope, schedule, or approach. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner.
- B. The Contractor shall fill out all pertinent information within the SWPPP.
- C. The Contractor shall locate the EPA “Notice of Intent for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY Under a NPDES General Permit” (NOI) form in the SWPPP. The Contractor is responsible for signing and filing his copy of the NOI at least 14 calendar days prior to the start of any construction activity and placing a signed copy along with proof of mailing in the SWPPP.
- D. The Contractor is responsible for obtaining a copy of the Owner’s filed copy of the NOI form and proof of mailing and placing it in the SWPPP.
- E. The Contractor is responsible for filling in the Contractor and Sub-Contractor information in the areas indicated within the SWPPP and for completing the Contractor’s Certification portion of the SWPPP.
- F. The Contractor is responsible for maintaining the following records on site:
 - 1. Completed SWPPP as indicated in sections B, C, D, and E.
 - 2. Completed Inspection Reports
 - 3. Completed Maintenance Reports
 - 4. Construction Activity Reports
 - 5. Spill Records
 - 6. Other Materials relevant to the NOI Permit and SWPPP

7. A copy of the Notice of Termination
- G. The Contractor is responsible for filing a Notice of Termination once the project has been completed and is permanently stabilized. Stabilization is complete when all temporary storm water and erosion controls have been removed, all permanent storm water and erosion controls are in place and functional and all vegetated areas are at least 70% viable.
- H. All labor, materials, equipment, and services necessary to make the work comply with the above requirements shall be provided by the Contractor without additional cost to the Owner.

PART 2-PRODUCTS

2.1 MATERIALS

- A. Straw Bales: Wire or nylon bound bales of straw, oriented around sides, rather than over and under.
- B. Stakes: Stakes for bales shall be one of the following materials: Wood stakes of sound hardwood 2 in. x 2 in. in size or steel reinforcing bars of at least No. 4 size. Lengths shall be approximately three feet.
- C. Straw Wattles
 1. Straw wattles shall consist of weed free rice straw inside biodegradable netting. Straw wattles shall measure at least 9 inches in diameter.
 2. Stakes for wattles shall be one of the following materials. Lengths shall be approximately two feet.
 - a. Wood stakes of sound hardwood, 1 in. x 1 in. in size.
 - b. Steel reinforcing bars of at least No. 4 size.
- D. Siltation Fence
 1. Fabricated or prefabricated unit consisting of the following filter fabric properties:

a. Grab Tensile Strength (lbs)	124	ASTM D4632
b. Elongation at Failure (%)	15	ASTM D4632
c. Mullen Burst Strength (PSI)	280-300	ASTM D3786
d. Puncture Strength (lbs)	60-65	ASTM D4833
e. Water Flow Rate (gal/min/sf)	8-10	ASTM D4491
f. Apparent Opening Size (Sieve)	30	ASTM D4751
g. Ultraviolet Radiation Stability (%)	70-80	ASTM D4355
 2. Use only commercially available fabric that is certified in writing by the manufacturer for the purpose intended.
 3. Acceptable fabric materials include "Mirafi Envirofence" by Mirafi Construction Products, "Style 2130" by Amoco Fabrics Co., and "IVI 3617C Silt Fence" by Indian Valley Industries, Inc., or approved equal by the Engineer.
 4. Silt fence posts: Posts may be wood or metal. Wood post shall be a minimum 1¼ inch by 1¼ inch by 5 feet long hardwood stakes commonly used to support siltation

fabric. Metal posts shall be a minimum of 1 inch wide and 5 feet long. Posts shall be spaced at a maximum distance of 8 feet on center.

5. Provide suitable heavy nylon cord for securing abutting silt fence posts.
- E. Fencing: Steel posts shall be standard 6-foot long metal stamped drive stakes commonly used to support snow fences. Fencing shall be new four-foot height wood lath snow fencing. Provide suitable steel staples or heavy nylon cord for securing filter cloth to support system.
- F. Crushed Stone: Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Percent Passing by Weight		
Sieve Size	1 Stone	1/2-inch Stone
2-inch	100	---
1 1/2-inch	95-100	---
1 1/4-inch	---	---
1-inch	35-70	100
3/4-inch	0-25	90-100
1/2-inch	---	10-50
3/8-inch	---	0-20
No. 4	---	0-5

- G. Protective Measures: As temporary coverings on ground areas subject to erosion, provide one of the following protective measures, and as directed by the Designer with concurrence of the Owner's Representative:
1. Hay or straw temporary mulch, 100 pounds per 1,000 square feet.
 2. Wood fiber cellulose temporary mulch, 35 pounds per 1,000 square feet.
 3. Tackifier for anchoring mulch or straw shall be a non-petroleum based liquid bonding agent specifically made for anchoring hay or straw.
 4. Provide natural (jute, wood excelsior) or man-made (glass fiber) covering with suitable staples or anchors to secure to ground surface. Note that wire staples and non-biodegradable coverings shall not be used for any area that will be mown turf.
 5. Temporary vegetative cover for graded areas shall be undamaged, air dry threshed straw or hay free of undesirable weed seed.
- H. Temporary Covers for Drainage Structures
1. Filter fabric for use as temporary covers for drainage structures shall be the same as noted above for siltation fence.
 2. Wire mesh for use at temporary drainage structure covers shall be 6 in. x 6 in., W2.9 welded wire mesh.
 3. Crushed stone shall be as specified herein before.

4. Silt-Sac, Hydro-FloGard + Plus Catch Basin Insert, Ultra-DrainGuard Insert, or approved equal, may be used in lieu of hay bales and filter fabric at catch basins.

PART 3-EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The Contractor shall provide suitable and adequate means of sedimentation and erosion control during construction. Control measures shall prevent all erosion, siltation, and sedimentation of waterways, drainage systems, construction areas, adjacent areas and off-site areas. Work shall be accomplished on and/or adjacent to the following work areas:
 1. Earthwork stockpiles and on-site storage and staging areas.
 2. Cut and fill slopes and other stripped and exposed graded areas.
 3. Constructed and existing swales and ditches.
 4. Unestablished lawns and seeded embankments.
- B. Means of protection as noted on the Contract Drawings indicate the minimum provisions necessary. Additional means of protection shall be provided by the Contractor as required for continued or unforeseen erosion problems, at no additional cost to the Owner.
- C. Periodic maintenance of all sediment control installations shall be provided to ensure intended purposes are accomplished. Sediment control measures shall be in working condition at the end of each day.
- D. After any significant rainfall, sediment control devices shall be inspected for integrity. Any damaged device shall be corrected immediately.
- E. The Contractor shall provide adequate means of control of runoff, as to not detrimentally impact downstream conditions during construction. The Contractor shall plan his operations so that permanent drainage mitigation systems such as detention/retention/infiltration basins and chambers are in place and properly functioning prior to connecting upland drainage flows to these systems. The Contractor shall plan his operations such that downstream drainage mitigation measures are in place and functioning before attempting to tie in upgradient drainage systems.
- F. In the event that the Contractor is unable to sequence the work so that construction of the permanent drainage mitigation systems precedes the upland work, then the Contractor shall submit a plan indicating his proposed methods of otherwise controlling runoff from the site.
- G. The "Massachusetts Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas" should be consulted as a guide for the selection and installation of Best Management Practices to suit the conditions encountered.

3.2 STRAW BALE BARRIERS

- A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches.

- B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale to a minimum depth of 18 inches.
- D. The gaps between bales shall be filled by wedging straw in the gaps to prevent water from escaping between the bales.
- E. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 in. on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.
- F. Inspection shall be frequent and repair or replacement shall be made promptly as needed.
- G. Bales shall be removed when they have served their usefulness so as not to block or impede stormwater flows or drainage.

3.3 STRAW WATTLE BARRIERS

- A. Install straw wattles as indicated on Contract Drawings and as directed.
 - 1. Wattles shall be placed in a row with ends overlapping a minimum of two feet.
 - 2. Each wattle shall be embedded in the soil a minimum of two inches and a maximum of six inches.
 - 3. Wattles shall be securely anchored in place by stakes or rebars driven through the wattles and a minimum 12 inches into the soil. Stakes shall be placed four feet on center.
- B. Inspection shall be frequent and repair or replacement shall be made as needed.
- C. Wattles shall be removed when they have served their usefulness so as not to block or impede stormwater flows or drainage.

3.4 STABILIZED CONSTRUCTION ENTRANCE AND STONE BERMS

- A. Stone size: Use ASTM designation C-33, size No. 2 (1-1/2" to 2-1/2"). Use crushed stone.
- B. Length: As effective, but not less than 50 feet.
- C. Thickness: Not less than eight inches.
- D. Width: Not less than full width of all points of ingress or egress, but not less than 25 feet.
- E. Washing: When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through the use of sand bags, gravel boards or other approved methods.

- F. Maintenance: The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spoiled, dropped, washed or tracked onto public rights-of-way must be removed immediately.
- G. Place crushed stone berms in locations required and as directed. Berms shall have side slopes of 1:3 or less.
- H. Inspect stone berms periodically and replace and/or regrade crushed stone as required.

3.5 SILT FENCING

- A. Excavate a 6-inch trench along the upstream side of the desired fence location.
- B. Drive fence posts a minimum of 1'-6" into the ground. Install fence, well-staked at maximum eight-foot intervals in locations as shown on Drawings. Secure fabric to fence and bury fabric end within the six-inch deep trench cut.
- C. Lay lower 12 inches of silt fence into the trench, 6 inches deep and 6 inches wide. Backfill trench and compact.
- D. Overlap joints in fabric at post to prevent leakage of silt at seam.
- E. Inspect siltation fence after major storm events and periodically and remove accumulated sediment and debris. If a breach or failure of the siltation fence occurs, the fence shall immediately be restored.

3.6 EROSION CONTROL GRASSING

- A. Grassing shall be applied according to the Massachusetts Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials.

3.7 INLET PROTECTION

- A. Install silt fence or straw bales around inlet as specified herein.
- B. Install temporary covers at drainage structure locations that may be subject to erosion infiltration and as directed by the Engineer.
- C. Inspect drainage structures periodically. Remove sediment accumulation and regrade or replace materials as required.

3.8 DUST CONTROL

- A. Throughout the construction period the Contractor shall carry on an active program for the control of fugitive dust within all site construction zones, or areas disturbed as a result of construction. Control methods shall include the following: Apply calcium chloride at a uniform rate of one and one-half pounds per square yard in areas subject to blowing. For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the contractor.

- B. The frequency and methods of application for fugitive dust control shall be as directed by the Designer with concurrence by the Owner's Representative.

3.9 TEMPORARY PROTECTIVE COVERINGS

- A. Place temporary soil coverings to control erosion and sedimentation on all disturbed or graded areas as required by the construction methods employed and as directed by the Engineer. Erosion control matting shall be installed in all areas seeded or hydroseeded with slopes of one vertical foot to three-foot horizontal, or steeper, immediately after such areas have been seeded and a hay mulch applied as follows:
 1. The area to receive matting shall have been recently seeded and shall have a smooth surface free from stones, clods or depressions.
 2. Roll out of the matting perpendicular to the slope, do not stretch the fabric. In drainage swales, center the fabric along the flow line. Install the matting in a check slot at the top and bottom of the slope and at the edges of the area to be covered. Check slots shall be six inches deep and six inches wide. Fabric shall extend down one wall of the check slot and across the full width of the base. Overlap edges of matting rolls four inches minimum and overlap the ends 18 inches minimum.
 3. Install staples in check slots, edges, center, and ends of rolls by driving specified steel staples two feet on center over the entire area to be covered except at check slots and ends of rolls, where staples shall be placed six inches on center. All staples shall be driven below finished grade.
 4. Fill check slots with loam and tamp firmly.
 5. Reseed check slots and all disturbed areas per Specifications.
 6. Following matting installation, roll the entire area with a smooth drum roller weighing between 50-75 pounds per linear foot of roller. The finished installation of matting shall be firmly in contact with the seeded area and provide a smooth, finished appearance free from lumps or depressions.
- B. Install erosion control matting as a temporary ground cover in all disturbed or graded areas subject to erosion and as directed by the Engineer. The temporary ground cover shall protect the site from erosion until a full permanent lawn can be installed. Install and anchor in place temporary erosion control matting in accordance with manufacturer's printed instructions or as directed by the Engineer and remove all temporary erosion control matting prior to installation of a permanent lawn.
- C. Inspect protective coverings periodically and reset or replace materials as required.

3.10 TEMPORARY PROTECTIVE COVERINGS (AFTER GROWING SEASON)

- A. Place temporary covering for erosion and sedimentation control on all areas that have been graded and left exposed after October 30. Contractor shall have the choice to use either or both of the methods described herein.
- B. Hay or straw shall be anchored in-place by one of the following methods and as approved by the Designer with concurrence by the Owner's Representative: Mechanical "crimping" with a tractor drawn device specifically devised to cut mulch into top two inches of soil surface or application of non-petroleum based liquid tackifier, applied at a rate and in accordance with manufacturer's instructions for specific mulch material utilized.

- C. Placement of mesh or blanket matting and anchoring in place shall be in accordance with manufacturer's printed instructions.
- D. Inspect protective coverings periodically and reset or replace materials as required.

3.11 REMOVAL AND FINAL CLEANUP

- A. Once the site has been fully stabilized against erosion, and with the approval of the Owner's Representative remove sediment control devices and all accumulated silt. Dispose of silt and waste materials offsite. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated.

END OF SECTION