SECTION 622 -- BOUNDS

Description

1.1 This work shall consist of furnishing and erecting bounds in accordance with the plans and at the required locations.

Materials

2.1 Concrete Bounds shall be as shown on the plans with concrete conforming to 520 and reinforcing steel conforming to 544.2.3

2.2 Stone Bounds shall be magnetized, and shall be cut from hard and durable granite and shall be free from seams which would impair their structural integrity, solid quartz or feldspar veins will not be cause for rejection. Dimensions shall be 4 inches to 8 inches square by not less than 4 feet - 0 inches in length. The top of the bound shall be roughly perpendicular to the length of the stone and shall have a 1/2 inch drill hole at least 1/2 inch deep near or at the center.

2.3 Backfill shall conform to 209.

Construction Requirements

3.1 Concrete Bounds.

3.1.1 Bounds shall be set as ordered on the right-of-way lines at the beginning and ends of curves, beginning and ends of spirals, angle points and on tangents with a maximum distance between bounds of 1,000 feet.

3.1.2 The exact location for each bound will be established by a land surveyor licensed by the State of New Hampshire.

3.1.3 The excavation shall be made to a sufficient depth to allow the bound to protrude 4 inches above the natural ground surface if in mowing land, 6 inches if in land not under cultivation or 12 inches if in woodland. Bounds in the roadway slope shall be set to protrude not more than 6 inches on the low side. The bound shall be set with the letters ED to read from the road, and the backfill shall be thoroughly tamped in place. Bounds set in mowing land shall be encircled by a mound of earth at least 4 feet in diameter and flush with the top of the bound at the center.

3.1.4 Unless otherwise ordered when rock is encountered, the bounds cut off if necessary, shall be firmly bonded to the rock.

3.1.5 When a tree or heavy root is encountered in setting bound, a steel pin at least 30 inches long and 3/4 inch in diameter shall be driven when ordered. The bound shall then be set at the nearest practical location as directed.

3.2 Stone Bounds

3.2.1 Stone bounds shall be set at points shown or ordered in accordance with 3.1 except that the letters ED in 3.1.3 will not apply.

3.3 Resetting.

3.3.1 Bounds to be reset shall be removed and reset without causing damage to the bounds. Location of the bound shall be recorded by a licensed land surveyor before removal, and the bound shall be reset in accordance with 3.1.2 and 3.1.3.

Method Of Measurement

4.1 Concrete bounds and stone bounds will each be measured by the number of types installed or reset.

Basis Of Payment

5.1 The accepted quantities of concrete bounds, stone bounds and bounds reset, will be paid for at the contract unit price per each for the kind specified complete in place.

5.1.1 Ordered excavation of solid rock for bounds to a limit of 1 foot from the sides of the bound, will be paid for at 100 dollars per cubic yard under 622.9. Payment will be made to the nearest 0.1 of a cubic yard.

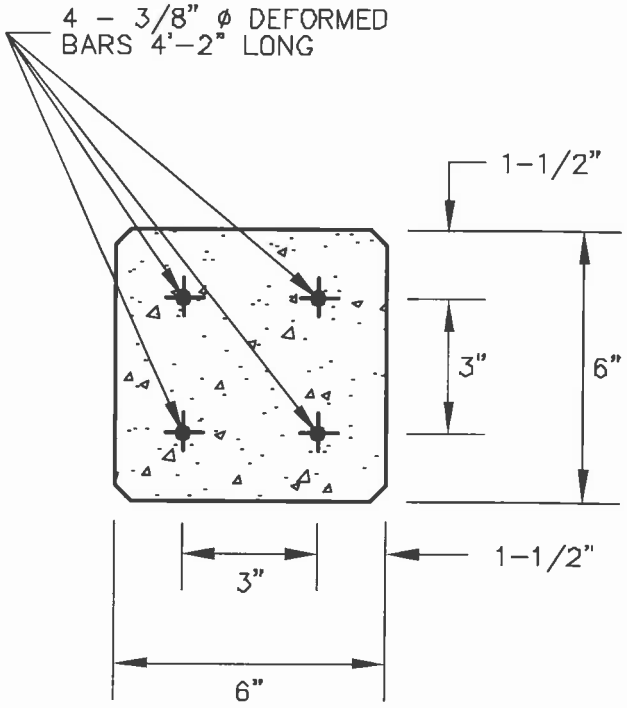
5.1.2 No extra allowance will be made for handling of bounds to be reset or for any excavation required to remove bounds from their original sites.

5.1.3 Pins used as specified in 3.1.5 will be subsidiary.

Pay Items and Units:

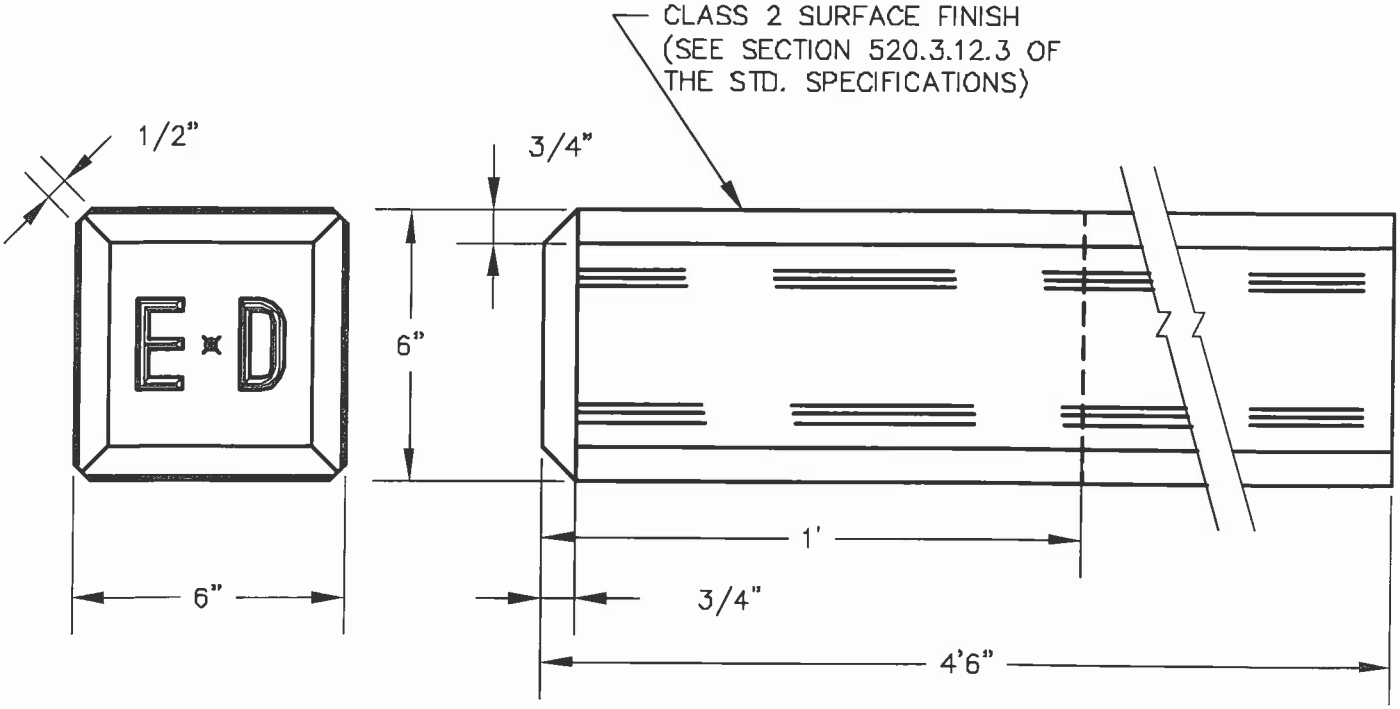
622.2	Concrete Bounds	Each
622.4	Stone Bounds	Each
622.52	Resetting Bounds	Each
622.9	Rock Excavation for Bounds*	C.Y.

*Not a bid item. See 5.1.1



SECTION

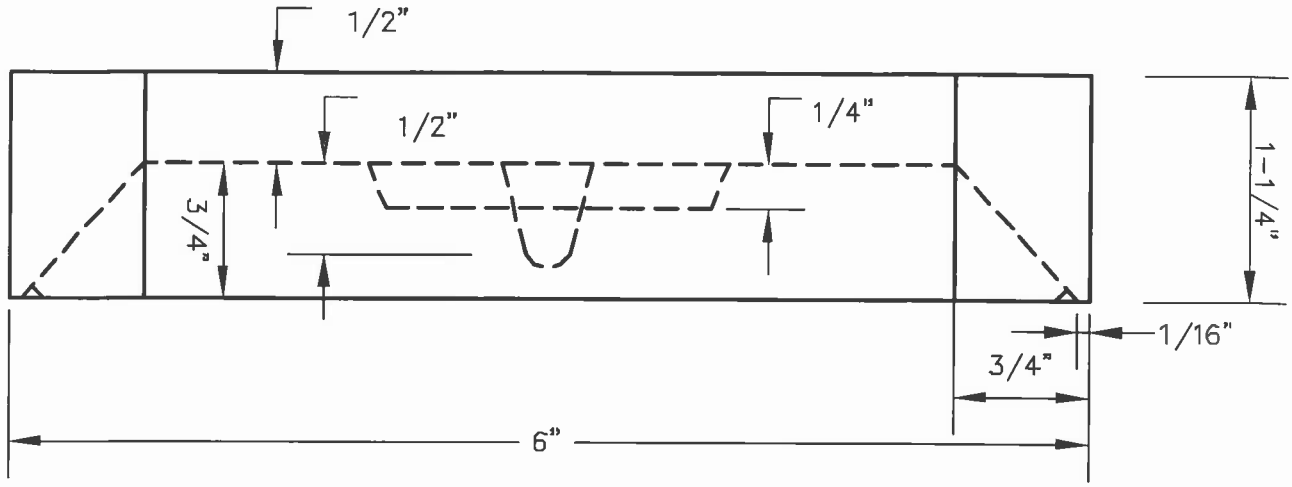
NOTE: CONCRETE SHALL BE CLASS A. COARSE AGGREGATE TO BE SIZE NO. 4 TO 1". ALL FACES OF BOUND MUST BE FREE FROM HONEYCOMB. BOUNDS TO BE SET IN GRAVEL, 9" ON ALL SIDES OF AND UNDER BOUND.

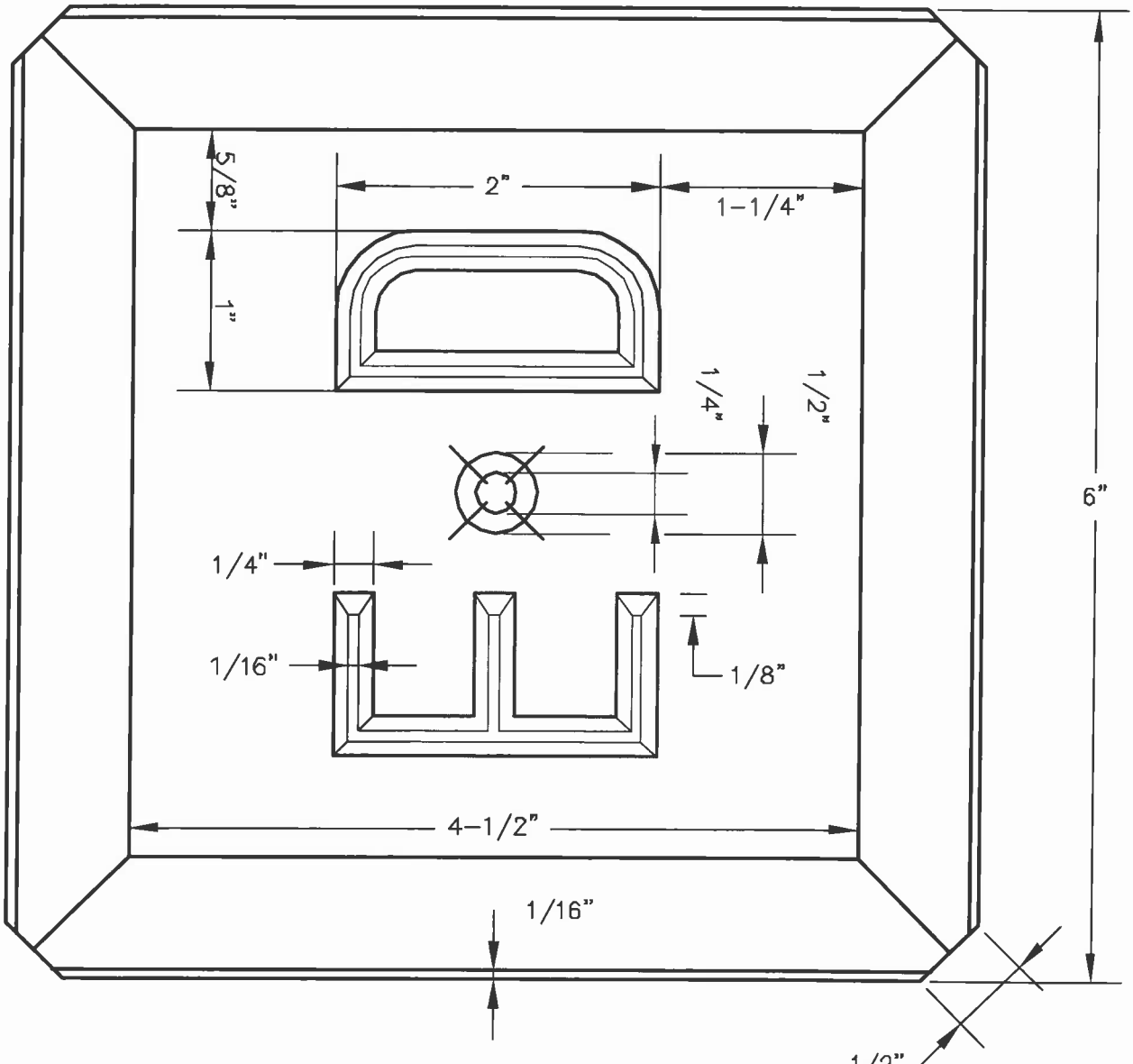


DETAIL OF CONCRETE BOUND

S \DWG\DETAILS\622-1 BOUND.DWG

FIGURE 622–1





DETAIL OF METAL FORM FOR THE TOP OF CONCRETE BOUND

S \DWG\DETAILS\622-2 BOUND.DWG

FIGURE 622-2

SECTION 624 --RAILROAD PROTECTION

Description

1.1 This item shall consist of all work necessary to insure the protection of railroad traffic during the progress of the work. The Contractor shall notify the Railroad of all anticipated work, and shall secure all necessary permits from the Railroad, including Railroad Protective Liability Insurance and arranging for flagmen as necessary.

1.2 This item shall include the services of all flagmen, swithch tenders, pilots, conductors, watchmen and similar protective labor; the installation and operation of gates, bell systems, warning lights and other protective devices, all as required by the Railroad to protect the operation and assure the safety of its equipment. The service shall be secured by the Contractor, who will reimburse the Railroad.

Method Of Measurement

4.1 Work performed under this Section will be paid for in the same manner as extra work.

4.2 The Bidder's attention is called to the price inserted in the proposal under this item, which price is the allowance the City has established to pay for Railroad Protection. This figure (1) must not be altered by the Bidder on his proposal and (2), must be included to obtain the grand total of the bid.

4.2.1 Payment of the amount included in the proposal will not be on a lump sum basis.

4.3 All payment for Railroad Protection will be made by the Owner to the Contractor based on and in the amount of submitted invoices from the Railroad. The Contractor shall not be entitled to any mark-up on the submitted invoices.

Basis Of Payment

Pay Item and Unit:

624	Railroad Protection	Allowance

SECTION 628 -- SAWED PAVEMENT

Description

1.1 This work shall consist of sawing concrete pavement, bituminous concrete pavement or both where concrete is overlaid with bituminous pavement, as shown on the plans or as ordered.

Construction Requirements

3.1 Concrete pavement or bituminous concrete pavement to be sawed shall be accurately marked before sawing.

3.2 The equipment used to saw concrete or bituminous pavement shall be capable of sawing the pavement as shown on the plans or as ordered and shall produce a substantially vertical and sound face without deformation of the adjacent pavement. The use of cutting wheels, pavement breakers, etc., which deform the pavement or leave an unsound face, will not be permitted.

3.3 Contraction joints to be cut in concrete pavement shall be cut to the width and depth as shown on the plans and filled with the type of filler shown on the plans.

3.4 Concrete pavement or bituminous concrete pavement to be sawed in connection with laying pipes, roadway excavation, constructing curb and the like, shall be of sufficient depth to permit breaking the pavement at the cut.

3.4.1 Where the pavement is found to consist of an overlay of bituminous concrete pavement above a concrete slab, the cut shall be increased enough to score the underlying concrete so that the concrete may be broken in a reasonably uniform manner.

Method Of Measurement

4.1 Sawed pavement of the type specified will be measured by the linear foot.

Basis Of Payment

5.1 The accepted quantity of sawed pavement will be paid for at the contract unit price per linear foot .

5.1.1 No separate payment will be made for filler.

5.1.2 Construction joints sawed in connection with 403 will not be paid for under this item.

5.2 Payment will be made under 628.3 only when bituminous concrete pavement and concrete pavement are sawed one above the other.

Pay Items and Units:

628.1	Sawed Concrete Pavement	Linear Foot
628.2	Sawed Bituminous Concrete Pavement	Linear Foot
628.3	Sawed Pavement	Linear Foot

SECTION 629 -- TESTING OF MATERIALS

1.1 General.

1.1.1 The Contractor shall employ an independent, qualified testing laboratory approved by the Engineer for conducting all required initial tests of concrete, trench backfill and embankment compaction and other like materials as specified and directed by the Engineer. Test results and laboratory recommendations shall immediately be made available to the Engineer. Three (3) certified copies of the test results bearing the name of the testing company, type of test, test number, date and location test was conducted, are to be presented to the Engineer promptly enabling the Engineer to make his determination of the acceptability or unacceptability of the material to meet these specifications.

1.1.2 All additional tests necessitated by the failure of initial tests as determined by the Engineer shall be conducted as directed by the Engineer. The Contractor shall take immediate corrective measures as suggested by the testing laboratory and/or directed by the Engineer to make the materials meet or exceed these specifications.

2.1 Concrete Testing.

2.1.1 All concrete to be used in the work shall be subject to testing to determine whether it conforms to the requirements of the specifications. The methods of testing shall conform to the appropriate specification but the place, time frequency and method of sampling, will be determined by the Engineer in accordance with the particular conditions of this project.

2.1.2 Concrete shall be of such consistency that it can be worked readily into all parts of the forms and around embedded work without permitting the materials to segregate or free water to collect on the surface. Consistency shall be measured by the ASTM Standard Method of Test for Slump of Portland Cement Concrete Designation C143. The consistency of concrete shall conform to the following slump requirements:

a)	Pavements & slabs on ground,	Normal 1-2	Maximum 3
b)	Massive reinforced sections,	Normal 2-3	Maximum 4
c)	Other reinforced walls & footings,	Normal 3-4	Maximum 5

Overly wet mixes with slumps exceeding those given above, are not acceptable and will be rejected by the Engineer.

2.1.3 Field tests of concrete for compressive strength shall be taken, cured and tested by the approved testing laboratory as directed by the Engineer. A minimum of four (4) specimens shall be made for each test. One specimen shall be broken at 7 days, one at 14 days, the other at 28 days. Specimens shall be made and tested in accordance with

ASTM Specification C39 and C31. Where there is any question as to the quality of the concrete in the structures, the Engineer will require the Contractor at his expense, to have tests made by an approved independent testing and inspection laboratory. Such tests shall be in accordance with the "Standard Methods of Securing, Preparing and Testing Specimens of Hardened Concrete for Compressive and Flexural Strengths" (ASTM Designation C42) or Sections 202 and 203 of the current A.C.I. Building Code for Reinforced Concrete (A.C.I.318) as may be required. The criteria for acceptability of the concrete under the latter, shall be that given therein. Concrete failing to meet the specification requirements shall be removed and replaced at the Contractor's expense.

2.1.4 Unless otherwise noted in these specifications or on the contract plans, all concrete masonry shall contain air-entrained cement. The average resulting air content in field mixtures shall be five (5%) percent when measured by means of an Acme Air Meter or an approved equal in conformity with the ASTM Standard Method of Test for air content of freshly mixed concrete by the "Pressure Method, Designation C231". Such tests shall be performed by the approved testing laboratory in the presence of and as directed by the Engineer. Any concrete for which the individual air content is less than 3.5 or greater than 6.5 percent, will be rejected.

3.1 Trench Backfill, Roadway Bases & Embankment Compaction Testing.

3.1.1 The Contractor shall provide samples of each backfill material from the proposed sources of supply. The Contractor shall allow sufficient time for testing and evaluation of results before material is needed. Samples from alternate sources shall be submitted if required. The Engineer will be the sole and final judge of the suitability of all materials.

3.1.2 Materials in question pending tests results shall not be used. Any materials rejected shall be removed and replaced with new acceptable materials whether in stockpiles or in place.

3.1.3 Compaction shall continue until the unit dry weight of the fill reaches a value of not less than the specified maximum unit dry weight attained in a laboratory compaction test performed under the specifications of ASTM D1557-64T, Method "A" (Backfill material of a stony nature shall be tested under Method "C" or "D" of the same ASTM Designation) or other approved ASTM or AASHTO Specifications. Such tests shall also be used for establishing the optimum moisture content of the material. The in-place dry unit weight of the compacted material shall be determined by methods specified under ASTM "D" 1556-58T or other approved ASTM of AASHTO Specifications. The in-place compaction test to be consistent with the approved laboratory compaction test.

3.1.4 At least one laboratory compaction test shall be performed for each distinctive type of material to be incorporated. These laboratory tests to be taken at the suggestion of the testing laboratory and/or as directed by the Engineer. A minimum of two (2) in-place moisture-density determinations shall be made for each 500 linear feet of trench backfilled. The actual number of compaction tests, their locations and depth shall be

determined by the Engineer. The percentage compaction of the fill at the point of the in-place moisture-density test shall be computed as follows:
Percentage compaction = DF x 100 DL
in which:

DF= Unit dry weight in lb ./cubic feet of sample in field moisture-density determinations.

DL= Maximum unit dry weight in lb./cubic feet obtained in the specified laboratory compaction test on a sample of the same type of material.

3.1.5 If the percentage compaction at any point is found to be unacceptable, additional compaction with or without modification of the field moisture content as directed shall be performed and additional moisture-density determinations made. This procedure shall be repeated until satisfactory compaction is obtained.

3.1.6 The Contractor will cooperate with the testing laboratory in obtaining field samples of in-place materials after compaction. Also incidental field labor and equipment necessary to dig and backfill test holes shall be furnished by the Contractor.

4.1 Payment.

4.1.1 All payment for initial testing of concrete, trench backfill, roadway bases and embankment compaction and other like materials as specified and directed by the Engineer will be made by the Owner to the Contractor based on and in the amount of submitted invoices from the testing firm. The Contractor shall not be entitled to any mark-up on the submitted invoices.

4.1.2 All additional tests necessitated by the failure of initial tests as determined by the Engineer shall be conducted as directed by the Engineer and all costs incurred from these additional tests shall be borne by the Contractor.

4.1.3 All work performed by the Contractor in connection with this Section shall be considered incidental to other contract items bid.

Pay Items and Units:

629 Testing of Materials Allowance

SECTION 632 -- REFLECTORIZED PAVEMENT MARKINGS

Description

1.1 This work shall consist of furnishing and placing white or yellow reflectorized paint pavement markings, preformed retroreflective pavement markings, and reflectorized thermoplastic pavement markings at the locations shown on the plans or as directed.

Materials

2.1 Paint shall conform to 708-NH 4.11 White Traffic Paint or 708-NH 4.12 Yellow Traffic Paint.

2.2 Glass beads for traffic paints shall conform to 708-NH 4.13.

2.3 Preformed retroreflective pavement marking tape shall conform to 711 Type I or Type II.

2.4 Thermoplastic pavement markings shall be subject to the approval of the Engineer. The Contractor shall submit his proposed materials list and method of application for approval at least two weeks prior to commencing the work, Included in this proposal shall be the manufacturer's warranty of durability, certified by an independent testing laboratory.

Construction Requirements

3.1 General.

3.1.1 All pavement markings of the type specified shall be applied at the locations shown on the plans or as ordered, and shall be in accordance with the Traffic Manual (MUTCD). Traffic control operations in conjunction with placing markings shall conform to 619 and the Traffic Control Plan.

3.1.2 Longitudinal lines placed on tangent roadway segments shall be straight and true. Longitudinal lines placed on curves shall be continuous smoothly curved lines consistent with roadway alignment. All pavement markings placed shall meet the tolerance limits shown on the plans.

3.1.3 Broken lines shall consist of 15 foot line segments with 25 foot gaps and shall meet the tolerance limits shown on the plans.

3.1.4 Unless otherwise specified, widths of longitudinal markings shall be as follows:

Line Type	Width (inches)
Centerlines	4
Edge Lines	4
Lane Lines	4
Gore Markings	8
Cross Walks	6
Parking Lines	4
Stop Bars	12

3.1.5 Newly painted markings shall be protected from traffic until the paint is cured. The method of protection shall not constitute a hazard to the traveling public. Damage to any markings as a result of tracking shall be repaired by the Contractor.

3.1.6 For guidance in marking longitudinal lines, the Engineer will establish base line points at 50 foot intervals on curves and 100 foot intervals on tangent sections throughout the length of pavement to be marked under this section. All other markings shall be applied according to the physical pavement layout provided. The Contractor shall provide at least 7 days notice to the Engineer prior to beginning marking operations to allow for layout.

3.1.7 For resurfacing contracts, the Contractor's attention is directed to the special requirements contained in 619.3.3.

3.2 Reflectorized Paint Pavement Marking.

3.2.1 All equipment used for highway striping shall be specifically designed and manufactured for that purpose by a company experienced in the design and manufacture of such equipment. Equipment used for longitudinal lines shall be truck mounted, and shall have the capability of placing two 4-inch yellow centerlines simultaneously according to the dimensions shown on the plans. The paint shall be applied with an atomizing spray type striping machine. The equipment shall include a mechanical glass bead dispenser mounted not more than 12 inches behind the paint dispenser. All equipment shall be kept in good operating condition.

3.2.2 Immediately before applying the pavement marking paint to the pavement, the Contractor shall insure the surface is dry and entirely free from dirt, sand, grease, oil, or other foreign matter.

3.2.3 The surface temperature of the pavement shall be a minimum of 40 degrees F.

3.2.4 Paint shall be applied at the following rates for the widths of line specified:

Width of Line (inches)	Linear Feet of Solid Line per Gallon of Paint	Linear Feet of Broken per Gallon of Paint
4	300 - 350	1200 - 1400
6	200 - 230	800 - 920
8	150 - 175	
12	100 - 120	

NOTE: Application rates for widths not shown shall be in direct proportion to those specified above.

3.2.5 Glass beads shall be evenly applied through the entire paint thickness at a rate of 6 pounds to each gallon of paint. Glass beads shall be applied by pressurized methods for fast-dry paint and by pressurized or mechanical drop methods for regular-dry paint.

3.2.6 All clean up and disposal of solvents, residue, and the like shall be the responsibility of the Contractor and shall be performed in accordance with all applicable federal, state, and local regulations.

3.3 Preformed Retroreflective Pavement Marking Tape.

3.3.1 Preformed retroreflective pavement marking tape shall be applied at locations shown on the plans by mechanical or manual methods. Mechanical applications shall be suitable for all markings. Manual applications shall normally be used for transverse lines, symbols and legends. The manufacturer shall provide technical assistance for equipment operation and maintenance, and product applications.

3.3.2 Preformed retroreflective pavement marking tape shall be stored and applied as directed by the manufacturer. When not specified, application by either the inlay or overlay method will be permitted. When the inlay method is specified, or chosen by the Contractor, paving and marking operations shall be coordinated to meet the manufacturer's recommendations.

3.3.2.1 For the inlay method, the pavement markings shall be embedded in the pavement surface with a conventional steel wheel roller. The surface temperature of the pavement shall be within the range specified by the manufacturer and shall not deform or discolor the markings.

3.3.2.2 When applying pavement markings by the overlay method, the pavement surface shall be clean, dry and above the minimum temperature as specified by the manufacturer. The surface shall be broomed clean and all dust shall be removed using compressed air. When required by the manufacturer, a coat of primer/adhesive activator shall be
applied.

3.3.3 The Contractor shall provide a copy of the manufacturer's storage and application recommendation to the Engineer upon delivery of the material to the project.

3.3.4 The required quantity of preformed retroreflective pavement marking tape shall be available at the project prior to the start of applicable pavement operations.

3.4 Reflectorized Thermoplastic Pavement Markings.

3.4.1 Thermoplastic pavement markings may be used as an option to preformed retroreflective pavement marking tape, but shall only be used for lane lines, arrows, legends, crosswalks, railroad markings, or stop lines. Thermoplastic material shall not be used for edge lines or center lines, unless specifically authorized.

3.4.2 Thermoplastic materials used as an option to preformed retroreflective pavement marking tape shall be applied according to the manufacturer's recommendations.

Method of Measurement

4.1 Longitudinal reflectorized pavement markings will be measured by the linear foot, on the surface of the markings, for the type and width specified.

4.1.1 Broken lines will be measured including gaps between line segments.

4.2 Reflectorized pavement arrows, with or without word, and other symbols or legends of the type specified will be measured by the number of units applied.

4.3 Repair work ordered under 3.1.5 will not be measured.

Basis of Payment

5.1 The accepted quantities of longitudinal reflectorized pavement markings of the type specified will be paid for at the contract unit price per linear foot complete in place.

5.2 The accepted quantities of reflectorized pavement arrows, with or without word, and other symbols or legends of the type specified will be paid at the contract unit price per each complete in place.

5.3 No payment will be made for those units of pavement markings which do not conform to the requirements of this section.

5.4 Thermoplastic markings applied as provided in 3.4.1 will be paid under the appropriate items for Preformed Retroreflective Pavement Marking Tape or Arrows, Type I.

KEY TO ITEM NUMBERS FOR PAVEMENT MARKINGS

Item Number

632. A B C D Item number
632. Section number
A Material
B Type of marking
C D Arrow type or width of line

.A Material
.0 Reflectorized Paint
.1 Preformed Retroreflective Tape, 60 mil, Type I
.2 Preformed Retroreflective Tape, 25 mil, Type II

B Type of Marking
1 Single Solid Line
2 Single Broken Line
3 Double Solid Line
4 Double Broken Line
5 Double Line (Solid with Broken)
6 Arrow
7 Railroad
8 Single Legend

C D	Arrow Type or Width of line	
0 1	Single Arrow	Each
0 2	Double Arrow	Each
0 3	Single Arrow, with Word	Each
0 4	4 Inch Line	Linear Foot
0 6	6 Inch Line	Linear Foot
0 8	8 Inch Line	Linear Foot
1 2	12 Inch Line	Linear Foot

Examples:

632.0104 Reflectorized Paint Pavement Marking 4", Solid Line
632.1303 Preformed Retroreflective Pavement Arrows, Single, with Word, 60 mil, Type I
632.2106 Preformed Retroreflective Pavement Marking Tape, 25 mil, Type II, 6" Solid Line

SECTION 641 -- LOAM

Description

1.1 This work shall consist of collecting and preparing loam material encountered in the work or obtained from other sources and placing the material at the locations shown on the plans or ordered, including necessary excavation for placing loam.

Materials

2.1 Loam shall consist of loose friable topsoil with no admixture of refuse or material toxic to plant growth. Loam shall be free from stones, lumps, stumps or similar objects larger than 3/4 inches in greatest diameter, subsoil, roots and weeds. The term as used herein shall mean that portion of the soil profile defined technically as the "A" horizon by the Soil Science Society of America. The minimum and maximum pH value shall be from 5.5 to 7.6. Loam shall be tested in conformance with the Standards of the Association of Official Agricultural Chemists. Loam shall contain a minimum of 3 percent and a maximum of 20 percent of organic matter as determined by loss by ignition. Not more than 65 percent shall pass a No.#200 sieve as determined by the wash test in accordance with ASTM D1140. In no instance shall more than 20% of the material passing the No. 4 sieve consist of clay size particles. Prior to stripping material to be used as loam, it shall have demonstrated by the occurrence upon it of healthy crops, grass or other plant growth, that it is of good quality and reasonably free draining.

2.1.1 Natural topsoil not conforming to 2.1 shall be treated by the Contractor to meet that specification.

Construction Requirements

3.1 The loam shall be spread upon the previously prepared surface and shall be raked carefully to remove all objectionable materials. Normally, loam for roadside use shall be placed at a depth of 4 inches. Loam placed adjacent to lawns or where directed, shall be compacted with a roller weighing approximately 100 pounds per foot of roller width. All depressions exposed during the rolling shall be filled with additional loam.

Method Of Measurement

4.1 Loam will be measured by the square yard as determined by actual surface measurements of the lengths and widths of the loamed areas.

Basis of Payment

5.1 The accepted quantities of loam of the various depths specified will be paid for at the contract unit price per square yard complete in place, except that when the item of

borrow is included in the contract, no deduction will be made from borrow for the volume of loam obtained from sectioned areas; the quantity of loam provided from nonsectioned areas will be added to borrow.

5.2 Materials used for treating natural topsoil as in 2.1.1 will be subsidiary.

Pay Items and Units:

641.0	Loam 4 Inches Deep	Square Yard

SECTION 642 -- LIMESTONE

Description

1.1 This work shall consist of furnishing and applying limestone on areas shown on the plans or ordered.

Materials

2.1 Limestone shall be a calcic or dolomitic ground agricultural limestone containing not less than 95 percent of either calcium or magnesium carbonate or both. It shall conform to the standards of the Association of Official Agricultural Chemists and shall comply with all existing State and Federal regulations.

2.1.1 Sieve Analysis. A minimum of 40 percent shall pass a No. 100 sieve and a minimum of 95 percent shall pass a No. 8 sieve.

2.1.2 Packaging. Limestone shall be furnished in new, clean, sealed and properly labeled bags of not more than 100 pounds each with the following information clearly marked thereon:

(a) Manufacturer's name
(b) Type
(c) Weight
(d) Guaranteed analysis.

2.1.2.1 Caked or otherwise damaged limestone may be rejected.

2.2 Other Liming Materials may be used, if permitted.

Construction Requirements

3.1 Limestone shall be used when ordered, to raise the pH of the soil at a rate determined by the Engineer, in accordance with Table 642-1.

Table 642-1

Limestone Required to Raise Soil pH to Min. (pH 5.5)

Existing PH	Tons/Acre	lbs./C.Y.
4.0 - 4.4	3	12
4.5 - 4.9	2	8
5.0 - 5.4	1	4

3.2 Limestone shall be applied by either the dry or hydraulic methods specified in 644.3.5.

Method Of Measurement

4.1 Limestone will be measured by the ton in accordance with 109.01, on the basis of delivery slips forwarded to the Engineer but not to exceed the rate ordered. Measurements will be made to the nearest 0.01 of a ton.

Basis Of Payment

5.1 The accepted quantity of limestone will be paid for at the contract unit price per ton complete in place.

Pay Item and Unit:

642	Limestone	Ton

SECTION 643 -- FERTILIZER FOR GRASSES

Description

1.1 This work shall consist of furnishing and applying an initial application of fertilizer on a new surface and one or more refertilizations after the growth has progressed sufficiently, all as shown on the plans or ordered.

Materials

2.1 Fertilizer shall be a standard commercial grade fertilizer conforming to all State and Federal regulations and to the standards of the Association of Official Agricultural Chemists. The analysis shall represent respective percentages of nitrogen, phosphoric acid and potash.

2.1.1 Except as permitted, the analysis ratio shall be 1:1:1 for initial application and 3:1:2 for refertilization application. The analyses in Table 1 are preferred. Permission to furnish fertilizer with an analysis varying from Table 643-1 will be based upon reasons given in writing by the Contractor requesting such variance.

Table 643-1
Fertilizer Information

Analysis Initial Refertilization	Minimum Application Rate (Lbs./1,000 S.F.)	Measurement Factor
10-10-10	20.0	1.0
15-15-15	13.4	1.5
10-3-6	20.0	1.0
12-2-8	16.7	1.2
12-4-8	16.7	1.2

2.1.2 A minimum of 30 percent of the nitrogen in fertilizer used for refertilization shall be water insoluble (WIN).

2.2 All fertilizer shall be identified by labels and shall show the following:

(a) Guaranteed analysis.
(b) Name and address of the guarantor of the fertilizer.
(c) Type or brand.
(d) Net weight.

2.2.1 When furnished as a liquid, the fertilizer shall be delivered in an appropriate container or vehicle and shall conform to the pertinent sections of the Fertilizer Rules and Regulations issued by the New Hampshire Department of Agriculture.

Construction Requirements

3.1 Fertilizer shall be uniformly applied by either the dry or hydraulic method specified in 644.3.5. When the dry method is used, special care shall be taken to thoroughly work the fertilizer into the soil.

3.1.1 The rate of application shall be based upon the nitrogen content and shall be a rate between 2.0 and 2.2 pounds of nitrogen per 1,000 square feet. See Table 1 for further information.

3.2 Unless otherwise ordered not less than 3 months shall elapse between the initial fertilization and the refertilization. No refertilization ordinarily will be allowed between November 1st or when the ground has frozen and the following April 1st or between June 1 and the following September 1. Refertilization will be allowed between August 15 and 31 only when it is determined that the permanent grasses have developed well and few weeds have appeared and such refertilization will not tend to promote the growth of noxious weeds.

Method Of Measurement

4.1 Fertilizer will be measured by the pound or by the ton and in accordance with 109.01 on the basis of weight slips or delivery slips forwarded to the Engineer, but not to exceed the maximum rate specified or ordered. Measurements by the ton will be made to the nearest 0.01 of a ton.

4.1.1 The quantity for payment will be the product of the accepted quantity used and the appropriate measurement factor from Table 1.

Basis Of Payment

5.1 The accepted quantity of fertilizer will be paid for at the contract unit price per pound or per ton complete in place.

Pay Items and Units:

643.11	Fertilizer for Initial Application	Pound
643.12	Fertilizer for Initial Application	Ton
643.21	Fertilizer for Refertilization	Pound
643.22	Fertilizer for Refertilization	Ton

SECTION 644 -- GRASS SEED

Description

1.1 This work shall consist of furnishing and sowing grass seed as shown on the plans or as ordered.

Materials

2.1 General.

2.1.1 Grass seed shall meet the requirements of the New Hampshire Agricultural and Vegetable Seeds Law. As specified in the law, the mixture shall include no "primary noxious weed seeds".

2.1.2 Grass seed of the specified mixtures shall be furnished in fully labeled, standard sealed containers.

2.1.3 Percent germination and purity of each seed type in the mixture and weed seed content of the mixture shall be clearly stated on the label.

2.1.4 Seed shall be subject to the testing provisions of the Association of Official Seed Analysts. The month and year of test shall be clearly stated on the label.

2.1.5 Seed may be tested after it has been delivered to the project.

2.1.6 Seed which has become wet, moldy or otherwise damaged will not be acceptable.

2.2 Park Seed Type 15 shall normally be used on loam areas. This seed mixture shall conform to Table 644-1.

Table 644-1 -- Park Seed, Type 15

Kind Of Seed	Minimum Purity (%)	Minimum Germination (%)	Lbs/Acre
Creeping Red Fescue	96	85	40
Perennial Ryegrass (a)	98	90	50
Kentucky Bluegrass (b)	97	85	25
Redtop	95	80	5
Total:			120

2.3 Slope Seed, Type 44 shall normally be used for all slope work and shall conform to Table 644-2 unless amended by the Engineer to suit special local conditions encountered.

Table 644-2 -- Slope Seed, Type 44

Kind Of Seed	Minimum Purity (%)	Minimum Germination (%)	Lbs/Acre
Creeping Red Fescue(c)	96	85	35
Perennial Ryegrass (a)	98	90	30
Redtop	95	80	5
Alsike Clover	97	90 (e)	5
Birdsfoot Trefoil (d)	98	80 (e)	5
Total:			80

(a) - Ryegrass shall be a certified fine-textured variety such as Pennfine, Fiesta, Yorktown, Diplomat or equal.

(b) - Bluegrass shall be a certified variety such as Merion, Baron, Majestic Touchdown, Nugget, Ram One or equal.

(c) - Fescue varieties shall include: creeping red and/or Hard Reliant, Scaldis, Koket or Jamestown.

(d) - (Empire variety preferred) Inoculum specified to Birdsfoot Trefoil, must be used with this mixture. The inoculum shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality and the ability to transform nitrogen from the air into soluble nitrates and to deposit them in the soil. The inoculum shall not be used later than the date specified. The inoculum shall be subject to approval.

(e) - Includes not more than 10 percent hard seed for
Alsike Clover and not more than 25 percent hard seed for Birdsfoot Trefoil. If necessary, to meet this requirement, extra seed shall be supplied at no expense to the City.

2.4 Crownvetch (Chemung, pengift and Emerald variety preferred) shall be used at the rate of 10 pounds per acre with or without Slope Seed, Type 44 on all slopes designated on the plans to be seeded with Crownvetch or as ordered. Generally, Crownvetch will be required on steep slopes, usually 3:1 or steeper and on other critical areas of poor soil conditions with susceptibility to erosion forces.

2.4.1 Inoculum specific to Crownvetch must be used with this seed. In all other respects it shall conform to note (d) in Table 2.

2.4.2 Crownvetch seed shall have a minimum 35 percent normal sprouts and 35 percent hard seed. If necessary to meet this requirement, extra seed shall be supplied at no expense to the City.

Construction Requirements

3.1 General.

3.1.1 In order to prevent unnecessary erosion of newly graded slopes and unnecessary siltation of drainage ways, the Contractor shall carry out erosion control items of work such as seeding and mulching as soon as he has satisfactorily completed a unit or portion of the project.

3.1.2 When immediate protection of newly graded areas is necessary at a time which is outside of the normal seeding season, hay mulch shall be applied in accordance with 645.3.1.1 with the seeding done at the same time or done later or both, as ordered.

3.1.2.1 When immediate seeding is required on areas of the roadside which are not to be regraded or disturbed, one of the above specified seed mixtures shall be used as ordered.

3.1.2.2 Areas of the roadside which are to be left temporarily and which will be regraded or otherwise disturbed later during construction may be ordered to be seeded with ryegrass under 645.5.2 to obtain temporary control. Ryegrass shall be spread at the rate of approximately 1 pound per 1,000 square feet.

3.1.3 The Engineer reserves the right to prohibit the use of any equipment that is unsuitable or inadequate for the proper performance of the work. The Contractor must immediately remove all rejected equipment from the project.

3.1.4 When the seed mixture requires an innoculum, the innoculum shall be kept as cool as possible, at all times below 75 degrees F until used. Inoculated seed shall be protected from exposure to sunlight prior to sowing and all seed not sown within 24 hours following inoculation, shall be properly reinnoculated.

3.1.4.1 When grass seed is to be sown dry and the specific legume seed such as Birdsfoot Trefoil or Crownvetch requiring inoculation is furnished on the project separately from the balance of the seed mixture, the legume seed shall be inoculated using twice the normal quantity recommended by the supplier, and regardless of the directions by the supplier, the seed shall be treated with a sticking agent to hold the innoculum to the seeds, and then treated with a drying agent. The sticking agent shall consist of a mixture such as 9:1 solution of water and molasses which shall be thoroughly mixed with the seed at the rate of 1/2 pint per 100 pounds of seed, unless a greater rate is recommended by the supplier. Before mixing the treated seed with the remainder of the seed mixture, a drying agent such as
cornstarch shall be added at the rate of approximately 1/2 pound per 100 pounds of seed, unless another rate is specified.

3.1.4.2 When grass seed is to be sown dry and the legume seed is furnished on the project already mixed with the remainder of the seed mixture, 3 times the normal quantity of innoculant recommended by the supplier as sufficient for the quantity of legume in the mixture shall be mixed with the total seed. The sticking agent and the drying agent shall be

mixed in the manner and at the rate specified in 3.1.4.1 with sufficient agents to treat the entire mixture.

3.1.4.3 When the seed is to be applied by the use of a hydraulic seeder, at least 4 times the normal amount of the appropriate innoculum required to inoculate only the legume, shall be added to the mixture just before application. See 3.5.2.7.

3.2 Seeding Seasons.

3.2.1 Seeding and initial fertilizing shall be done between April 1 and June 1, between August 15 and October 24, or as directed or permitted. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet or otherwise untillable.

3.3 Application Rates. Unless specifically ordered, seed shall be spread at the rates specified in 2.2, 2.3 and 2.4.

3.4 Preparation.

3.4.1 All areas to be seeded shall be prepared to provide a reasonably firm but friable seed bed.

3.4.1.1 Sloped areas shall not be left too smooth; the surface shall be left in a ruffled condition such as may be produced by the use of tracked vehicles run up and down the slopes. Smooth compacted slopes such as may be left from blading, which might allow the free flow of water down them shall be disked, harrowed, dragged with a chain or mat, machine-raked or hand worked as directed to give the effect of miniature terraces, particularly in silty or clayey soils. The slopes shall however; be left smooth enough to enable the Contractor or the State to mow them later, if necessary.

3.4.1.2 Lawn areas such as where loam has been spread shall be prepared for seeding in accordance with 641.3.1.

3.4.2 Depth of tillage shall be shown on the plans or ordered.

3.4.2.1 On slopes steeper than 4:1, the depth of tillage may be reduced as directed.

3.4.3 All areas to be seeded shall meet the specified grades and shall be free of growth and debris.

3.4.4 Care shall be taken to prevent the formation of low places and pockets where water will stand.

3.4.5 Where ryegrass has been planted for temporary erosion control and has not been eliminated prior to the completion of the work, such areas shall be disked at least 3 inches deep and seeded to permanent grasses to prevent the ryegrass from reseeding and becoming competitive with and retarding development of the permanent cover.

3.5 Seeding Methods. Fertilizer, limestone and mulch material if required and seed of the type specified may be placed at the locations shown or ordered by one of the following methods, provided an even distribution is obtained.

3.5.1 Dry Method.

3.5.1.1 Power Equipment. Mechanical seeders, seed drills, landscape seeders, cultipacker seeders, fertilizer spreaders or other approved mechanical seeding equipment or attachments may be used when seed, limestone and fertilizer are to be applied in dry form.

3.5.1.2 Manual Equipment. On areas which are inaccessible to power equipment, permission may be given to use hand-operated mechanical equipment when the materials are to be applied in dry form. The use of hand shovels to spread the materials will not be allowed.

3.5.1.3 When the dry method is used, limestone and fertilizer shall not be mixed together prior to their application, but they shall be worked into the soil together to the depth of at least 1 inch.

3.5.1.4 At least 24 hours shall elapse between the time fertilizer is incorporated and the seed is planted.

3.5.1.5 Loamed areas or areas covered with park seed shall be raked and unless rolling is ordered omitted, shall be rolled with a roller weighing not more than 100 pounds per foot of roller width to firm the soil, but not to pack it. The rolling shall be done the same day as the seeding unless otherwise permitted.

3.5.1.6 Unless otherwise ordered, areas covered with park seed or slope seed with or without crownvetch, shall be mulched in accordance with 645. Private lawns affected by this specification need not be mulched unless it is requested by the landowner.

3.5.2 Hydraulic Method.

3.5.2.1 The application of grass seed, fertilizer, limestone and a suitable wood fiber mulch shall be accomplished in one operation by use of an approved spraying machine.

3.5.2.2 The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water.

3.5.2.3 The spraying equipment shall be so designed that the solution is sprayed over an area, the resulting deposits of limestone, fertilizer and grass seed shall be equal in quantity to the required rates.

3.5.2.4 Prior to the start of work, the Engineer shall be furnished with a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.

3.5.2.5 The hydraulic seeding and fertilizing machine shall be completely flushed and cleaned each day before seeding is to be started and shall also be thoroughly flushed of all residue after the completion of application on every 10 acres.

3.5.2.6 If the results of the spray operations are unsatisfactory, the Contractor will be required to abandon this method and apply the materials in accordance with 3.5.1.

3.5.2.7 When inoculum is required, if the inoculum is left in solution with fertilizer longer than 30 minutes, a fresh charge of inoculum (4 times normal) shall be added to the mixture. See 3.1.4.3.

3.5.2.8 When the hydraulic method is used, compaction or rolling will not be required.

3.5.2.9 Except as provided in 3.1.2, unless mulch material required is applied during the seeding operation or within 1/2 hour following the seeding operation, temporary and satisfactory measures to protect the seed from sunlight and heat shall be taken such as the use of a light brush drag over the seeded areas to stir the seed into the soil. Care shall be taken not to carry the seed ahead.

3.6 Care After Seeding.

3.6.1 The Contractor shall be responsible for protecting and caring for seeded areas until final acceptance of the work. He shall repair at his own expense any damage to seeded areas caused by pedestrian or vehicular traffic or other causes, except for conditions as covered in 107.16.

3.6.2 If necessary, barricades of brush or other materials and suitable signs shall be placed to protect the seeded areas.

3.6.3 The seeded areas shall be carefully and suitably watered as necessary to produce a satisfactory growth.

3.6.4 Areas seeded with Park Seed shall be mowed whenever necessary to keep the growth between 3 inches and 6 inches in order to allow light to penetrate to the shorter, slower growing species in the mixture. Areas seeded with slope seed may be ordered mowed whenever the contract extends into a second growing season.

3.6.5 Weeds growing in areas seeded with the slope seed shall be cut back to prevent them from dominating the desired grass plants.

3.7 Liability.

3.7.1 The Contractor shall keep all seeded areas in good repair.

3.7.2 To be acceptable, a stand of grass shall show a reasonably thick, uniform stand free from sizeable areas of thin or bare spots with a uniform count of at least 100 plants of

specified grass per square foot. When applicable, at least three Birdsfoot Trefoil plants and one crownvetch plant per square foot must be visible with the other specified grasses.

3.7.3 Any part of seeded areas which fail to show a uniform stand shall be reseeded until all areas are covered with grass.

Method Of Measurement

4.1 Grass seed shall be measured by the pound based upon the delivery slips and tags furnished by the Engineer, but not to exceed the rate specified or ordered.

Basis Of Payment

5.1 The accepted quantity of grass seed will be paid for at the contract unit price per pound of the type specified complete in place.

5.1.1 Seeded areas which need reseeding will be done at the Contractor's expense.

5.2 Hay mulch will be paid for under 645.101 or 645.11.

5.3 Limestone will be paid for under 642.

5.4 Fertilizer will be paid for under 643.

5.5 Ryegrass will be paid for under 645.52.

Pay Items and Units:

644.15	Park Seed, Type 15	Pound
644.44	Slope Seed, Type 44	Pound
644.51	Birdsfoot Trefoil	Pound
644.6	Crownvetch Seed	Pound

SECTION 645 - EROSION CONTROL

Description

1.1 Permanent Control. This work shall consist of furnishing and placing mulch or matting on surfaces prepared and seeded under other items at locations shown on the plans or ordered.

1.2 Temporary Control. When the use of hay bales is ordered, this work shall consist of furnishing and placing hay bales as a temporary erosion and pollution control device at locations shown on the plans or ordered. When seeding is ordered, this work shall consist of sowing seed of the type ordered on the areas as directed.

Materials

2.1 Mulch shall consist of cured hay, free from weeds and rough or woody materials.

2.1.1 Bark mulch shall be bark chippings graded to be approximately 3/8 inches to 2 inches in width. The chippings shall not have been stored so long and under such conditions that the material has decomposed sufficiently so that it has lost its fibrous texture. Bark mulch must be approved as to grading and condition prior to its use.

2.2 Matting for Erosion Control shall conform to one of the following provisions:

2.2.1 Jute Mat shall be of open weave, single jute yard averaging 130 pounds per spindle of 14,400 yards. The yarn shall be of loosely twisted construction, not varying in thickness by more than 1/2 its normal diameter. The woven material shall be 48 inches wide plus or minus 1 inch and with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard. The woven material shall weigh 1.22 pounds per linear yard with a tolerance of plus or minus 5 percent.

2.2.2 Excelsior Mat shall be wood excelsior, at least 35 inches in width, weighing 0.8 pounds per square yard plus or minus 5 percent. The excelsior material shall be covered with a netting on one side to facilitate handling and to increase strength.

2.2.3 Other Types of Matting shall be those accepted by the Engineer as equal in effectiveness to one of those specified above.

2.3 Staples shall be of No. 11 (or heavier) plain iron wire, made from lengths of at least 12 inches each.

2.4 Seed for Erosion Control shall be one of the following:

(a) Seed for temporary control shall be annual or perennial ryegrass.

(b) Seed for a more permanent control shall be slope seed, Type 44, as set forth in 644.2.3.

2.5 Hay Bales for Erosion Control shall consist of rectangular shaped bales of hay or straw weighing at least 40 pounds per bale. They shall be free from primary noxious weed seeds and rough or woody materials.

Construction Requirements

3.1 Mulch.

3.1.1 Mulching shall be done immediately after each area has been properly prepared. When seed for erosion control is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 48 hours after seeding. Hay that has been thoroughly fluffed, shall be applied at approximately but not to exceed 3 tons per acre unless ordered. Blowing chopped mulch will be permitted when authorized. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner there will be a minimum amount of matting that would retard the growth of plants. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing, cannot see ground through the mulch. Matted mulch or bunches shall be removed or otherwise taken care of.

3.1.2 In order to prevent its being blown away after the mulch has been spread to the required depth, a light covering of loose branches, a system of pegs and strings or other approved method shall be employed. Unless otherwise ordered, such means of control shall be removed prior to the acceptance of the project.

3.1.3 All baling wire or rope such as that used in the shipment of mulch, shall be disposed of outside the limits of the project in approved areas.

3.1.4 Bark mulch shall be placed on the designated areas to the depth specified

3.2 Matting.

3.2.1 Surfaces of ditches and slopes to receive matting shall conform to the grades and cross sections shown on the plans and shall be finished to a smooth and even condition with all debris, roots, stones and lumps raked out and removed. The soil surface shall be sufficiently loose to permit bedding of the matting. Unless otherwise directed, seed ordered shall be applied prior to placement of the matting.

3.2.2 Jute. Strips of jute matting shall be placed lengthwise in the direction of the flow of water. Where strips are laid parallel or meet as in a tee, they shall overlap at least 4 inches. Ends shall overlap at least 6 inches, shingle fashion. In addition, the up-slope end of each strip of the matting shall be turned down and buried to a depth of not less than 6 inches with

the soil firmly tamped against it. The Engineer may require that any other edge exposed to more than normal flow of water be buried in a similar manner.

3.2.2.1 Check slots built at right angles to the direction of the flow of water shall be spaced so that one check slot or one end occurs within each 50 feet of length of slope. Check slots shall be constructed by placing a tight fold of the matting at least 6 inches vertically into the ground. These shall be tamped the same as the up-slope ends.

3.2.2.2 Edges of matting shall be similarly buried around the edges of catch basins and other structures.

3.2.3 Excelsior. When excelsior matting is being laid, the material shall be unrolled in the direction of the flow of water.

3.2.3.1 Where strips of excelsior matting are laid end to end, the adjoining ends shall be butted.

3.2.3.2 When adjoining rolls of excelsior matting are laid parallel to one another, the matting shall be butted snugly.

3.2.4 Except where jute matting is turned down, all matting shall be spread evenly and smoothly so that it is in close contact with the ground. Bulging seams in either matting material shall be cut out and joints formed as described above. When ordered, additional seed shall be spread over jute matting, particularly at those locations disturbed by building the slots. Jute matting shall then be pressed onto the ground with a light lawn roller or by other satisfactory means.

3.2.5 Matting shall be held tightly to the soil by staples driven approximately vertically into the ground flush with the surface of the matting. On slopes flatter than 4:1, staples shall be spaced not more than 3 feet apart in three rows for each strip, with one row along each edge and one row alternately spaced, down the center. On grades 4:1 or steeper, staples shall be placed in the same three rows, but spaced 2 feet apart. On all overlapping or butting edges, the number of staples shall be doubled with the spacing halved; all ends of the matting and all required check slots, shall likewise have staples spaced every foot. The matting placed adjacent to boulders or other obstructions, shall be stapled with no spaces between the staples, to eliminate any loose edges of matting.

3.2.5.1 The above specified spacing of staples may be changed as ordered, depending upon varying factors such as the season of the year or the amount of water encountered or anticipated.

3.2.5.2 In driving the staples, care shall be taken so as not to form depressions or bulges in the surface of the matting.

3.2.6 Other Matting. Approved, alternate matting shall be applied in accordance with the recommendations of the manufacturer and as directed.

3.3 Seed for Erosion Control.

3.3.1 Seeding when required, shall be performed as ordered and in accordance with 644.3.

3.3.1.1 Areas of the roadside which are to be left temporarily and which will be re-graded or otherwise disturbed later during construction may be ordered to be seeded with ryegrass to obtain temporary control. The seed shall be sown at the rate of approximately 1 pound per 1,000 square feet.

3.4 Maintenance.

3.4.1 If any staples become loosened or raised or if any matting becomes loose, torn or undermined, satisfactory repairs shall be made immediately.

3.4.2 The Contractor shall maintain areas mulched or matted, with no extra compensation until the completion of the contract.

3.4.2.1 On areas treated with bark mulch, the Contractor shall remove unsightly weeds and plant material as directed.

3.5 Hay Bales for Erosion Control. Hay bales shall be placed as ordered to provide for temporary control of erosion or pollution or both. They shall be staked with the required stakes. Upon acceptance of the contract, the bales shall be left in place unless released to the Contractor.

Method Of Measurement

4.1 Mulch will be measured by the square yard or by the acre. When measurements are made by the acre, such measurements will be made to the nearest 0.01 of an acre.

4.2 Matting will be measured by the square yard, based on dimensions of the matting prior to installation. Areas buried or ordered overlapped will not be deducted.

4.3 Grass seed will be measured by the pound, as specified in 644.4.1.

4.4 Hay bales for erosion control will be measured by the number of bales required.

Basis Of Payment

5.1 The accepted quantities of erosion control work will be paid for at the contract unit price per square yard or per acre for mulch and per square yard for matting, all complete in place.

5.2 Slope seed, Type 44 ordered for erosion control will be paid for under 644.44; the accepted quantity of ryegrass ordered for temporary erosion control will be paid for at the contract unit price per pound complete in place.

5.3 Hay bales for erosion control will be paid for at the contract unit price per bale complete in place. No extra payment will be made for removal of bales ordered removed.

Pay Items and Units:

645.101	Mulch	S.Y.
645.11	Mulch	Acre
645.15___	Bark Mulch __Inches Deep	S.Y.
645.2	Matting for Erosion Control	S.Y.
645.51	Hay Bales for Temporary Erosion Control	Each
645.52	Ryegrass for Temporary Erosion Control	Pound

SECTION 646 -- TURF ESTABLISHMENT

Description

1.1 This work shall consist of preparing the soil and furnishing and applying seed of the type or types specified, fertilizer, limestone, and mulch if required, on all areas designated for turf establishment as shown on the plans or ordered.

Materials

2.1 Limestone shall conform to 642.2.

2.2 Fertilizer shall be that for initial fertilization and shall conform to 643.2.

2.3 Seed shall conform to 644.2 using the type of mixture ordered.

2.4 Mulch shall conform to 645.2.1.

2.5 Mulch tackifiers shall be environmentally non-toxic.

Construction Requirements

3.1 Construction requirements shall conform to 643.3, 644.3 and 645.3.

3.2 Application rate of limestone shall generally be 130 pounds per 1,000 square feet (approximately 3 tons per acre), unless otherwise ordered.

3.3 When mulch tackifiers are ordered to be used as tie- down or adhesive for mulch, it shall be used at the rate specified by the manufacturer, and applied uniformly over and through the mulch.

Method of Measurement

4.1 Turf establishment will be measured by the acre or by the square yard. Computations will be made to the nearest 0.01 of an acre or the nearest 0.1 square yard from measurements taken on the actual ground surface covered.

Basis of Payment

5.1 The accepted quantities of turf establishment will be paid for at the contract unit price per acre or square yard complete in place.

5.2 The material cost of crownvetch seed ordered added to Slope Seed Type 44 will be paid for under extra work.

Pay Items and Units:

646.1	Turf Establishment with Mulch	Acre
646.2	Turf Establishment without Mulch	Acre
646.3	Turf Establishment with Mulch & Tackifiers	Acre
646.4	Turf Establishment with Mulch	S.Y.
646.5	Turf Establishment without Mulch	S.Y.
646.6	Turf Establishment with Mulch & Tackifiers	S.Y.

SECTION 647 -- HUMUS

Description

1.1 This work shall consist of salvaging humus material encountered in the work or furnishing humus material from other sources, and placing the material at the locations shown on the plans or ordered.

Materials

2.1 Humus shall be the surface layer of natural workable soil containing organic matter, or material of a generally humus nature capable of sustaining the growth of vegetation, with no admixtures or refuse or material toxic to plant growth. It shall be relatively free from stones, lumps, stumps or similar objects larger than 2 inches in greatest diameter, sterile soil, roots, and brush. Ordinary sods of herbaceous growth such as grass and non-noxious weeds will be permitted. Muck, dry enough to be properly measured and spread may be used if it meets the above requirements, but the Engineer reserves the right to prohibit the use of muck which he considers may be or may become a fire hazard. If muck is accepted, extra limestone, sand, or humus material, shall be added as ordered by the Engineer.

Construction Requirements

3.1 The material shall be spread over the properly prepared areas to give a covering which will be approximately 3-1/2 inches thick, with generally not less than 3 inches or more than 4 inches, measured normal to the slope.

Method of Measurement

4.1 Humus material will be measured by the cubic yard. Slope measurements will be taken of the lengths and widths of the material in place and the volume will be computed by using the nominal depth of 3-1/2 inches.

Basis of Payment

5.1 The accepted quantity of humus will be paid for at the contract unit price per cubic yard complete in place.

5.1.1 Excavation required to undercut slopes in order to accommodate the material will be subsidiary.

5.1.2 When the item of borrow is included in the contract, no deduction will be made from borrow for the volume of humus obtained from sectioned areas; the quantity of humus provided from nonsectioned areas will be added to borrow.

Pay Item and Unit:

647.1	Humus	Cubic Yard

SECTION 648 -- SOD

Description

1.1 This works shall consist of furnishing and placing live grass sod, including sod gutters, as shown on the plans or ordered. This work shall also include any excavation necessary to place the sod.

Materials

2.1 Sod shall consist of an approved, dense, vigorous, well-rooted growth of commercial turf of perennial grasses indigenous to the area where it is to be used.

2.1.1 The sod shall be free from noxious weeds, annual grasses, large stones or roots, or other materials harmful to growth, or which would interfere with mowing or future maintenance.

2.1.2 The soil shall be of such character that the sod will not break or crumble.

2.2 Pegs for holding shall be of sound wood approximately 3/4" square or round, and 8' to 10" long.

Construction Requirements

3.1 Sodding seasons. Unless otherwise permitted, sodding shall be done between April 1 and June 1, or between August 15 and October 15, but not when the ground or sod is frozen.

3.2 Cutting sod. The sod shall be cut with an approved sod cutter into strips of uniform width having minimum dimensions of 12" x 18". The sod shall be severed below the root line, shall have a uniform thickness and shall contain the majority of the feeding roots of grasses.

3.3 Site Preparation

3.3.1 Areas to be sodded shall be brought to grade with 4" of loam as shown or ordered, making allowance for the thickness of the sod.

3.3.2 As necessary, the soil shall be harrowed, tilled, or otherwise loosened to a depth of at least 2 inches to allow for mixing of the soil with the fertilizer and limestone.

3.3.3 The area shall be cleaned of large stones, roots, or other debris which might interfere with laying of the sod.

3.4 Laying Sod.

3.4.1 Sod shall be in a moist condition when laid and shall be placed on a reasonably moist bed. The sod shall be carefully placed and tightly fitted edge to edge. Any broken, damaged, or irregular shaped sod will be rejected.

3.4.2 On slopes, the sod shall be laid at right angles to slope, beginning at the bottom.

3.4.3 Transverse joints shall be staggered, and any unavoidable gaps shall be filled with sod plugs or loam.

3.4.4 All sod shall be tamped with an approved tamper or roller to insure tight joints and a smooth uniform surface.

3.4.5 The inlet edges of sod in waterways and other edges exposed to water scour shall be turned down and buried to a depth of 3 inches with tamped earth.

3.4.6 On slopes steeper than 4:1, every other line of sod shall be fastened with wooden pegs spaced 3 feet apart and driven flush with the surface of the sod.

3.4.7 Single lines of sod for anchoring loam on slopes greater than 4:1 shall be secured as 3.4.6.

3.4.8 After laying, all sod shall be watered as necessary to insure full establishment and growth.

Method of Measurement

4.1 Sod will be measured along the slope, except that the width of gutters will be as shown on the plans or ordered. Dead sod will not be measured. Sod will be computed to the square yard.

Basis of Payment

5.1 The accepted quantity of sod will be paid for at the contract unit price per square yard complete in place.

5.2 Excavation required to complete this work will be considered as incidental to the items, but fertilizer, limestone, and loam ordered will be paid for under the respective items.

Pay Item and Unit:

648	Sod	Square Yard

SECTION 650 -- PLANTING -- GENERAL

Description

1.1 This specification includes general requirements that are applicable to all types of planting, including trees, shrubs, vines and ground cover plants, irrespective of type. Deviations from these general requirements will be indicated in the specific requirements for each type.

Materials

2.1 Plants.

2.1.1 General.

2.1.1.1 Plant material shall meet the current specifications of the "American Standard for Nursery Stock" as published by the American Association of Nurserymen unless otherwise specified.

2.1.1.2 All plants shall be first class and shall be representative of their normal species of varieties. All plants must have a good, healthy, well formed upper growth and a large, fibrous, compact root system.

2.1.1.3 All plants shall be nursery grown stock that has been transplanted unless indicated as "seedlings", or root pruned at least once every 4 years. Plant hardiness shall be determined acceptable by the Engineer as specified relative to the zone of origin. A sworn affidavit as to region of growth shall be furnished when ordered.

2.1.1.4 Unless otherwise specified, so-called exposed or "bare-root" material will be accepted. Container grown plants may be furnished in lieu of balled and burlapped plants, provided they meet the current specifications in the American Standard for Nursery Stock.

2.1.2 Names and Marking.

2.1.2.1 All scientific and common plant names of the items specified shall conform with the current edition of "Hortus Third" compiled by the staff of the L.H. Bailey Hortorium, Cornell University. All plants delivered shall be true to name.

2.1.2.2 Each bundle, or each plant when not tied in bundles, shall be legibly and properly labeled. Care shall be taken throughout the operation to keep each plant species or variety segregated and labeled.

2.1.3 Inspection

2.1.3.1 All plants shall be free from plant diseases and insect pests, and shall comply with all applicable State and Federal laws with respect to inspection for plant diseases and infestations.

2.1.3.2 All plant material shall be available for inspection in the nursery or collecting fields before it is dug. The Contractor shall provide a list of suppliers in sufficient time to allow the Engineer to inspect nurseries on a timely bases. Approval to move nursery material shall not be considered as final acceptance. The Contractor shall notify the Engineer not less than 48 hours in advance of delivery of plants.

2.1.3.3 All planting stock shall conform to the laws of New Hampshire and shall be inspected before removal from the nursery, by authorized Federal, State, City or other authorities as may be required in the area where the nursery is located. The invoice or order for each shipment of plants shall contain the project name and number and the quantity and variety of plant material delivered. An inspection certificate shall certify that the plants are free of disease and insect pests of all kinds and shall accompany each shipment. Disease certificates and delivery slips shall be given to the Engineer upon arrival of the plant material at the point of delivery.

2.1.3.4 For purchase of material from nurseries within New Hampshire, information regarding inspection for plant disease and pest infestations is available from the New Hampshire Department of Agriculture. Inspection of plants from outside New Hampshire is controlled by the United States Department of Agriculture and information is available from the United States Department of Agriculture, Animal & Plant Health Inspection Service.

2.1.4 Digging, Handling, and Packing.

2.1.4.1 General. Plants shall be dug with care and skill. Special precautions shall be taken to avoid any unnecessary injury to, or removal of fibrous roots. Each species or variety shall be handled and packed in the approved manner for that particular plant. All precautions shall be taken to insure the arrival of the plants at the project site in good condition for successful growth.

2.1.4.2 Balled and burlapped plants. The ball shall be firm and, unless a manufactured ball is allowed, shall be composed of the original and undisturbed soil in which the plant has been grown. The plant shall be handled in such a manner that the soil in the ball will not drop away from the roots and will not cause stripping of the small, fine-feeding
roots. The ball shall be wrapped with burlap or other approved material and tightly laced to hold the desired shape. No balled plants will be accepted if the ball is cracked or broken. A substitute for burlap may be approved provided it can be demonstrated that the material is tight enough to retain the soil ball securely. During planting operations material which will not readily disintegrate in the ground shall invariably be removed or extensively cut to allow the roots to grow through freely.

2.1.4.3 Bare-root plants. The roots of bare-rooted stock shall be carefully packed in sphagnum moss, moist straw, or other suitable material that will insure the arrival of plants in an acceptable condition.

2.1.5 Shipment.

2.1.5.1 Arrangements shall be made as far as practical be to have plants delivered as the pits or beds are ready for them.

2.1.5.2 Plants which have heated or sweated at any time, or have broken, fractured, scraped or bruised, will be rejected.

2.1.5.3 All local, state or federal laws relative to the shipping of plants shall be strictly complied with.

2.1.6 Measurement.

2.1.6.1 Measurement will be made in accordance with the practice prescribed in the "American Standard for Nursery Stock" published by the current American Association of Nurserymen.

2.2 Blank.

2.3 Blank.

2.4 Wrapping material shall be an approved type either plain burlap or paper, or plastic manufactured for this purpose. Burlap shall be of good quality, approximately 6 inches wide, weighing at least 8 ounces per square yard. Paper shall be 4 inch wide strips of krinkle-craft, sisal kraft or equal.

2.4.1 Fastening for the wrapping material shall be paper adhesive masking tape or a minimum 3-ply jute twine of suitable strength.

2.4.2 All deciduous trees shall be wrapped promptly after planting to prevent sun-scald, frost crack and rodent damage. No trees shall be wrapped before the plant material is inspected by the Engineer.

2.5 Plant supporting materials shall conform to those shown on the plans.

2.6 Rodenticides, herbicides and pesticides shall be those approved for use by the New Hampshire Pesticides Control Board.

2.7 Water used in the planting or care of vegetation shall be free from any substance injurious to plant life.

2.8 Antidesiccants shall be of an approved emulsion which will provide a film over plant surfaces, permeable enough to permit the exchange of gases but inhibit the passage of water vapor.

2.9 Fertilizer.

2.9.1 Fertilizer shall be a standard commercial grade fertilizer conforming to all State and Federal regulations and to the standards of the Association of Official Agricultural Chemists. The analysis shall represent respective percentages of nitrogen, phosophoric acid and potash.

2.9.1.1 All fertilizer shall be identified by labels and shall show the following:

(a) Guaranteed analysis.
(b) Name and address of the guarantor of the fertilizer.
(c) Type or brand.
(d) Net weight.

2.9.1.2 Dry fertilizer for other than acid-loving plants shall have an analysis of 10-6-4 (preferred), 10-3-6 or 10-5-5 or, with written permission, a substitute may be furnished. In any case, a minimum of 35 percent of the nitrogen shall be water-insoluble (35 percent WIN).

2.9.1.3 Water-soluble fertilizer shall be completely water soluble. Fertilizer for other than for acid-loving plants shall contain the following minimum percentages of available elements by weight: nitrogen -- 16 percent, phosphoric acid -- 19 percent, potash -- 16 percent. The total available nutrients shall be at least 55 percent by weight.

2.9.1.4 Fertilizer for acid-loving plants shall be formulated for acid-loving plants such as rhododendrons, azaleas and blueberries. Dry fertilizer for such plants shall have a minimum analysis of 7-7-7 or as approved. Water- soluble fertilizer for such plants shall have an analysis in the range of 21-7-7 or as approved.

2.10 SOIL CONDITIONERS

2.10.1 Peat moss shall be air dried, granulated, sphagnum peat moss, nearly from woody substances, consisting of at least 75 percent of partially decomposed stems and leaves of sphagnum, and essentially brown in color. The texture may vary from porous fibrous to spongy fibrous and shall be free of sticks, stones, and mineral matter. Peat moss shall not show an acid reaction of less than 3.5 pH.

2.10.2 Peat humus shall be natural peat or peat humus from fresh water saturated areas, consisting of sedge, sphagnum, orreed peat, and shall be such physical condition that it will pass through a 1/2-inch mesh screen. The humus shall be free of sticks, stones, roots, and other objectionable materials. Samples taken at the source of supply shall meet the following requirements:

Acidity:	Not less than 4.0 pH.
Minimum water absorbing ability:	200 percent by weight on oven-dry basis.
Minimum organic content:	60 percent when dried at 105 degrees C.

2.1.10.2.1 Freshly excavated peat, if saturated with water, shall be stored for a sufficient length of time to condition it for workability.

2.10.3 Humus material other than peat humus shall conform to 647.2.

2.11 MULCHES

2.11.1 Wood chips shall be obtained primarily from disease -free green hardwood, shall be 1/4 inch in nominal thickness, and 50 percent shall have an area of not less than one square inch nor more than six square inches. Not more than 2 percent shall consist of leaves, twigs, or shavings, and it shall be free of materials injurious to plant growth. Wood chip mulch must be approved prior to use. Where wood chips are specified, bark may only be used when permitted.

2.11.2 Bark mulch shall be bark chippings graded to be approximately 3/8 inches to 2 inches in width. The chippings shall not have been stored so long and under such conditions that the material has decomposed sufficiently so that it has lost its fibrous texture. Bark mulch must be approved as to grading and condition prior to its use. Where bark mulch is specified, wood chips may only be used when permitted.

2.11.3 Other mulch material may be used upon approval.

2.12 Loam Backfill.

2.12.1 Loam backfill shall be relatively free of roots or rhizomes of witchgrass. No sticks, sods, clods or other material which would tend to form large air pockets in the soil shall be included. The use of muck will not be permitted around any plantings.

2.12.2 Loam backfill shall have minimum and maximum pH values of 6.0 and 7.6. Organic matter, as determined by loss by ignition shall be from 6 percent to 20 percent. Natural topsoil with a pH over 4.5 and over 4 percent organic may be amended to meet these specifications.

2.12.3 A loam source will be sampled and tested by the Engineer so that the results are obtained at least three days prior to planting and prior to the addition of soil amendments. Planting shall not begin prior to loam approval.

2.12.4 After the test results are known, amendments shall be made, when necessary, to meet the minimum pH and organic standards.

2.12.5 To each cubic yard of accepted loam, the following shall be added and thoroughly mixed to produce loam backfill: 2 to 3 cubic feet of well rotted cow manure (dehydrated cow manure at a rate specified by the Engineer); 4 cubic feet of sphagnum peat moss; 15 pounds

of 10-6-4 fertilizer minimum 50 percent water insoluble (WIN); and 20 pounds of ground agricultural limestone.

2.12.5.1 When permitted, individual components of the loam backfill may be added directly to the approved plant pits.

2.12.5.2 Batch size for mixing shall be determined by the Engineer, typically 15 cubic yards.

Construction Requirements

3.1 Planting Seasons.

3.1.1 Unless otherwise directed, seasons for planting shall be within the following dates:

Deciduous Material:

Spring - April 1 to June 15
Fall - September 15 to November 15

Evergreen Material:

Spring - April 1 to May 31
Fall - August 15 to October 30

3.1.2 Preparations for planting may begin earlier than the specified season, and if approved, planting work may continue beyond the specified time limits. However, the Engineer may require that all plants planted out of season, except deciduous material planted prior to April 1 and after
November 15, shall be balled, burlapped and pruned.

3.1.3 No planting shall be done when the site or weather is unsatisfactory for planting, unless permitted.

3.2 Delivery and Inspection.

3.2.1 A preliminary check will be made of all plants at the time of delivery fro condition of the plants and general conformity to the specifications. A more thorough inspection of individual plants will be made just prior to planting. No plants shall be planted which have not received this inspection. In order to facilitate this inspection, the Contractor shall inform the Engineer, at least 24 hours in advance, as to what plants are to be planted and in what location. Any plants which are planted without receive in this inspection will be rejected and, if rejected must be removed and replaced with inspected stock.

3.2.2 Due to the difficulty of identifying dormant plants and to the effect to of handling on the health and vigor of plants, only conditional approval will be given to plants in

preliminary and intermediate inspections. Inspection will continue throughout the life of the contract up to the time of final acceptance. Plants discovered at any time which are not true to name, do not conform to the specifications, show evidence of improper handling or lack of proper care, or which appear to be in a seriously unhealthy condition for any other reason must be removed from the project site at once and replaced by acceptable plants as soon as the planting season allows.

3.2.3 At least 3 days before digging any collected or plantation-grown material, the Contractor shall notify the Engineer of the time and place of digging so that inspection of the work and of the material can be made by the Engineer.

3.3 Protection and Temporary Storage.

3.3.1 The Contractor shall keep all plant material moist and protected from drying out. Protection shall be provided during the time the plants are in transit, in temporary storage, or on the project site awaiting planting.

3.3.2 Unless otherwise approved by the Engineer, plants delivered, but not scheduled for immediate planting, shall be protected as follows:

(a) Bare-root plants shall be heeled-in in moist soil in a satisfactory manner. All plants heeled-in shall be properly maintained by the Contractor until planted.

(b) Balled and burlapped plants shall have the earth balls covered with wood chips or other suitable material and shall be kept in a moist condition.

3.3.3 The Contractor shall exercise the utmost care in loading, unloading or handling of plants to prevent injuries to the branches or to the roots of the plants. The solidity of balled and burlapped plants shall be carefully preserved.

3.3.4 While plants with exposed roots are being transported to and from heeled-in beds, or are being distributed in planting beds, or are awaiting planting after distribution, the Contractor shall protect the roots from drying out by means of wet canvas, burlap or straw, and watering, if necessary. The means employed shall be satisfactory and shall depend on weather conditions and the length of time the roots must remain out of the ground.

3.3.5 Stock left out of the ground unprotected overnight or left with roots exposed to the sun, or otherwise unprotected during transit, unloading, heeling-in or planting will be rejected.

3.4 Layout.

3.4.1 The Engineer may adjust plant material locations to meet field conditions. Plant material locations and bed outlines shall be staked on the project site by the Engineer with the assistance of one contractor employee. Stakes or other approved markers shall be furnished by the Contractor upon request of the Engineer.

3.4.2 Prior to the start of active work on the project, the Contractor shall provide a planting sequence schedule to be used in establishing priorities in laying out plant locations. The Contractor shall give at least 2 days advance notice of any deviations from this schedule. The Engineer will not be responsible for any delay or inconvenience resulting from the Contractor's failure to follow the above procedure.

3.4.3 An artificial appearance in the layout scheme is generally not desired. Except where uniform spacing may be required, as i the case of snow-control planting and the like, some variation in spacing is essential and care must be taken to avoid straight lines and uniform spacing.

3.5 Excavation.

3.5.1 Excavation for plant pits shall not begin before the approved loam backfill is available on the project.

3.5.2 Holes for plant material shall be excavated at the indicated locations and shall be of sufficient size to permit not less than 6 inches of loam backfill beneath and 12 inches around the outer periphery of the root system or ball. Plant pit sizes are shown on the planting detail sheet.

3.5.2.1 Trenching may be ordered for special sites such as long narrow medians. Trenches shall provide a minimum 12 inches of loam backfill beneath and around the outer edge of the plant ball.

3.5.3 When ordered, the soil at the bottom of the plant pit shall be loosened to a depth of at least 6 inches by spading or other approved methods before beginning to backfill each plant pit.

3.5.4 Surplus excavated material or material unsuitable for backfill or saucer construction shall be removed from the site as soon as practicable or disposed of as ordered.

3.5.5 When rock or boulders over 1/3 cubic yard in size are encountered in digging plant pits, the Contractor shall notify the Engineer, who will change the location of the plants. No excavation of rock or boulders over 1/3 cubic yard in volume will be required.

3.5.6 If topsoil on the planting site is acceptable as loam, the topsoil encountered in the excavation may be used for loam backfill when it is kept separate from the subsoil. Soil amendments may be required. See 2.12.4.

3.5.7 In certain areas of poor drainage or heavy soil, the Engineer may require that the soil excavated from the plant pit be spread on the ground adjacent to the pit and neatly distributed so as to raise the grade of the area to provide better surface drainage. Where shown on the plans or directed, such pits may also require ditches. When ditches are

required, they shall be included as a part of the cost of the plant. Beds constructed by trench method must be raised sufficiently to permit drainage to flow alongside and into the bed.

3.5.8 Where permitted, bare-root evergreens such as seedlings or transplants may be planted in the existing soil. Plant holes must be deep enough to allow room for the full depth of the root without doubling, folding, or pruning, and wide enough to allow room for its normal spread. Plants must be set straight and at the same depth at which they were previously growing. Soil must be firmly compacted about the roots, leaving no air pockets. In heavy grass the Engineer may require that the sod be removed or folded back to a distance of 4 to 6 inches from the main stem of each plant, or require herbicide treatment in advance of planting.

3.6 Setting Plants.

3.6.1 General.

3.6.1.1 Plants shall be set to depths appropriate to the various types of material, local drainage and the special requirements of each. In general, plants shall be placed on backfill that has been firmly settled so that the root crown is even with or slightly higher than the ground level. Roses and budded or g rafted plants shall be set at least 3 inches below their previous earth line or as directed.

3.6.1.2 All trees and shrubs shall be planted plumb.

3.6.1.3 As shown on the planting detail sheets, the ground around the plants shall be graded and rims shall be constructed at the edge of the plant pit for each plant, forming a saucer capable of holding sufficient water to give the root system a good soaking. Saucer rims shall be tamped so as to be durable enough to allow several years of watering if necessary. To prevent the growth of weeds and noxious grasses, the rims shall be constructed from soil removed from the plant pits. Imported loam for backfill shall not be used in the construction of the plant saucer rims and every effort shall be made to prevent spillage of loam in the planting area.

3.6.2 Planting and Backfilling Bare-Root Plants.

3.6.2.1 Prepared backfill soil shall be placed in the plant pit to required minimum depth and very slightly tamped. Plants shall then be placed in the center of the pit and roots properly spread out in a natural position. All broken or damaged roots shall be cleanly cut back to sound root growth.

3.6.2.2 Backfill soil shall then be carefully worked around and over the roots, with thorough watering. Care shall be taken to avoid the bruising or breaking of roots.

3.6.3 Planting and Backfilling Balled and Burlapped Plants.

3.6.3.1 Plants of this type shall be handled and placed in holes in such a manner that they soil of the ball will not be loosened. After the hole has been partly backfilled and the soil watered under and around the ball, the burlap and ties shall be cut away or loosened to avoid girdling, and the remaing in burlap adjusted to prevent the formation of air pockets. Backfilling and watering shall then be completed in a manner to avoid loosening the soil of the root ball.

3.6.4 Planting and Backfilling Potted Plants.

3.6.4.1 All containers shall be carefully removed prior to planting. Pot-bound material shall be subject to rejection if proper root pruning cannot be accomplished in a manner acceptable to the Engineer.

3.7 Fertilizing.

3.7.1 Initial fertilization shall consist of the use of dry fertilizer, water-soluble fertilizer or a combination of both as permitted.

3.7.1.1 Dry fertilizer, when not included in the loam backfill, including fertilizer for acid-loving plants as appropriate, shall be uniformly mixed with the loam used as backfill about the plants at the following rates:

(a) Trees: 1-1/2 pounds per inch of caliper.
(b) Shrubs: 1/4 pound per foot of height.
(c) Vines: 1/2 pound per vine.

3.7.1.2 Water-soluble fertilizer, when ordered by the Engineer, including fertilizer for acid-loving plants as appropriate, shall be dissolved in water at the rate recommended by the manufacturer. The thoroughly mixed solution shall be applied at the time of initial planting after the water used for backfill soaking has leached away. Care shall be taken to prevent washing plant saucers away either during the original watering or while applying water- soluble fertilizer.

3.7.1.2.1 The fertilizer solution shall be applied at the following rates:

(a) Seedling plants, except coniferous: 1 pint per plant.
(b) Plants up to 2 feet in height shall receive 4 quarts.
(c) Plants over 2 feet and up to 6 feet shall receive 6 quarts.
(d) Plants over 6 feet and up to 12 feet shall receive 12 quarts.
(e) Plants over 12 feet shall receive 16 quarts.

3.7.2 Refertilization.

3.7.2.1 Unless otherwise ordered, up to two refertilizations shall be done using a water-soluble fertilizer applied in conjunction with watering or by itself. No refertilization

will be allowed between August 1 and plant dormancy and between frozen ground and April 1.

3.7.2.2 All plants except seedlings and root plantings shall be fertilized at least once between April 1 and August 1 with water-soluble fertilizer mixed and applied in accordance with 3.7.1.2 or as directed when applied with a watering. Dry fertilizer for acid-loving plants may be used for such plants provided it is dissolved insufficient water to make a workable solution and the solution is applied around the outside drip line of the branches at the rate of 1/4 pound per foot of height of shrub.

3.7.2.3 When the contract period extends spring to spring, all plants except seedlings and root cutting shall receive an additional application of fertilizer in the spring prior to final acceptance.

3.8 Watering.

3.8.1 The plants shall be watered immediately following planting, preferably when two-thirds of the backfill has been placed so all air pockets are removed and the plant properly set. A later soaking will be made after the saucers are constructed. Additional waterings shall be made at least once every three weeks unless otherwise directed until final acceptance of the contract.

3.9 Guying and Staking.

3.9.1 All trees shall be guyed in a taut manner or firmly staked in accordance with the details shown on the plans as soon as the plant is in place. Anchor stakes shall not protrude more than 8 inches above the ground. Where ordered, three support posts may be required instead of guys and stakes.

3.10 Antidesiccant Spray.

3.10.1 Antidesiccant spray shall be used when directed.

3.11 Pruning.

3.11.1 Pruning shall be done preferably before or immediately after planting in such a manner as to preserve the natural character of each plant. All pruning shall be done by experienced personnel with properly conditioned equipment and in keeping with accepted horticultural practice. Unless otherwise directed, all deciduous plants shall have 1/3 to 1/2 of the potential leaf bearing surface removed.

3.12 Mulching.

3.12.1 Within 48 hours of planting a plant, unless a longer period is allowed, mulch material shall be furnished and placed over all pit or saucer areas of individual trees, shrubs and vines, and over the entire area of shrub beds to the depth indicated on the plans. Mulch

material shall either be bark mulch or wood chips. Saucers shall be inspected prior to placement of mulch or chips.

3.13 Restoration and Cleanup.

3.13.1 Where existing grass areas have been damaged or scarred during planting operations, the disturbed areas shall
be restored to their original conditions as directed at no additional cost to the Department. Mowing may be required when directed by the Engineer to insure complete slope restoration. All debris, spoil piles, containers and the like shall be cleaned up and the project left in an acceptable condition after each planting season. All slopes shall be left in a smooth condition with ruts and excavate soils removed and areas regraded as required.

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3.14 Establishment Period.

3.14.1 The acceptability of the plant material furnished and planted as specified will be determined at the end of the establishment period. The period of establishment shall begin as soon as all plants are planted and shall extend for 1 year or until the date of final acceptance, whichever date is later. During the period, the Contractor shall employ all possible means to preserve the plantings in a healthy condition including: watering, weeding, pesticide application, pruning, repairing saucers and adding mulch, adjusting guys and stakes, replacement of unacceptable plants, together with such other work as may be ordered. Weeding shall be a minimum of 1 foot beyond the limit of the saucers.

3.14.2 An inspection will be made by the Contractor and the Engineer immediately prior to or early in the planting season following the original planting season to determine the condition of the plant material. Dead plants, diseased plants, plants lacking sufficient vigor, or plants showing evidence of sizable die-back will require replacements. Unacceptable plant material must be removed promptly from the project.

3.14.3 The Engineer may require that replacement plants that are not dormant or that are planted late in the planting season shall be sprayed as directed with an approved antidesiccant.

3.14.4 Except as provided in 2.1.1.5, all replacement plantings shall be of the same kind and size as originally

specified. The use of more loam and more initial fertilizer may be waived by the Engineer; otherwise, replacement plantings shall be handled, planted and maintained in the same manner specified for the original plantings.

3.15 Herbicides, Insecticides and Fungicides.

3.15.1 The Engineer may order, or the Contractor may request, the use of an approved herbicide at planting locations when it is determined that the chemical control of weeds is necessary.

3.15.2 The Engineer may order, or the Contractor may request the use of a suitable insecticide or fungicide when it is determined that infestations of insects or plant disease require the use of such material.

3.15.3 All herbicides, insecticides and fungicides shall be applied as prescribed by their manufacturer and in accordance with New Hampshire laws. The Contractor shall either possess from the New Hampshire Pesiticide Control Board the proper registrations and permits for the application of such materials or have the applications made by an approved, qualified firm holding such registrations and permits. Copies of all permits in connection with such materials shall be furnished to the Engineer. All pesticide application within the right-of-way will require a special permit from the New Hampshire Pesticide Control Board.

3.16 Protection Against Rodents.

3.16.1 Rodent protection is a required part of plant care during the life of the contract. Unless otherwise permitted, after planted trees have been inspected, single stemmed deciduous trees shall be promptly wrapped for rodent protection using paper, burlap or plastic manufactured for the purpose. Wrapping shall start at the groundline and extend to the first branches. Whether paper, burlap or plastic is used, the wrapping shall be fastened top and bottom at 1 foot above the bottom, and at 18-inch intervals between or as directed. An approved rodenticide shall be used on all other plants that are susceptible to rodent damage. Approval for the proposed rodenticide and for the method of application must be obtained from the New Hampshire Pesticide Control Board and copies of the approval shall be furnished to the Engineer. A mixture of wood alcohol and rosin may be used in the absence of an approved rodenticide at a ratio as determined by the Engineer.

Method of Measurement

4.1 Plant material will be measured by the number of units of plants in healthy condition, of the specified sizes and species, furnished and planted.

Basis of Payment

5.1 All work performed will be paid for as provided under the appropriate Sections 651 through 658 in accordance with the following schedule for partial payments:

(a) Upon approval of all work in connection with initial planting of each specie delivered, including watering, guying, stacking and mulching, 90 percent of the accepted quantity of each specie may be paid.
(b) Upon completion of the replacement of all plant matter so ordered an additional five percent of all species may be paid.
(c) The balance of all acceptable trees not paid previously, will be paid after the final acceptance.

5.2 When substitutions are approved, payment will be by supplementary agreement.

5.2.1 Any non-bid substitution of collected stock as described in 2.1.1.5 will be subject to a price reduction of 25%.

5.3 Excessive damage due to heavy insect infestation, if all reasonable precautions are taken by the Contractor, will be reason for consideration of extra payment for approved replacements.

SECTION 692 -- MOBILIZATION

Description

1.1 This item shall consist of preparatory work and operations, including but not limited to, those necessary to the movement of personnel, equipment, supplies, and incidentals to the site of the work; and for all other work and operations which must be performed or for costs which must be incurred prior to beginning work on the various items.

Method of Measurement

4.1 This item will be measured as a Unit.

Basis of Payment

5.1 Partial payments for this item will be made approximately as follows:

(a) When 5 percent of the original contract amount is earned, 25 percent of the amount bid, or 2-1/2 percent of the original contract amount, whichever is the lesser, will be paid.

(b) When 10 percent of the original contract amount is earned, 50 percent of the amount bid, or 5 percent of the original contract amount, whichever is lesser, will be paid.

(c) When 25 percent of the original contract amount is earned, 60 percent of the amount bid, or 6 percent of the original contract amount, whichever is lesser, will be paid.

(d) When 50 percent of the original contract amount is earned, 100 percent of the amount bid, or 10 percent of the original contract amount, whichever is lesser, will be paid.

5.2 Upon completion of all work, payment of any amount bid for this item in excess of 10 percent of the original contract amount will be paid.

5.3 Upon written request by the Contractor made within 30 days of the Award of Contract, an amount equal to 25 percent of the amount bid for this item or 1 percent of the contract amount, whichever is lesser, will be paid. Further partial payments will be made according to the schedule in 5.1.

5.4 The total sum of all payments will not exceed the original contract amount bid for this item, regardless of the fact that the Contractor may have, for any reason, shut down his work on the project or moved equipment away from the project and then back again.

5.5 When the item for mobilization is not included in the proposal form, the costs as described in the item will not be paid for directly, but shall be considered incidental to other items in the proposal.

Pay item and unit:

692	Mobilization	Unit

SECTION 699 -- TEMPORARY PROJECT WATER POLLUTION CONTROL (SOIL EROSION)

Description

1.1 This work shall consist of temporary control measures as shown on the plans or required during the life of the contract to control water pollution. This work includes but is not necessarily limited to the use of pipes, berms, dams, sediment basins, fiber mats, filter fabrics, netting, erosion control stone, gravel, mulches, grasses, slope drains and other erosion control devices or methods.

1.2 The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features specified elsewhere in the contract to the extent practicable to assure economical, effective and continuous erosion control throughout the construction and post construction periods.

1.3 The quantity of work required will depend upon many factors, among which is the amount of soil which may be exposed to erosion. The Contractor's attention is called to the fact that siltation of streams adversely affects the ecology.

Materials

2.1 Mulches may be hay, straw, fiber mats, netting, wood cellulose, bark, chips or other acceptable material and shall be reasonably clean and free of noxious weeds and deleterious materials.

2.2 Slope Drains may be constructed of rigid or flexible pipe, fiber mats, rubble, concrete of bituminous sluices, plastic sheets or other acceptable material that will protect slopes from erosion.

2.3 Grass shall be a quick growing specie suitable to the area, such as rye or cereal grass, providing a temporary cover which will not compete with the grasses subsequently sown for permanent cover.

2.4 Fertilizer and Soil Conditioners shall be an acceptable standard commercial grade.

2.5 Erosion Control Stone shall be as specified for 585.

Construction Requirements

3.1 At the pre-construction conference or prior to the start of the applicable construction, the Contractor shall submit for acceptance a written schedule for accomplishment of temporary and permanent erosion control work for clearing,
grubbing, grading and drainage, especially in or adjacent to existing waters or water courses. This schedule shall include proposed methods of erosion control on haul roads and borrow pits and shall also include plans for disposal of waste materials.

3.1.1 No work shall be started until the erosion control schedule and methods of operation have been approved.

3.2 The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time, as specified on the plans and as outlined in the approved schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction; that are needed prior to installation of permanent pollution control features; or that are needed to temporarily control erosion not associated with permanent control features.

3.2.1 When erosion is likely to be a problem, grubbing operations shall be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter.

3.3 The Engineer will limit the area of grubbing, excavation, borrow and embankment operations commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and permanent pollution control measures concurrent with operations in accordance with the accepted schedule.

3.3.1 Under no conditions shall the amount of surface area of erodible earth material exposed at one time by grubbing, excavation, borrow and fill operations within the right-of-way exceed 250,000 square feet without prior approval.

3.3.2 Earth excavation and embankment slopes shall be seed and mulched by or before the time the slant height of exposed untreated slopes reaches 30 feet, or when work in the area is suspended.

3.3.3 As work progresses, patch seeding and mulching shall be done as required on areas previously treated to maintain or establish protective cover.

3.4 Drainage pipes and ditches shall be constructed in a sequence from outlet to inlet in order to stabilize outlet areas and ditches before water is directed to the new installation or any portion thereof unless conditions unique to the location warrant written approval of an alternative method.

3.4.1 Channel and ditch work, including erosion protection items, shall be completed before diversion of the drainage is accomplished unless conditions exist as stated in 3.4. Any temporary relocation of a brook bed shall be properly protected where necessary to prevent erosion pollution.

3.5 In the event of conflict between these requirements and pollution control laws, rules or regulations of Federal, State and local agencies, the more restrictive laws, rules or regulations shall apply.

3.6 Erosion control features shall be maintained by the Contractor throughout the life of the project.

Method of Measurement

4.1 Temporary erosion and pollution control work required to be performed not attributed to the Contractor's negligence, carelessness or failure to install controls will be computed either in the same manner as Extra Work or where such work falls within the specifications for a contract item, a computation will be made using the appropriate quantity multiplied by the contract unit price to obtain the proper dollar value to be summarized under this item.

Basis of Payment

5.1 Payment for work authorized under this item will be paid on an allowance basis as computed in 4.1.

5.1.1 Specific costs incurred during the construction and maintenance of temporary erosion control devices associated with water control such as settlement basins, hay bales, channel lining and stone ditches will be included for payment under this item.

5.2 Payment for the following work will not be allowed under this item.

5.2.1 The Contractor shall provide for the temporary diversion of water during pipe construction and for the dewatering, pumping and control of water when necessary. This work will be subsidiary to the pertinent contract items.

5.2.2 Temporary erosion and pollution control measures required due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the scheduled work shall be required at borrow pits, disposal areas, on-site and off-site haul roads, equipment storage sites and material processing sites shall also be at the Contractor's expense.

5.3 In case of failure on the part of the Contractor to control erosion, pollution, or siltation, the Department
reserves the right to employ outside assistance or to use its own forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's estimates.

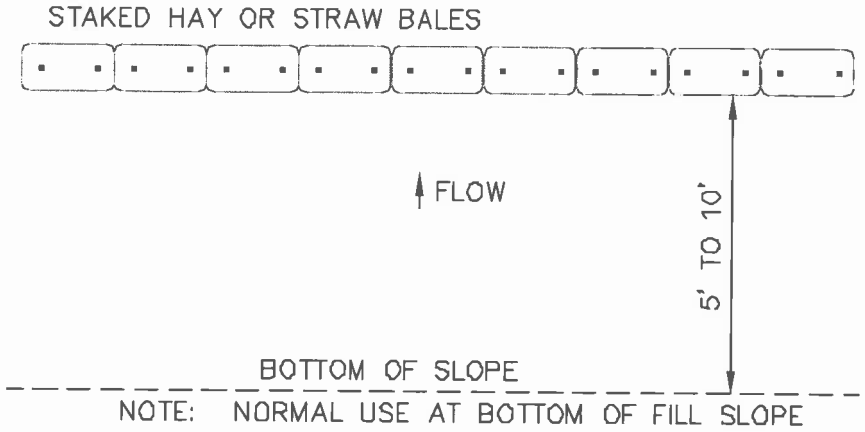
5.4 The Bidder's attention is called to the price inserted in the proposal under this item, which price is the amount the City has set for temporary pollution control measures. This amount, (1) must not be altered by the Bidder on the proposal and (2) must be included to obtain the grand total of the bid.

5.4.1 Payment of the amount set in the proposal will not be on a lump sum basis, but only the dollar value as authorized will be paid.

5.5 When no money is allocated in the proposal under this item, it is anticipated that this work will be of minor significance and will be the responsibility of the Contractor.

Pay item and unit:

699	Temporary Project Water Pollution Control	Allowance

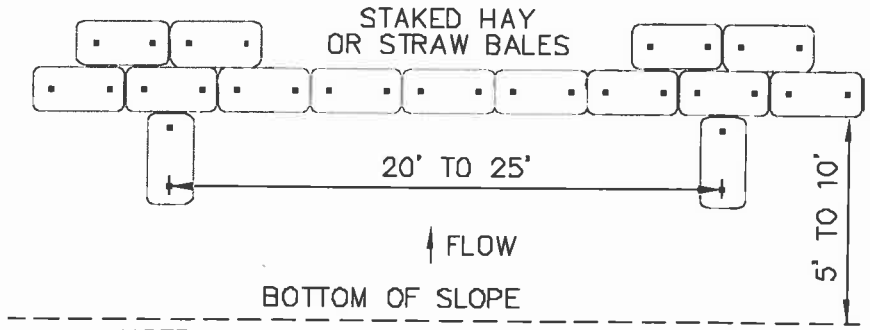


NOTE: NORMAL USE AT BOTTOM OF FILL SLOPE

EROSION PROTECTION TYPE 'A'

NOT TO SCALE

FIG. 699–1



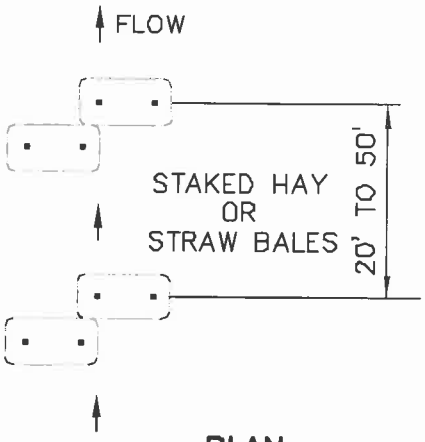
NOTE: NORMAL USE AT BOTTOM OF FILL SLOPE
WHERE HEAVY FLOW MAY BE ANTICIPATED

EROSION PROTECTION TYPE 'B'

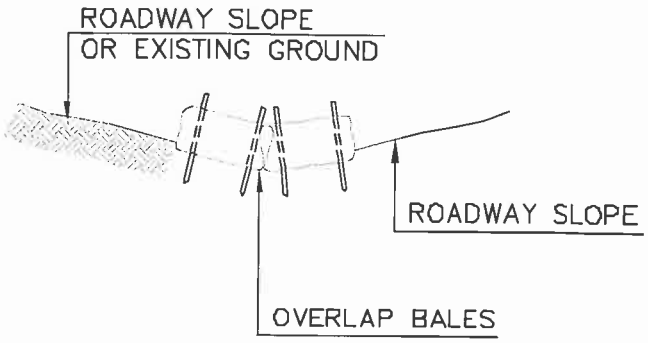
S:\DMC\DETAILS\699-1 699-2 EROS-A-B

NOT TO SCALE

FIG. 699–2



PLAN



ELEVATION

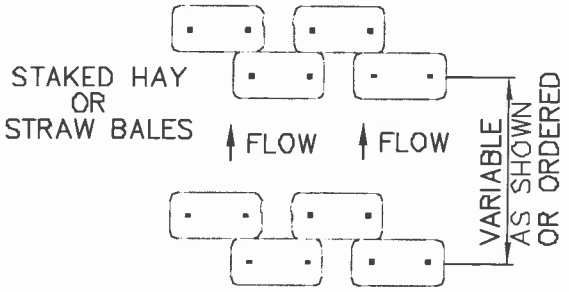
NOTE: NORMAL USE IN NARROW DITCH SECTION

EROSION PROTECTION TYPE 'C'

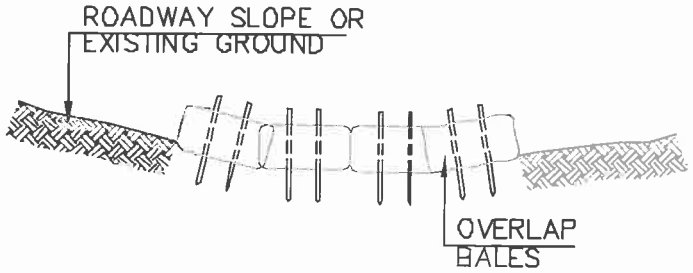
S:\DWG\DETAILS\699-3 EROS-C.DWG

NOT TO SCALE

FIG. 699-3



PLAN



ELEVATION

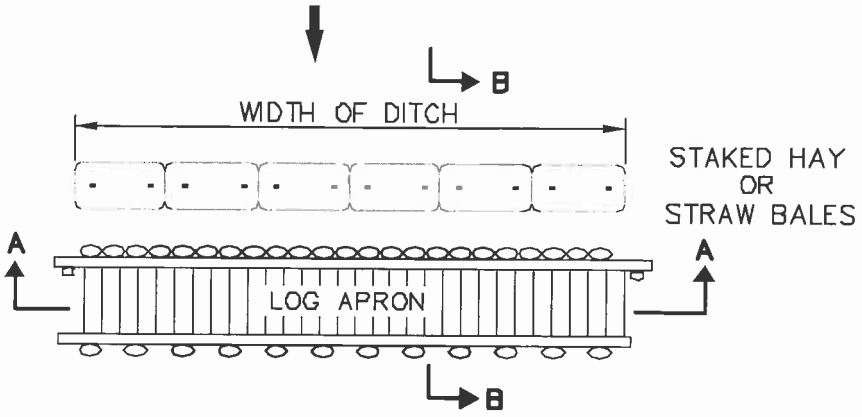
NOTE: NORMAL USE IN WIDE DITCH SECTION

EROSION PROTECTION TYPE 'D'

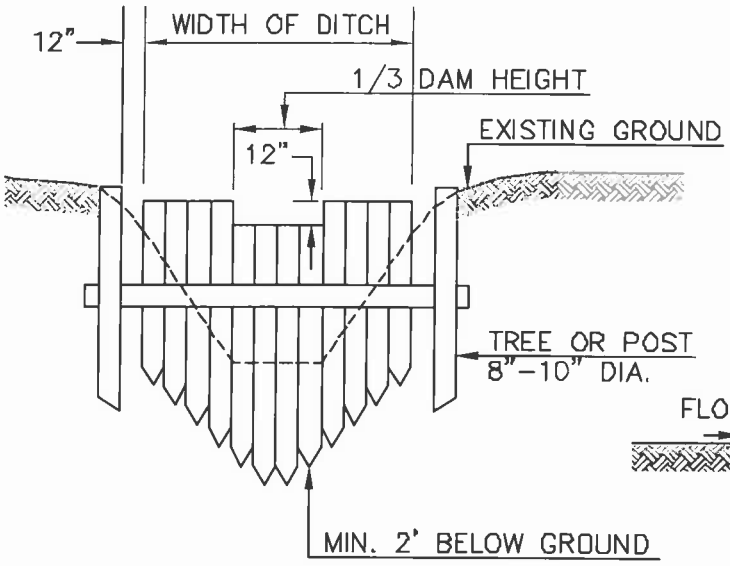
S:\DWG\DETAILS\699-4 EROS-D.DWG

NOT TO SCALE

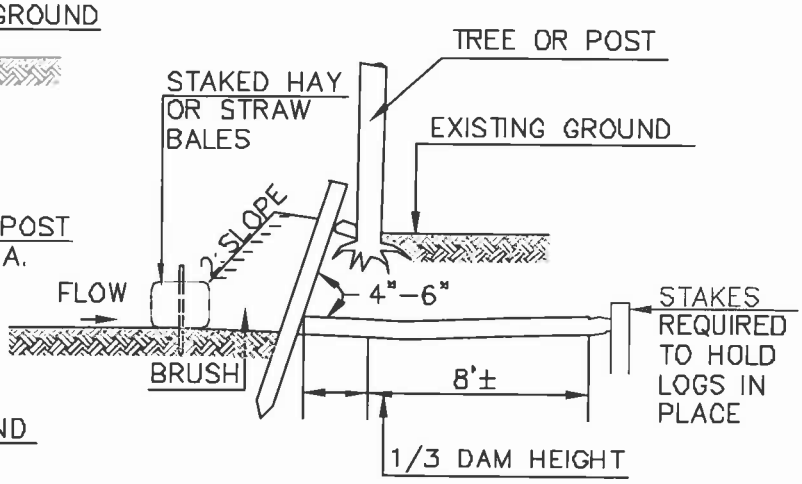
FIG. 699-4



PLAN



SECTION A–A



SECTION B–B

ELEVATION

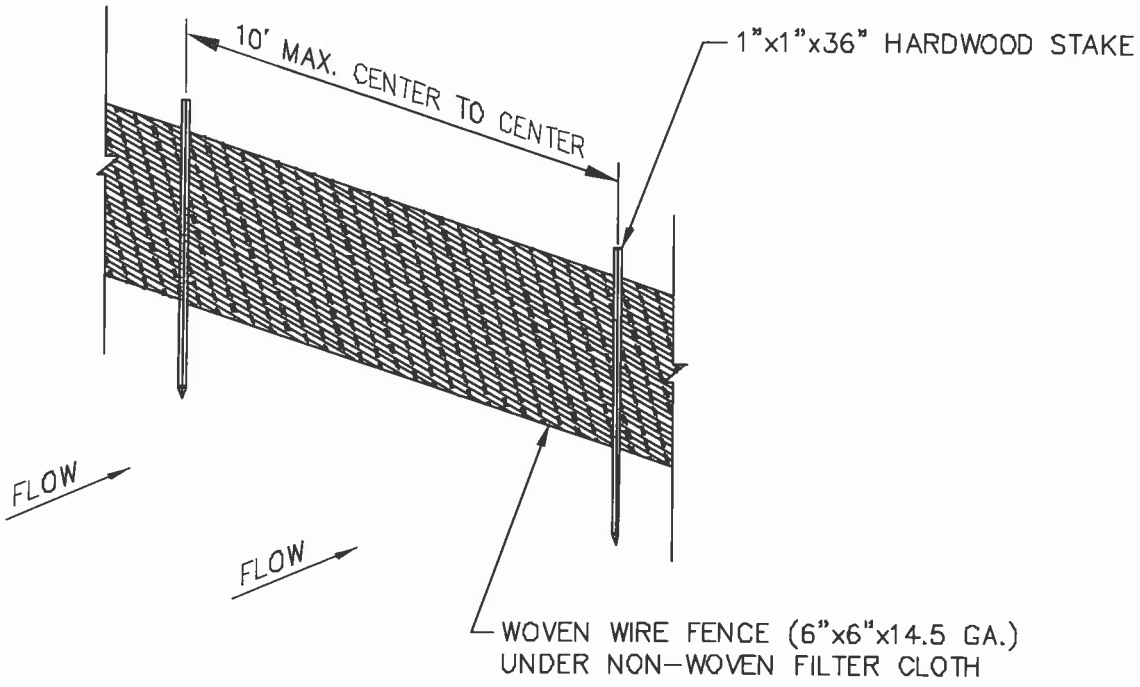
NOTE: NORMAL USE IN, OR JUST UPSTREAM OF WATER COURSE.

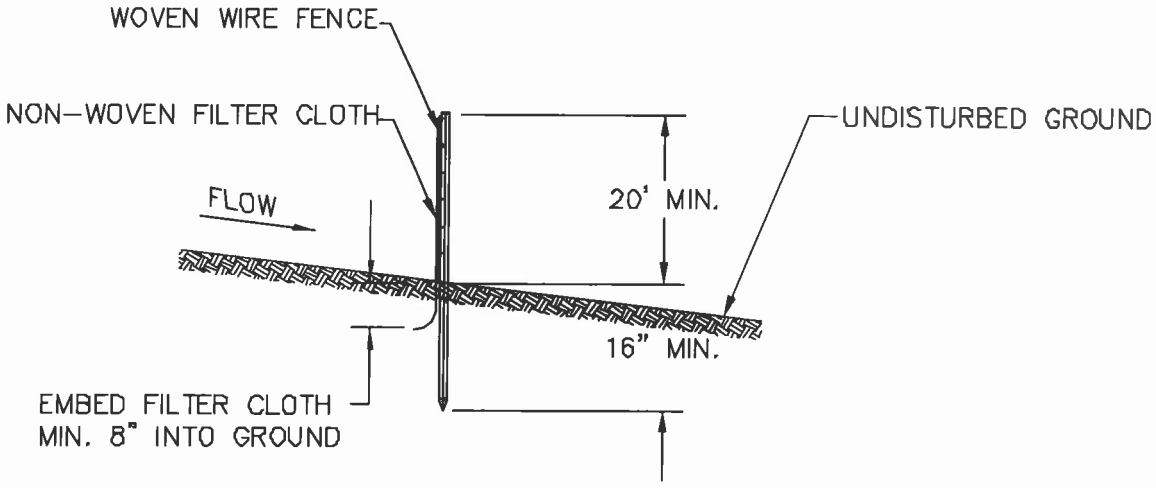
EROSION PROTECTION TYPE 'E'

S:\DWG\DETAILS\699-5 EROS-E.DWG

NOT TO SCALE

FIG. 699–5



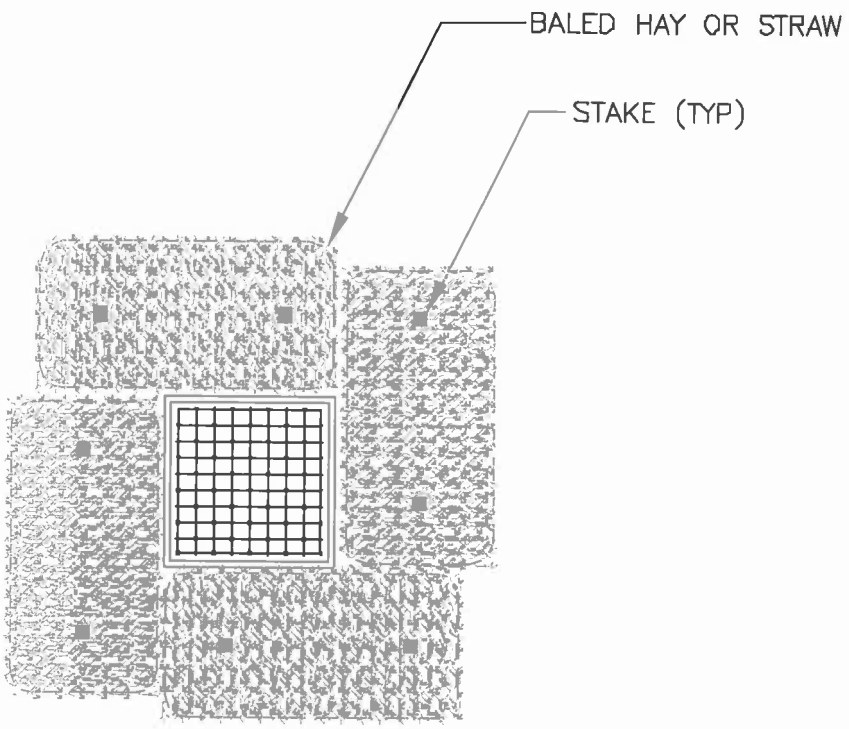


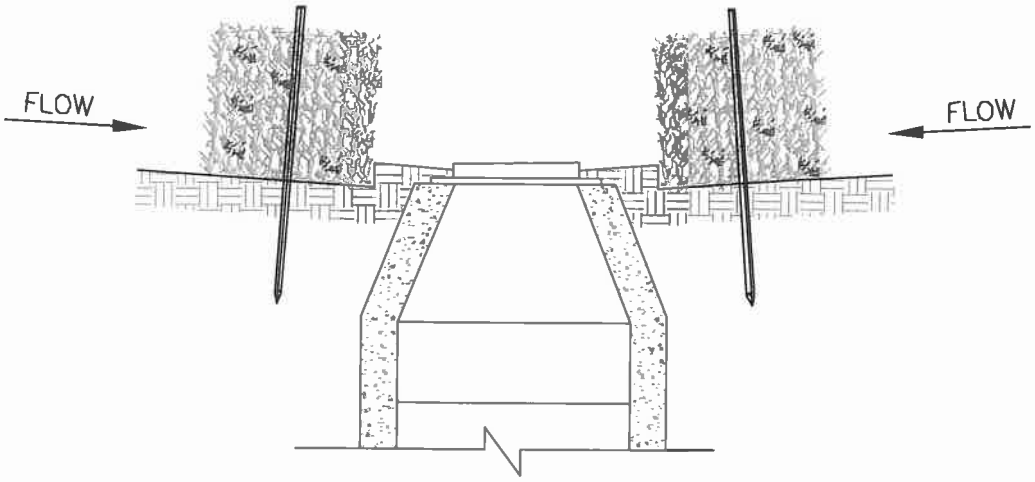
SILT FENCE DETAIL

S:\DWG\DETAILS\699-6 SILTFENC.DWG

NOT TO SCALE

FIG. 699-6



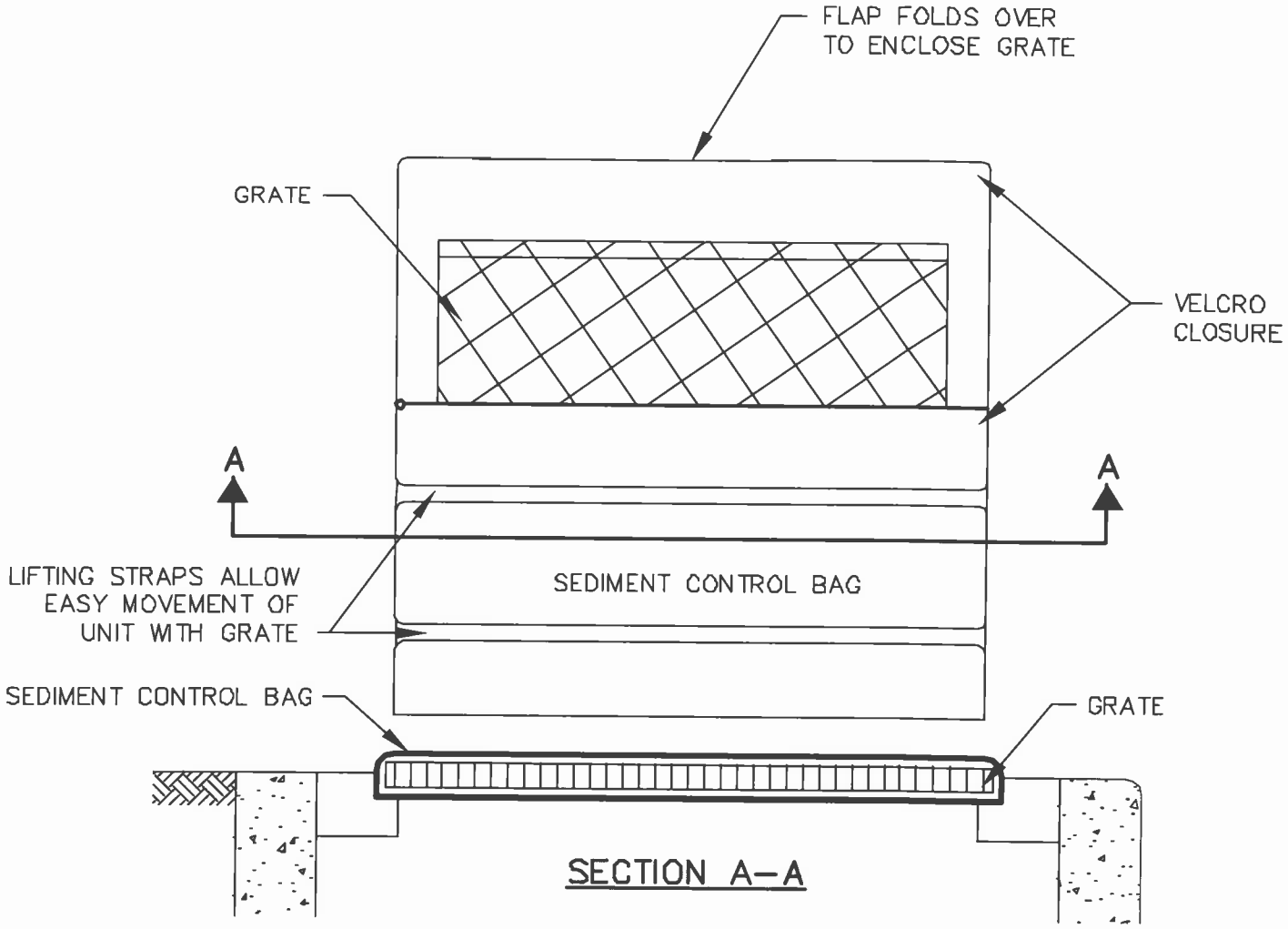


SEDIMENTATION CONTROL AT CATCH BASINS

S:\DWG\DETAILS\699-7 EROS-CB.DWG

NOT TO SCALE

FIG. 699-7



INSTALLATION:
STAND GRATE ON END. PLACE BAG OVER GRATE.
ROLL GRATE OVER SO THAT OPEN END IS UP.
PULL UP SACK.
TUCK FLAP INSIDE TO COMPLETELY ENCLOSE THE GRATE. BE SURE END OF GRATE IS COMPLETELY COVERED BY FLAP OR BAG WILL NOT WORK PROPERLY. HOLDING HANDLES, CAREFULLY PLACE BAG WITH GRATE INSERTED INTO CATCH BASIN FRAME.

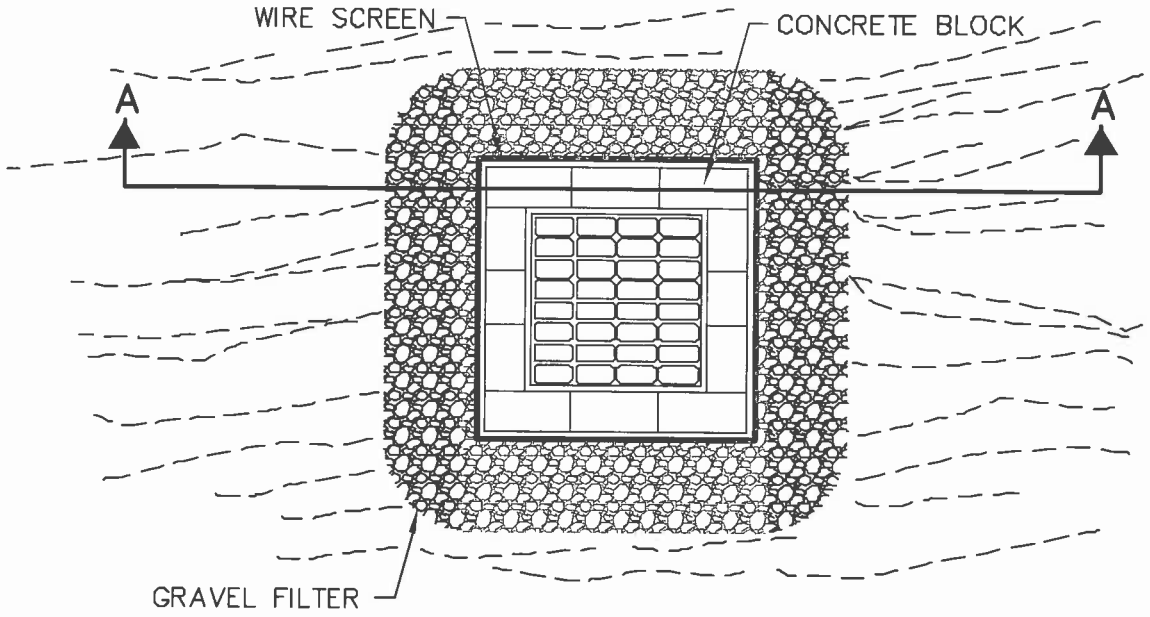
MAINTENANCE:
WITH A STIFF BRISTLE BROOM OR SQUARE POINT SHOVEL, REMOVE SILT & OTHER DEBRIS OFF SURFACE AFTER EACH EVENT. REMOVE FINE MATERIAL FROM INSIDE ENVELOPE AS NEEDED.

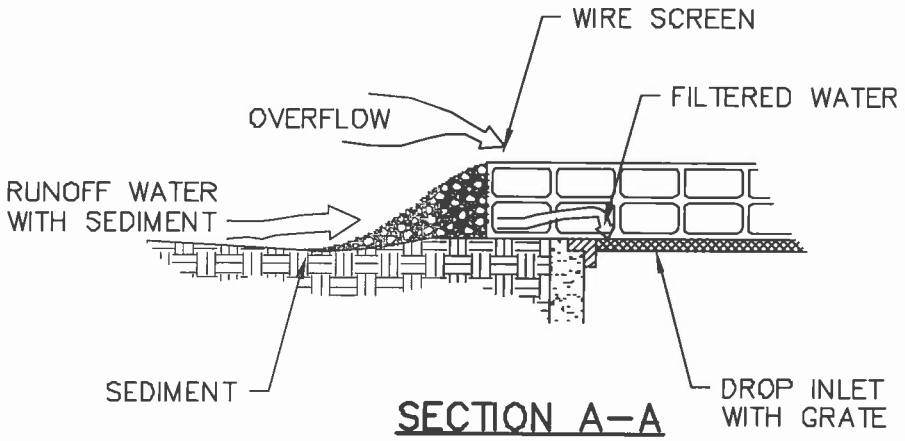
SEDIMENT CONTROL BAG FOR CATCH BASIN

S:\DWG\DETAILS\669-8 SED CNTRL BAG.DWG

NOT TO SCALE

FIGURE 669–8





SECTION A–A

BLOCK & GRAVEL DROP INLET SEDIMENT FILTER

THIS PRACTICE IS SHOWN IN FIGURE 699–9 AND SHOULD BE CONSTRUCTED AS FOLLOWS:

1. CONCRETE BLOCKS SHOULD BE PLACED LENGTHWISE ON THEIR SIDES IN A SINGLE ROW AROUND THE PERIMETER OF THE INLET. THE ENDS OF EACH BLOCK SHOULD BE ABUTTING. THE HEIGHT OF THE BARRIER CAN BE VARIED DEPENDING ON THE DESIGN BY STACKING VARIOUS COMBINATIONS OF DIFFERENT SIZED BLOCKS. THE BARRIER SHOULD BE A MINIMUM OF 12 INCHES HIGH AND A MAXIMUM OF 24 INCHES HIGH.

2. HARDWARE CLOTH OR WIRE MESH SHOULD BE PLACED OVER THE OPENINGS OF THE CONCRETE BLOCKS AND EXTENDED AT LEAST 12 INCHES AROUND THE OPENING TO PREVENT AGGREGATE FROM BEING TRANSPORTED THROUGH THE OPENINGS IN THE BLOCK.

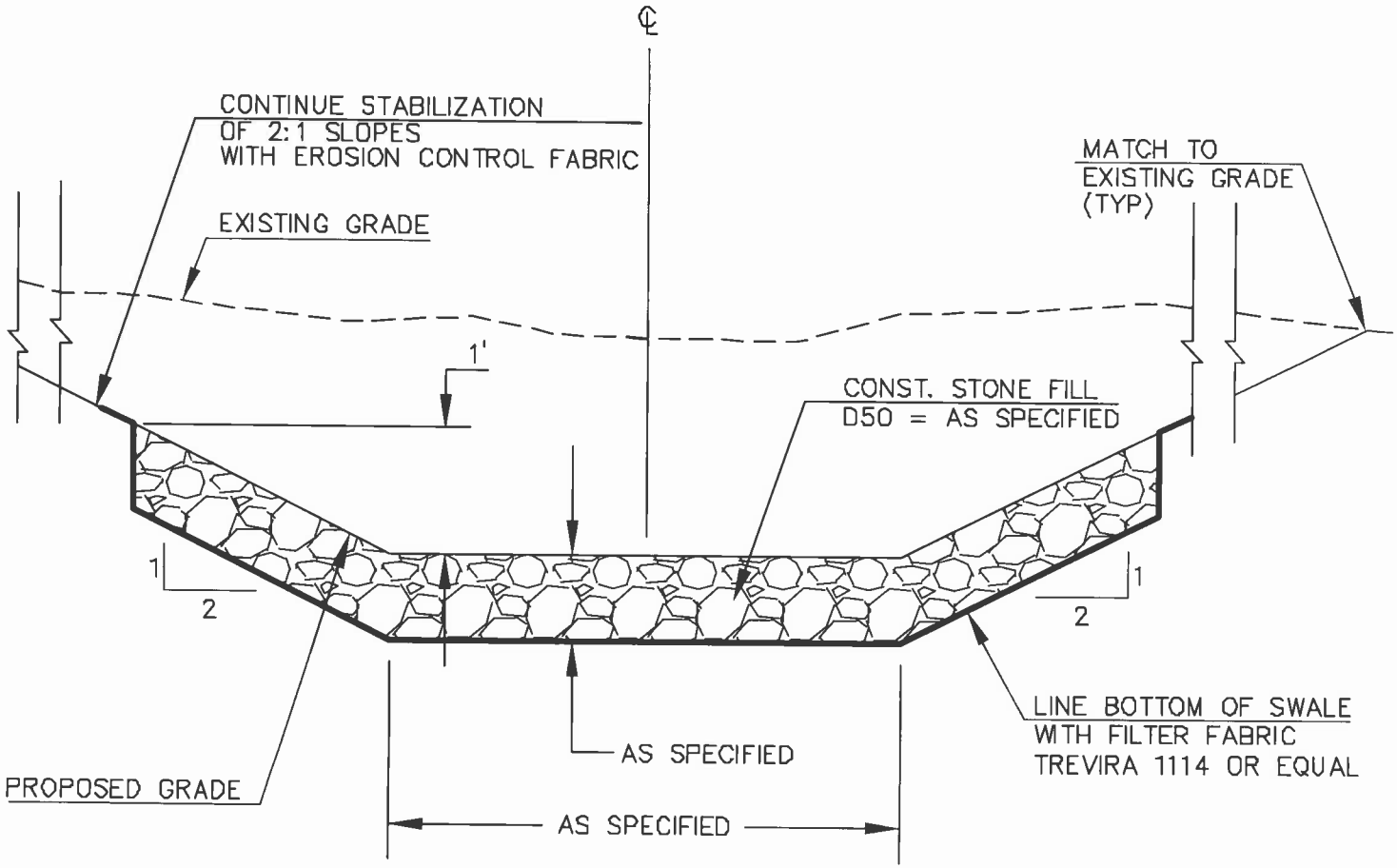
3. SEWER STONE OR OTHER CLEAN COARSE AGGREGATE SHOULD BE PLACED AGAINST THE BLOCK TO THE TOP OF THE BARRIER.

BLOCK & GRAVEL DROP INLET SEDIMENT FILTER

S:\DWG\DETAILS\699-9 Block & Gravel D.I. Sed Fltr.DWG

NOT TO SCALE

FIGURE 669–9

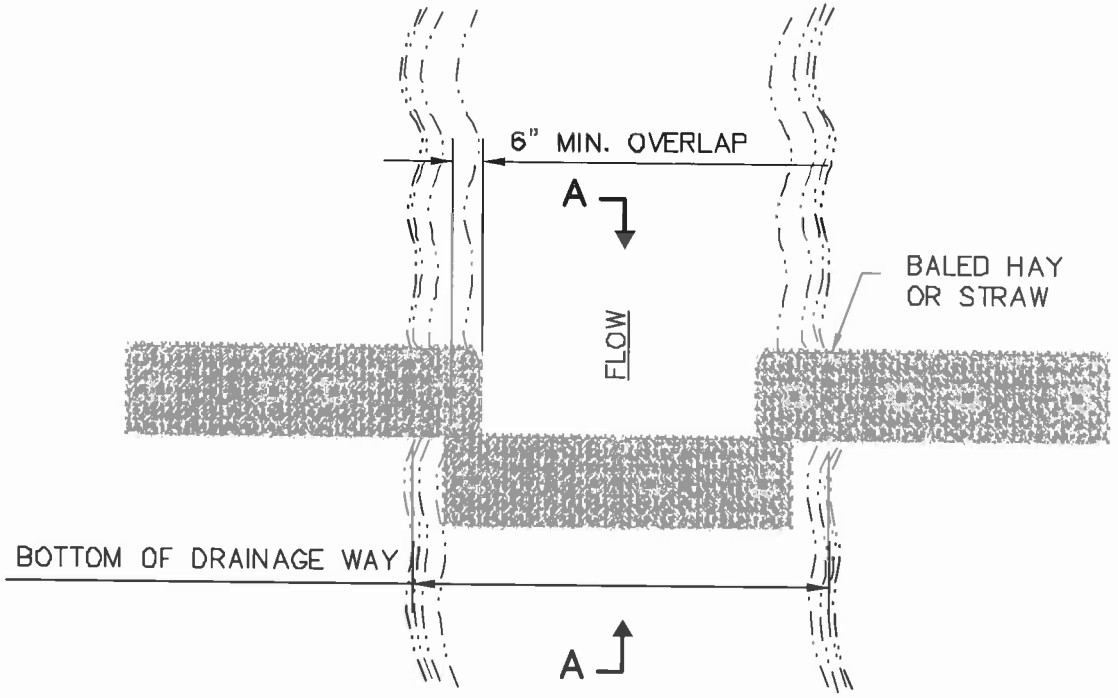


RIP-RAP SWALE DETAIL

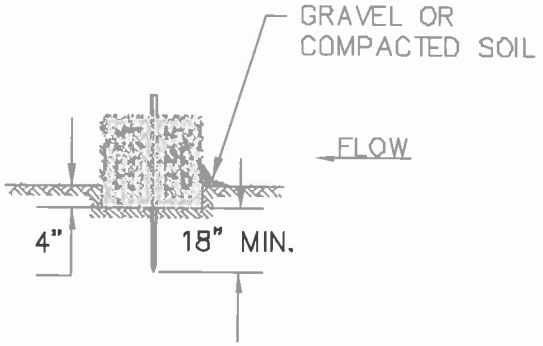
S:\DWG\DETAILS\699-10 RIP-RAP-SWALE.DWG

NOT TO SCALE

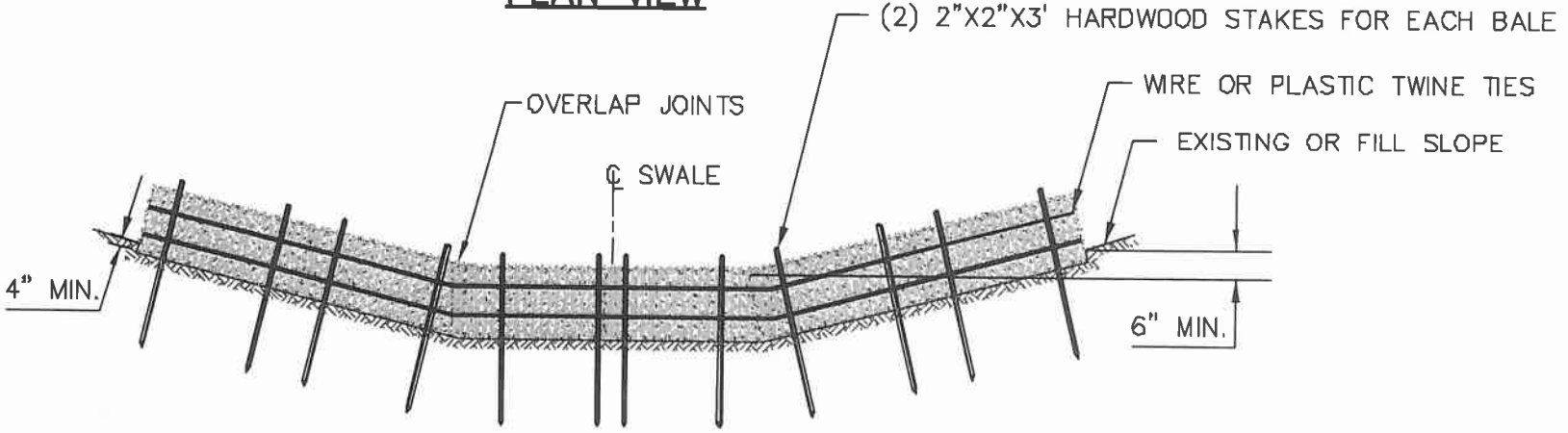
FIG. 699-10



PLAN VIEW



SECTION A–A



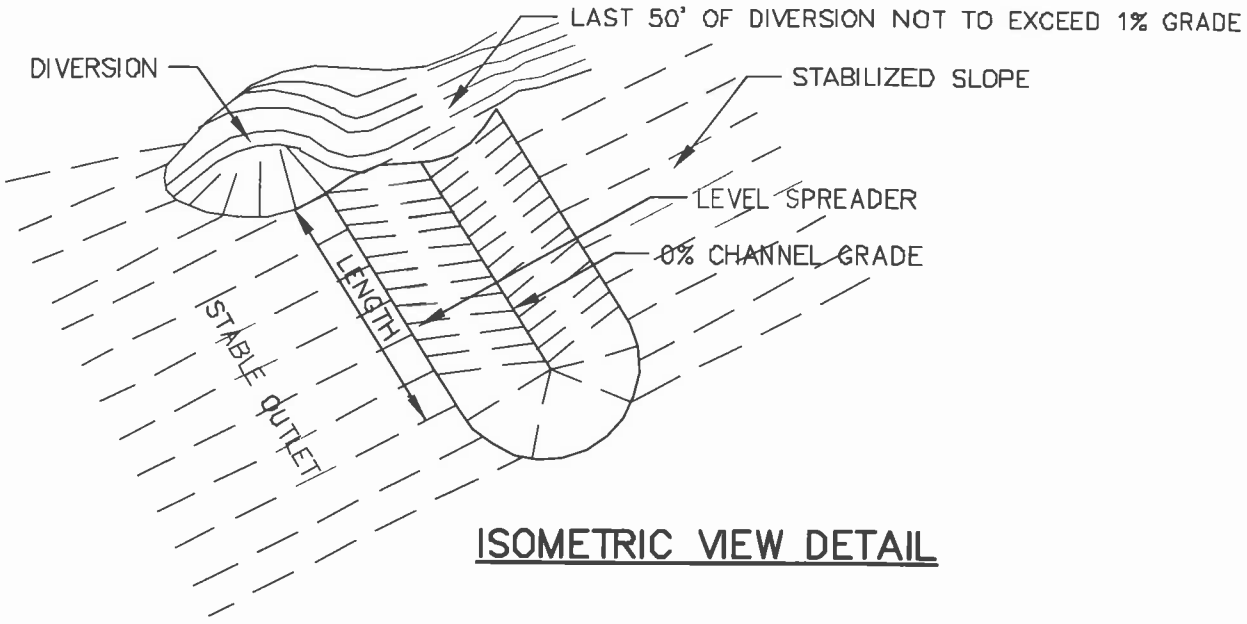
DRAINAGE WAY CROSS SECTION

DETAIL – HAY BALE CHECK DAM

S:\DWG\DETAILS\699-11 CHECKDAM.DWG

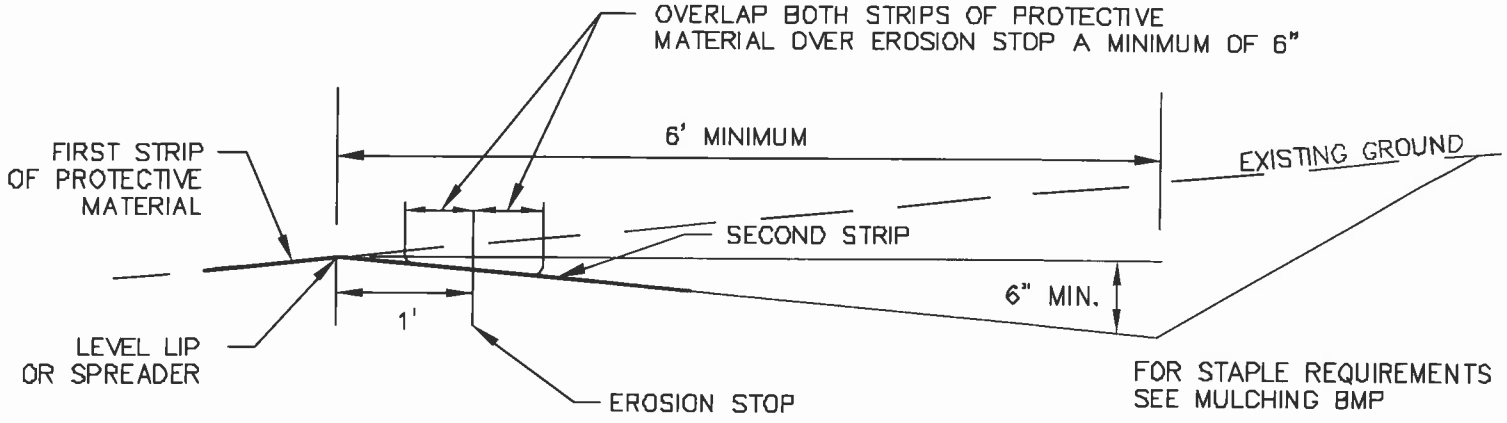
NOT TO SCALE

FIG. 699–11



ISOMETRIC VIEW DETAIL

NOT TO SCALE



CROSS SECTION DETAIL

LEVEL SPREADER DETAIL

S:\DWG\DETAILS\699-12 LEVEL SPREADER.DWG

NOT TO SCALE

FIG. 699-12