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.

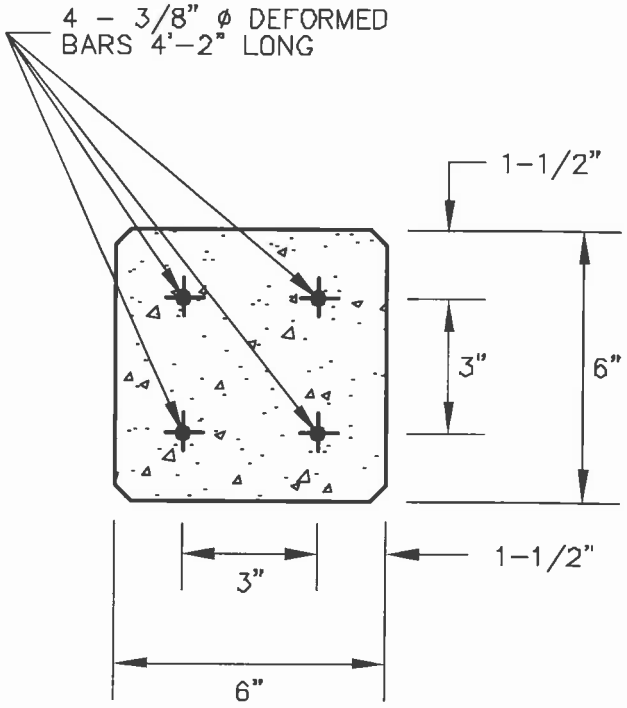
5.1.2 No extra allowance will be made for handling of bounds to be reset or for any excavation required to remove bounds from their original sites.

5.1.3 Pins used as specified in 3.1.5 will be subsidiary.

Pay Items and Units:

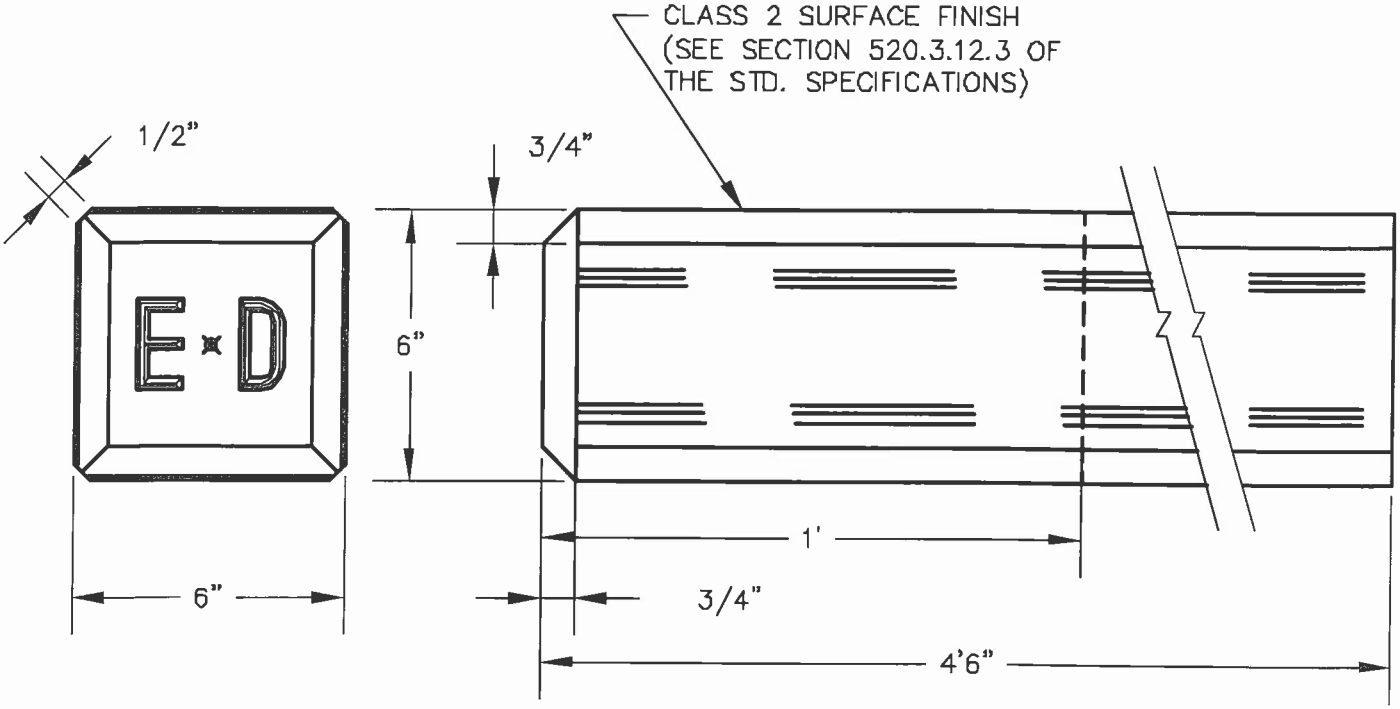
622.2	Concrete Bounds	Each
622.4	Stone Bounds	Each
622.52	Resetting Bounds	Each
622.9	Rock Excavation for Bounds*	C.Y.

*Not a bid item. See 5.1.1



SECTION

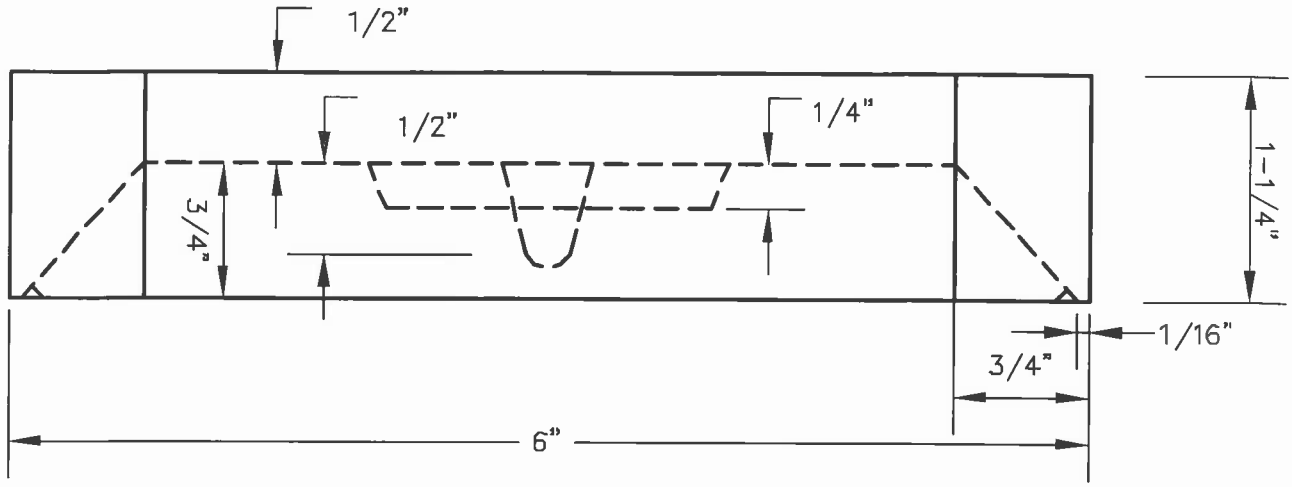
NOTE: CONCRETE SHALL BE CLASS A. COARSE AGGREGATE TO BE SIZE NO. 4 TO 1". ALL FACES OF BOUND MUST BE FREE FROM HONEYCOMB. BOUNDS TO BE SET IN GRAVEL, 9" ON ALL SIDES OF AND UNDER BOUND.

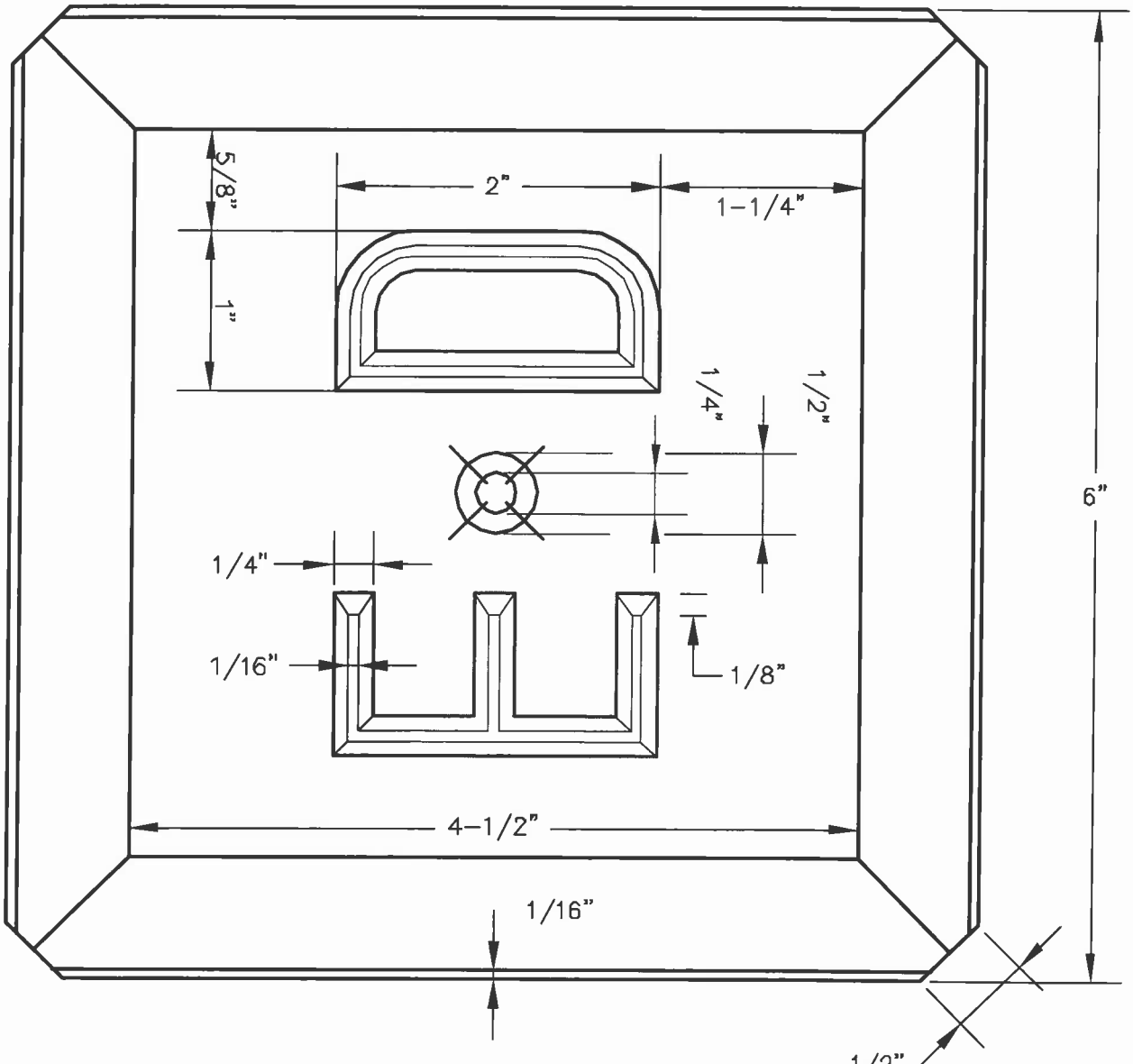


DETAIL OF CONCRETE BOUND

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