Department of Public Works Nassau County, N.Y.

Bid Sheet for Contract: H6158765G

Item No	Engineers Estimate	Item Description			
1	1.00 LS	Clearing and Grubbing	For:		
1M	1.00 LS	Mobilization	For:		
2	291.00 CY	Unclassified Excavation	For:		
4A	50.00 SY	Cement Concrete Breaking (Pavement)	For:		
5C	291.00 CY	Selected Fill	For:	Contingent	
7	360.00 SY	Preparing Fine Grade	For:	Contingent	
12H	885.00 LF	Cleaning Existing Drainage System	For:	Contingent	
12H-X	136.00 EACH	Cleaning Existing Drainage System-Catch Basin	For:	Contingent	
15	46.00 EACH	Altering Catch Basins	For:		
16SS-1	4.00 EACH	Change Elevation of Sanitary Sewer Manholes (Minor Adjustment)	For:	Contingent	
16SS-3	4.00 EACH	Change Elevation of Drainage Manholes & Drop Inlets (Major Adjustment)	For:	Contingent	
24V	100.00 CY	Concrete Valley Gutter	For:		
26	2,595.00 LF	Concrete Curb	For:		
26CG	100.00 LF	Monolithic Concrete Curb and Gutter	For:		

Department of Public Works Nassau County, N.Y.

Bid Sheet for Contract: H6158765G

Item No	Engineers Estimate	Item Description			
27	2,831.00 SF	Cement Concrete Sidewalk	For:		
27DW	530.00 SF	Detectable Warning Surface	For:		
28	8,795.00 SF	Cement Concrete Driveways and Driveway Aprons	For:	Contingent	
29	2,940.00 SF	Driveway Restoration	For:	Contingent	
34	8,610.00 LB	Miscellaneous Metals	For:		
36C	155.00 TON	Aspahlt Concrete Truing and Leveling Course-Type 1A	For:		
36CX	400.00 TON	Asphalt Concrete Truing and Leveling Course Type 1A	For:		
36DRAR	14,709.00 TON	Rut Avoidance Asphalt Concrete Type 1A (Top RA Resurfacing)	For:		
58RPC	783.00 LF	Saw Cutting Existing Roadway Pavement and Concrete	For:		
102	1.00 LS	Work Zone Traffic Control	For:		
102D	122.00 DAY	Flashing Arrow Board	For:		
102PVMS	414.00 DAY	Portable Variable Message Sign	For:		
111	645.00 SY	Removal and Replacement of Pavements	For:		
112	176.00 EACH	Adjusting Manholes	For:		
114	173.00 EACH	Adjustment of Water Appurtenances	For:		

Department of Public Works Nassau County, N.Y.

Bid Sheet for Contract: H6158765G

Item No	Engineers Estimate	Item Description			
115	2,210.00 LF	Butt Joints	For:		
116A	153,616.00 SY	Profiling and Removal of Asphalt Pavement	For:		
132	86.00 EACH	Plowable Raised Reflectorized Pavement Markers	For:		
133A	9,310.00 LF	Cleaning and Resealing of Longitudinal Joints in Portland Cement Concrete Pavement	For:		
133X	1.00 LS	Clean and Fill Joints and Cracks	For:		
136S	1.00 DAY	Survey Stakeout (Per Day)	For:		
136X	92.00 SHFT	Survey Stakeout	For:		
137	10,300.00 LF	Remove Existing Traffic Markings	For:	Contingent	
138	525.00 SY	Asphalt Joint Repair	For:		
141B	96.00 EACH	Silt Protection For Surface Inlet Drainage Structures	For:		
141C	121.00 EACH	Silt Protection For Curb Inlet Drainage Structures	For:		
199	1.00 LS	Interim Payments (Force)	For:		
199AX	1.00 LS	Asphalt Price Adjustment (Force)	For:		
206.0301 0010	65.00 LF	Conduit Excavation and Backfill - (Restoring Top Surfaces Not Included)	For:		
206.0310 0010	10.00 LF	CONDUIT EXCAVATION AND BACKFILL (RESTORING INCLUDED)	For:		

Item No	Engineers Estimate	Item Description			
368	3,254.00 SY	Topsoil and Grass Seed	For:		
372A	7.00 EACH	Tree Removal - A - (<6" Caliper)	For:		
372B	3.00 EACH	Tree Removal - B - (6" - <12" Caliper)	For:		
372C	6.00 EACH	Tree Removal - C - (12" - <24" Caliper)	For:		
372D	2.00 EACH	Tree Removal - D - (24" - <36" Caliper)	For:		
374A	7.00 EACH	Stump Grinding -A- (4" - <6" Diameter)	For:		
374B	3.00 EACH	Stump Grinding -B- (6" - <12" Diameter)	For:		
374C	6.00 EACH	Stump Grinding -C- (12" - <24" Diameter)	For:		
374D	2.00 EACH	Stump Grinding -D- (24" - <36" Diameter)	For:		
419S-075	100.00 LF	Furnish and Install 3/4 Inch Diameter Steel Conduit	For:	Contingent	
420R	1.00 EACH	Regrade a Pullbox Frame and Cover	For:		
422L	5,990.00 LF	Furnish and Install Loop Wire	For:		
422LS	2,165.00 LF	Furnish and Install Loop Saw Cut	For:		
450	6.00 EACH	Furnish and Install Post Mounted Sign	For:		
606.27	2.00 EA	HPBO (Mod.) CORRUGATED BEAM GUIDE RAILING END TERMINAL (ENERGYABSORBING)	For:		

Item No	Engineers Estimate	Item Description			
606.2701	270.00 LF	HPBO (MOD.) Corrugated Beam Guide Railing	For:		
606.2702	380.00 LF	HPBO (Mod.) CORRUGATED BEAM GUIDE RAILING WITH EXTA LONG POSTS AT 3'-1 1/2" SPACING	For:		
606.2703	2.00 EACH	Anchorage Unit for HPBO (MOD.) Corrugated Beam Guide Railing	For:		
606.71	270.00 LF	Removing and Disposing Corrugated Beam Guide Railing	For:		
606.75	211.00 LF	REMOVING & DISPOSING CONCRETE BARRIER	For:		
606.79	2.00 EA	REMOVING AND DISPOSIG ANCHORAGE UNITS FOR CORRUGATED BEAM GUIDE RAILING AND MEDIAN BARRIER	For:		
680.5001	3.00 CY	Pole Excavation and Concrete Foundation	For:		
680.5105 0010	1.00 EACH	Pullbox, Rectangular Reinforced Concrete (26 Inch X 18 Inch)	For:		
680.5111 1010	1.00 EACH	Slip Resistant Surface for Cast Iron Pull Box Covers	For:		
680.5201 04	60.00 LF	Conduit, Metal Steel, Zinc Coated, 1 1/4 Inches	For:		
680.5201 06	50.00 LF	Conduit, Metal Steel, Zinc Coated, 2 Inches	For:		
680.5201 08	45.00 LF	Conduit, Metal Steel, Zinc Coated, 3 Inches	For:		
680.54	170.00 LF	Inductance Loop Installation	For:		
680.6710	3.00 EACH	Traffic Signal Pole Post Top Mount 10 Feet Mounting Height	For:		

Item No	Engineers Estimate	Item Description			
680.71	400.00 LF	Shielded Lead-in Cable	For:		
680.72	450.00 LF	Inductance Loop Wire	For:		
680.730214	500.00 LF	SIGNAL CABLE, 2 CONDUCTOR, #14 AWG	For:		
680.730314	375.00 LF	SIGNAL CABLE, 3 CONDUCTOR, #14 AWG	For:		
680.730514	425.00 LF	Signal Cable 5 Conductors, 14 AWG	For:		
680.730714	320.00 LF	SIGNAL CABLE, 7 CONDUCTOR, #14 AWG	For:		
680.790000010	1.00 LS	Remove Traffic Signal Equipment	For:		
680.810101	7.00 EACH	Traffic Signal Module 12 Inch, Red Ball, LED	For:		
680.810103	7.00 EACH	Traffic Signal Module 12 Inch, Yellow Ball, LED	For:		
680.810104	2.00 EACH	Traffic Signal Module 12 Inch, Yellow Arrow, LED	For:		
680.810105	7.00 EACH	Traffic Signal Module 12 Inch, Green Ball, LED	For:		
680.810106	2.00 EACH	Traffic Signal Module 12 Inch, Green Arrow, LED	For:		
680.810107	25.00 EACH	Traffic Signal Section Type 1, 12 Inch	For:		
680.8112	2.00 EACH	Traffic Signal Bracket Assembly 2 Way	For:		
680.8113	1.00 EACH	Traffic Signal Bracket Assembly 3 Way	For:		
680.813200010	3.00 EA	LED PEDESTRIAN SIGNAL WITH COUNTDOWN TIME	For:		

Item No	Engineers Estimate	Item Description			
		16"X18"			
680.8133 0010	3.00 EA	AUDIBLE PEDESTRIAN SIGNAL WITHOUT POST	For:		
680.8143 0010	1.00 EA	AUDIBLE PEDESTRIAN SIGNAL WITH POST	For:		
685.0720 0110	92,115.00 LF	White Epoxy Reflectorized Pavement Stripes - 20 mils (Wet Night Visibility Spheres)	For:		
685.0720 0210	111.00 EA	White Epoxy Reflectorized Pavement Letters - 20 Mils (Wet Night Visibility Spheres)	For:		
685.0720 0310	199.00 EACH	White Epoxy Reflectorized Pavement Symbols - 20 mils (Wet Night Visibility Spheres)	For:		
685.0720 0410	5,600.00 LF	White Epoxy Reflectorized Pavement Stripes (Cross Hatching) - 20 mils (Wet Night Visibility Spheres)	For:		
685.0720 0510	18,722.00 LF	WHITE EPOXY REFLECTORIZED PAVEMENT STRIPES (SPECIAL MARKINGS) 20 MILS THICK (WET NIGHT VISIBILITY SPHERES)	For:		
685.0720 0610	100,180.00 LF	Yellow Epoxy Reflectorized Pavement Stripes - 20 mils (Wet Night Visibility Spheres)	For:		
685.0720 0710	5,200.00 LF	YELLOW EPOXY REFLECTORIZED PAVEMENT STRIPES (CROSS HATCHING) 20 MILS	For:		

Item No	Engineers Estimate	Item Description			
		THICK (WET NIGHT VISIBILITY SPHERES)			
698.9394 0015	1.00 LS	Incentive Payments / Disincentive Assessments for Work Subject to the Special Note "Incentive/Disincentive Clause" (Fixed)	For:	$100,000.00	

SPECIAL NOTE

"Incentive/Disincentive Clause"

(Refer to Special Item #698.9394M)

The Contractor shall schedule and perform the contract work in accordance with the following restrictions:

The County has determined that a benefit to the traveling public within Nassau County will be derived by completing certain Contract work within a specified time period during which time the traffic on these roads will be required to be fully, partially or frequently interrupted at any time of the day or night.

The County's objective is to minimize the duration of lane closures during construction, and to timely restore safe roads. The Contract critical work is defined as all items, excluding traffic loops, listed on the Bid Sheets and all associated work in order to open the roads and/or sidewalks to pedestrian use and vehicular traffic without restriction excluding non "punch list" lane closures ("Critical Work"). Prior to commencing Work, the Contractor submit a Schedule containing the elements described in General Note, and such Schedule shall be updated bi-weekly ("Progress Schedule").

Description of Time-Related Contract Provision:

There is only one-time period, the Critical Work period, that shall be subject to this Incentive / Disincentive Clause. The Critical Work duration shall commence ten (10) days after the Notice to Proceed, and shall be completed in no more than ninety (90) calendar days, excluding any

days lost due to: (i) Sundays, Labor Day, and Thanksgiving; (ii) other Official County Holidays for work proposed to be performed in specific locations, as determined by the Commissioner based on the accepted Progress Schedule; (iii) weather and temperature restrictions as specified in this Contract and (iv) other disruptions beyond the control of the Contractor, as defined in the bid documents and to the extent approved by the Commissioner upon written request from the Contractor (the "Critical Work Period").

Completion of Critical Work after the expiration of the Critical Work Period shall result in Disincentive deductions, which shall be deducted, **until the Critical Work is completed**, from money due to the Contractor. If the Critical Work is completed early, the contractor shall be entitled to an incentive payment for a total maximum of twenty (20) days for the reduced Critical Work duration. The completion of Critical Work shall mean vehicular/pedestrian traffic is returned to normal traffic flow with only occasional lane closures during non-peak hours, with prior notification and approval, to complete the 'punch list' work items.

The Contractor is alerted to the fact that multiple crews may be needed to complete the Critical Work during the Critical Work Period. The actual number of crews may vary and may sometimes be limited due to other restrictions and/or requirements described elsewhere in these notes, Contract Plans or Bid Documents. Any of the work phases may be started first or several phases may be started concurrently upon prior notifications and approval of the Commissioner in accordance with the accepted Progress Schedule. To maximize the Contractor's ability to achieve the Incentive, the Contractor may submit, and the Commissioner will review, the Progress Schedule and proposed subcontractors after the Notice of Award is issued and prior to the issuance of the Notice to Proceed. Upon the expiration of the Critical Work Period continuing until the Critical Work is completed, a Disincentive deduction of $5,000 (Five Thousand dollars) per day will be assessed to the contractor for each day the Critical Work extends beyond the Critical Work Period and retained from Contractual monies due to the Contractor. If the Critical Work is completed early, an incentive payment of Five Thousand dollars ($5,000) per day up to a maximum of Twenty (20) days, for a maximum payment of One Hundred Thousand dollars ($100,000) shall apply.

The Incentive payment is subject to a maximum amount to maintain a realistically achievable schedule. There shall be no limit to the Disincentive deduction that shall be assessed against the Contractor for failing to complete the Critical Work within the Critical Work Period.

The incentive payments under this clause and item shall be considered Lump Sum inclusive of all overhead, profit, labor including overtime payment (subject to approval by NYSDOL), equipment, supplies, material, scheduling, management and all incidental and/or associated costs based on the per day reduction to the Critical Work Period.

The amount set forth on bid sheets for the item #698.9394M is **Fixed** lump sum amount of One Hundred Thousand dollars ($100,000) for the maximum allowable incentive payment for the Project.

Nassau County Resurfacing of Various County Roads - Phase 65

Nassau County, New York

CONTRACT NO. H61587-65G

GENERAL NOTES

All work included in this contract shall be in accordance with the following Nassau County Standard Specifications and Drawings, if they apply, or modified and amended in the Contract Specifications and Drawings.

a) County of Nassau, Department of Public Works, 2009 Standard Specifications for Civil Engineering and Site Development Construction, or latest edition.

b) County of Nassau, Department of Public Works, Traffic Engineering, Traffic Signal Specifications and Standard Drawings, November 1998 and Addenda, or latest edition.

c) County of Nassau, Department of Public Works, Latest Standard Specifications and Details for the Construction of Sanitary Sewers 2003 or latest edition.

d) New York State Department of Transportation Standard Specifications 2008 and Addenda or latest edition.

1. Scope of Work – It is proposed to resurface the project roadways as follows:

a) **Berry Hill Road,** Syosset (McCouns Lane to South Street (SR 106))
b) **Crescent Beach Road**, Glen Cove (Landing Road to Valley Road)
c) **Hill Street**, Glen Cove (Landing Road to Madison Ave)
d) **Sea Cliff Avenue**, Sea Cliff (Main Avenue to Glen Cove Avenue)
e) **Grace Avenue**, Great Neck Plaza (Gilchrist Road to East Shore Road)
f) **Bryant Avenue**, Roslyn Harbor (Old Northern Blvd. to Glen Cove Ave)
g) **Glenwood Road**, Roslyn Harbor (Bryant Avenue to Scudders Lane)
h) **Roslyn Road**, Roslyn (Approx. 300ft s/o Harbor Hill Road to C/L of LIRR Bridge)
i) **Main Street (Roslyn Road)**, Roslyn (C/L of LIRR Bridge to East Broadway)
j) **Searingtown Road**, North Hills (North waterline of LIE North Service Rd to Harrow Lane)
k) **Glen Cove Road**, East Hills (The Pines (South Entrance) to Harbor Hill/Red Ground Road)
l) **Mill Road**, Valley Stream (Rosedale/Brookfield Road to Sunrise Highway (SR27))

2. **NOTE: Item 36CX in this contract is intended to be used as outlined in Item 133X.**

3. **NOTE: Any reference to Item 36C in the Construction Plans will be paid for under Item 36DRAR**

4. **NOTE: If ROW at any intersection is not shown in the Construction Plans to mill and repave, paving limits will be the flow line or determined by the Engineer in Charge. Also, the Engineer in charge will determine if a topographic survey must be performed to establish a proper flowline.**

5. **NOTE: <u>Compliance with Law.</u>**

<u>Prohibition of Gifts</u>. In accordance with County Executive Order 2-2018, the Contractor shall not offer, give, or agree to give anything of value to any County employee, agent, consultant, construction manager, or other person or firm representing the County (a "County Representative"), including members of a County Representative's immediate family, in connection with the performance by such County Representative of duties involving transactions with the Contractor on behalf of the County, whether such duties are related to this Agreement or any other County contract or matter. As used herein, "anything of value" shall include, but not be limited to, meals, holiday gifts, holiday baskets, gift cards, tickets to golf outings, tickets to sporting events, currency of any kind, or any other gifts, gratuities, favorable opportunities or preferences. For purposes of this subsection, an immediate family member shall include a spouse, child, parent, or sibling. The Contractor shall include the provisions of this subsection in each subcontract entered into under this Agreement.

<u>Disclosure of Conflicts of Interest</u>. In accordance with County Executive Order 2-2018, the Contractor has disclosed as part of its response to the County's Business History Form, or other disclosure form(s), any and all instances where the Contractor employs any spouse, child, or parent of a County employee of the agency or department that contracted or procured the goods and/or services described under this Agreement. The Contractor shall have a continuing obligation, as circumstances arise, to update this disclosure throughout the term of this Agreement.

6. **Work Hours**

Special Condition: Unless otherwise specified in other sections of this Contract, the Contractor may not close an active travel lane during peak travel times. Any requests to close the lanes between 6:30 AM and 9:00 AM and/or between 4:00 PM and 6:30 PM must have written approval 72 working hours in advance. If approval is obtained and excessive congestion results, the approval will be withdrawn by verbal notice from a County Representative and no claim for additional compensation will be considered valid.

If the contractor does not adhere to the specified time limit on each roadway, a $ 5,000.00 per day penalty for each infraction shall be deducted from Item 102 - Work Zone Traffic Control. Nassau County DPW shall utilize the information contained on/in the Inspector Daily Work Reports to determine when an infraction has occurred.

Work is not permitted on all Nassau County holidays unless prior County Approval is obtained. This includes, but is not limited to Memorial Day, Independence Day, Labor Day, Columbus Day, Election Day, Veterans Day, from 12:00 on the Wednesday before Thanksgiving Day through the following Sunday, Christmas Eve, Christmas Day, New Year's Eve, New Year's Day, and various Jewish Holidays including, but not limited to Rosh Hashanah, Sukkot, Shemini Atzeret, Simchat Torah, Yom Kippur, Chanukah.

During nighttime operations, the Contractor shall supply portable lights on his equipment and to light up the work area. There will be no additional payment for the increase in cost to supply lights and/or nighttime wage differential.

The Contractor, at his option and at no additional cost may install the pavement markings during night-time hours with prior approval by the Engineer. County pavement marking inspection staff will be provided 3 working days to inspect and approve the pavement marking layouts before the permanent installation occurs.

7. The contractor will be required to adjust traffic pullboxes and/or municipality-owned electric pull boxes under Item 420R, "Regrade Pull Box Frame & Cover". Manholes, 30" diameter and larger Nassau County Sanitary Sewer Manholes will be paid under Item 16X, "Adjusting Manholes".

   No inserts are to be used. Castings must be physically raised, except Adjustable Frame type. Where drainage and sanitary manholes are of the adjustable frame type, a maximum of two (2) one-inch adjustment rings will be allowed to bring casting to finished grade.

   All non-adjustable Nassau County drainage manhole frames and castings raised under Item 16X - Altering Brick Manholes, shall be replaced with new adjustable two-part manhole frames and castings including new cover. No adjustment rings shall be allowed in these castings. They should be raised to the proposed roadway grade. No payment will be made for manholes that are not set to proper grade. Payment for these new frames, covers, and castings shall be made under Item 34 - Miscellaneous Metals. If debris is found by the Contractor's carelessness in raising the drainage manholes, it must be cleaned out immediately. For the safety of public the Contractor shall ramp around all the manhole castings and valves with temporary asphalt after milling or raising the castings. If the Contractor fails to ramp the castings and valves, there shall be no payment for Item 102 for that day.

8. It is also intended to replace traffic loops that are destroyed by the Asphalt Removal and/or Pavement Removal under Items 422L "Furnish & Install Loop Wires" and 422LS "Furnish & Install Loop Saw Cut". The work to be done under these items shall be in accordance with the Nassau County Traffic Signal Specifications, Standard Drawing and Addenda notes and/or as ordered by the Engineer. The Contractor must coordinate all work with the New York State Department of Transportation's Traffic Section (where appropriate) and Nassau County's Engineering Unit's Signal Management Section at 516-572-0465, extension 20958.

   Any existing traffic signal post, pole, mast arm shaft, or strain pole affected by the installation of handicap ramps or changes in grade must be height adjusted to bring the base plate to match new

grades, including removing the pole/post and adjusting the anchor nuts, and reinstallation of the pole and equipment. Existing raincap is to be removed and new one installed as per the Nassau County traffic signal foundation item specifications.

All signal head heights must be checked before any pole height is adjusted so that they continue to meet signal head height requirements. All traffic signal pushbuttons need to be adjusted in height to be ADA compliant, if affected by the ramp installation which includes changes in grade from existing and meet the Nassau County traffic signal specifications.

If any existing Nassau County owned streetlight poles are affected by the installation of handicap ramps or changes in grade the contractor must notify Nassau County Traffic Signal Management prior to the start of any work.

The Contractor must notify Sheila M. Dukacz of the Nassau County Traffic Signal Management Section before any work begin by calling 516-572-0465, ext. 20958 and by email sdukacz@nassaucountyny.gov A Nassau County inspector must be present during this work.

10. The Contractor will be responsible, at all times, for the safety of the general public, and for the protection of persons who may for any reason enter within the limits of his work.

11. The Contractor shall employ flagmen when deemed necessary by the Engineer and shall erect proper warning signs and necessary barricades to protect the general public and to warn them of changes caused by the progression of his contract. The contractor is responsible for work zone safety as per OSHA requirements.

12. Prior to the start of work, the Contractor shall notify the local police, fire department, school district, utilities and all municipalities within the proximity of the work order limits or if they may be impacted by the work in anyway, as to the conditions prevailing on the construction site.

13. The Contractor must, at all times, provide a safe and uninterrupted two-way traffic over the roads under construction, unless a detour plan is provided and approved by the County.

14. Lighted Barricades, Flashing Warning Lights and Signs:

    a) Must be serviced a minimum of twice each week.
    b) Must be checked and maintained by the Contractor each day, including weekends and holidays.
    c) Must be secured or weighted in such a manner as to prevent them from blowing over under windy conditions.
    d) Must be in accordance with the latest Manual of Uniform Traffic Control Devices.

15. No direct payment shall be made for the above items of work, but the cost shall be included in the price bid for Item 102.

16. Conformance to the following notes with respect to the American with Disabilities Act Curb Ramps is required:
    - All curb ramps installed shall be in compliance with the ADA, PROWAG, and NCDPW standards.
    - Contractor shall verify the placement of all new ramp configurations prior to installation. Contractor must give 48 hours (2 business days) notification for NCDPW approval.
    - A NCDPW inspector must be present during the installation of any curb ramp.
    - It is recommended that a smart level tool (or equivalent) is used to check the slopes on all form work prior to the placement of concrete.

- NCDPW Civil Engineering Design Unit must be notified in writing of all work done to curb ramps to update the transition plan inventory.

NOTE: The contractor will be required to maintain safe pathways for pedestrians during the entire time the contract is in effect, including all periods of work shutdown. This may involve mowing of grass, removal of snow and ice, and any other interruptions interfering with their safe travel through the construction zone. Failure of the contractor to insure safe pedestrian passage as determined by County staff, or from pedestrian complaints in the work zone will result in a fine of $ 500.00 a day. This fine will be deducted from any funds owed the contractor.

17. The Contractor must submit to the Engineer a schedule of work order locations at which he will be working and a tentative schedule of dates that he intends to be at said locations. All work will be done during a normal eight (8) hour day, Monday through Friday. If the Contractor chooses to work beyond the normal work hours, the Contractor will be responsible for reimbursing the County for the additional cost, including benefits costs of any County employees and/or County representatives working for the County that work these overtime hours.

Note: If work is done under a County declared emergency condition, this provision will not apply.

18. The Contractor will not be allowed to commence more than three (3) work orders at any one time. If the County issues a written declaration of an emergency a fourth work order may be started prior to one of the three in progress work orders being 100% complete. However, at no time will more than four Work Orders be in progress.

19. Payment for the work performed under each Work Order, shall be made upon the completion and acceptance by the County. However, final payment will not be made until all punch list work is completed to the satisfaction of the Engineer.

20. All weather and temperature requirements specified by the Manufacturers for materials used must be adhered to.

21. Where there are fire hydrants situated along a section of roadway where markers are to be installed, blue double faced markers shall be installed in line with the hydrant (as required).

22. **Pavement Restoration**

a) Stone Base Pavement

(1) Longitudinal Openings
   (a) The pavement over the trench shall be cut back a minimum of 6" on both sides of the trench to insure an even edge.
   (b) If the remaining longitudinal strip is less than 3 feet on one side, the total width of the cutback, trench and side strip must be replaced.

(2) Transverse Openings
   (a) The Pavement over the trench shall be cut back a minimum of 6 inches on both sides of the trench to insure an even edge.
   (b) Asphalt plant mix, dense base or concrete, shall be used for the replacement of the stone base pavement removed.

b) Concrete Base and Finished Concrete Pavement

(1) Longitudinal Openings

(a) The entire panel width must be removed and replaced. Ends of panel to be saw cut if not at a transverse joint.

(b) In no case shall any portion of the existing panel that is less than 6 feet from a transverse joint be left in place.

(c) When concrete base panels with macadam overlays are to be removed, the Black Top shall be cut back a minimum of 6 inches onto the adjacent panels to provide a smooth vertical edge on the Black Top.

(2) Transverse Openings

(a) Transverse openings shall be saw cut 90 degrees to the longitudinal joints.

(b) Pavement replacement to be a minimum of 2 feet on both sides of the trench, and a total minimum of 6 feet wide.

(c) In no case shall any portion of the existing panel that is less than 6 feet in length from a transverse joint be left in place.

(d) Where openings are skewed across the pavement the concrete replacement must be carried straight across each panel and not staggered. No portion of the existing panel that is less than 6 feet from a transverse joint should be left in place.

23. The contractor shall ensure that the "Longitudinal Joints" in the top course correspond with the edges of the proposed traffic lanes, or are located under the pavement markings. Longitudinal joints in the travel lanes wheel path shall be avoided. The crown of the roadway will *not be relocated for any reason.* Joint arrangements will require approval by the Engineer. The contractor must submit a detailed mat layout three (3) working days prior to any paving operations.

24. Item 36CX in this contract shall be used to fill all joints and cracks greater than one-inch (1") in the existing pavement as outlined in Nassau County Standard Specifications Item 133X.

25. Truing and Leveling will only be used when shown on the plans or as directed by the Engineer. If this Item is in the plans or directed to be installed separately other than the top course installation payment will be made under Item 36DRAR.

26. All work performed under this contract shall be in compliance with **Appendix EE**, "Equal Employment Opportunities for Minorities and Women". As part of the "Detailed MBE/WBE Utilization Plan" the contractor shall provide documentation that a good faith effort was made to meet the intended goals. Also, all work performed under this contract shall include an SDVOB goal of 6% or Good Faith Effort.

27. **Procedure to Ensure Worker Safety**

Work Zone safety was addressed in the contract documents. In addition, the County and contractor will discuss Work Zone safety issues at the pre-construction meeting. The contractor shall provide a safety plan (including subcontractors). The County Project Manager/Consultant R.E will ensure that the contractor has on site at all times at least one person skilled in safety and health procedures familiar with State and Federal safety and health regulations, whose responsibility it will be to monitor methods and procedures. NCDPW will review and approve prime contractor's Health & Safety plan as per NYSDOT Specification 107-05.

It is the Contractor's responsibility to only have on site for the particular contract those workers who successfully completed the OSHA 10-hour construction safety course, and to have each of the worker's certificates of completion with the project records, available for review by NCDPW.

The Health & Safety Plan must be approved by NCDPW prior to the start of contract work.

The Prime contractor will keep NCDPW informed as to their safety meeting schedule. Include with the schedule (whether it is monthly or weekly etc.) any meeting minutes, as well as sign-in sheets

as part of the project file/records.

28. **Maintenance of Traffic**

a) Maintenance and protection of traffic will be paid as described under Item 102. No work shall commence until all appropriate traffic devices have been placed and functioning.

b) If in the judgment of the Engineer, traffic is not properly and adequately maintained, no payment will be made to the contractor for Item 102, Maintenance and protection of traffic. The price bid shall include the cost of furnishing all labor, materials, tools and equipment necessary to satisfactorily complete the required to safely maintain traffic.

29. **Utilities**

a) The Contractor is directed to notify all utilities well in advance of beginning work, to allow them to mark-out their facilities.

b) The Contractor is directed to notify all privately-owned utilities well in advance of beginning work, to allow them time to adjust their manholes and other castings.

c) The Contractor will see to it that utility valves and manholes are readily accessible at all times. The Contractor will not store materials over them and should it become necessary to cover the valves and manholes with soil, will devise a method for finding them quickly and assist the Utility Company to uncover them. Further, all utilities will be uncovered during non-working hours.

d) Prior to the award of contract, the Contractor will be required to submit a list, certified by National Grid, of his key personnel who have taken the National Grid Safety Course along with a statement that sufficiently trained personnel will be available on the job site at all times.

e) Mechanical excavation will not be permitted within two feet (2') on either side of any utility or house service so marked by the utility company. Hand digging will be required to expose the utility pipe. All provisions of 16 NYCRR Part 753 shall apply.

f) Prior to backfilling, a National Grid representative will inspect all gas facilities and any damaged pipe will be repaired by the utility company. The Contractor's attention is called to existing PSE&G overhead lines. The Contractor is warned to keep all equipment and personnel a minimum of ten feet (10') from any conductor. The Contractor shall fully cooperate with PSE&G and comply with its requirements for safe operations.

g) The Contractor's attention is called to the fact that there are utilities, both publicly and privately owned, that are within the contract area. The owners of privately-owned utilities may be relocating parts of their existing plants to conform to the new lines and grades of this project. The Contractor shall cooperate with the various agencies carrying out the work, which must be coordinated with the work of this contract.

h) Existing structures, utilities and facilities, either shown or not shown on the plans, above or below the ground, may not have been located accurately. The Contractor shall determine the locations and elevations of pertinent structures, utilities and facilities, before new installations are started so that there will be no interference with the progression of the work. Any conflict between existing structures, utilities and facilities and the new items of work shall be ascertained by the Contractor prior to commencing any work under the respective items and called to the attention of the Engineer. It is the responsibility of the contractor to protect and maintain utilities or utility structures while working "in proximity". No additional payment will be made for this purpose.

i) Grades and locations of new installations may be changed by the Engineer, if possible, to prevent conflict with existing installations. Therefore, the Contractor shall locate all existing installations accurately, both as to line and grade before new items of work are started.

j) If the above procedure is not followed by the Contractor and new work has to be removed and replaced, or there is a delay, all the cost will be borne by the Contractor and the County will only pay for the amount of the items in place complete at the completion of the work.

k) The Contractor shall exercise extreme care in the performance of any operation, in the vicinity of the existing or relocated cable pipelines. No such operations shall take place without proper personnel of PSE&G on hand. All excavation in the immediate vicinity of these lines shall be done by hand, with such application as to ensure that the pipe shall not be punctured or the coating disrupted. In the event that any length of cable pipeline is exposed, it shall be supported and protected to the satisfaction of PSE&G inspection personnel. No blind sheeting shall be driven in the proximity of the existing electric cable pipes before first exposing these cable pipes by hand.

l) The Contractor should inspect the utility companies' plans to ascertain the location of the underground work and locations of crossings of sewer and drainage work. The Contractor shall coordinate his work with the work being done by the utility companies. It is anticipated that job meetings will be held at various times to aid in coordination of the work.

30. Protection of Facilities - The Contractor shall protect all new work done under this contract from possible injury for the duration of the Contract. He shall be responsible for the repair or replacement, to the satisfaction of the Engineer, of any material, structure, or property on or adjacent to the site and damaged by him or his employees through the construction and demolition operations up to the time of acceptance by the County.

31. Drainage Installations - The Contractor shall plan his work and progress, so that at all times either the new or the existing drainage facilities will function to carry off liquids so that no damage or inconvenience will result.

32. **Clean-Up**

a) Prior to final acceptance of the work under this Contract, the Contractor shall clean the pipe, manholes and catch basins where construction was undertaken, of accumulated dirt, sand or other materials which have washed into them. No direct payment shall be made for the aforementioned work; but shall be included in the prices bid for the various items of the Contract.

b) The Contractor will be required to restore to original condition all areas, outside the work limits, that are disturbed by him during the life of this contract.

c) No separate payment will be made for any of this clean-up and restoration work, but the cost thereof shall be included in the unit prices bid for various items.

d) No separate payment will be made for any of this clean-up and restoration work, but the cost thereof shall be included in the unit prices bid for the various items.

33. **Subletting**

The attention of all bidders is directed to the provisions of Article 20, Sublet or Assign, relative to the percentage of work that may be assigned or sublet, which provisions will be enforced by the County in the manner it deems advisable.

34. **Job Site Safety**

Precaution shall be exercised by the Contractor at all times for the protection of all personnel. The safety provisions of applicable laws shall be observed, but job site safety is the sole responsibility of the Contractor and his subcontractors and cannot be assumed by the County or its agents.

35. **Rubbish and Debris**

The Contractor shall legally dispose of all unsuitable material, rubbish and debris at some separate location, not in the vicinity of the site.

36. **Concrete Breaking**

The Contractor is cautioned that the use of a ball operated from a crane or other equipment will not be permitted under any circumstances for the breaking up of any concrete or other demolition work. Any machine or method used must meet the approval of the Engineer.

37. **Sales Tax Exemptions**

Nassau County is exempt from the payment of New York State Sales Tax and Compensating Use Taxes under Section 1116 of Article 28 of the Tax Law of the State of New York and is exempt from the payment of Nassau County Sales and Uses taxes under Section 7, Ordinance 404-C-1968, enacted pursuant to Section 1210 of Article 29 of the Tax Law of the State of New York. However, it is not to be construed by bidders as relieving them from any obligation to pay sales tax on applicable items pursuant to the terms of the present sales tax laws.

38. **Cold Patch**

Payment for cold patch material used in this contract is included in the cost of the Item 102, no additional payment shall be paid for this material.

39. **Requirements of Other Municipal Departments**

The Contractor shall give all necessary notices, obtain all permits and pay all fees in connection with the work under this contract. He shall comply with all laws, ordinances, rules and regulations of Nassau County and Municipal Departments having jurisdiction over work of this character. These shall take precedence over any requirements of these Specifications where and if a conflict occurs. This, however shall not be interpreted as permitting the use of materials and equipment inferior to those specified.

40. The Contractor shall notify the Nassau County Dept. of Public Works at (516) 571-9600 prior to the removal and relocation of bus shelters and/or benches. Shelters shall be taken out of service for the shortest amount of time possible. The Contractor is directed to relocate bus shelters and/or benches in kind, the cost of this removal and reinstallation shall be included in the cost of Item 1. The seven-inch (7") thick concrete slab for shelters, is to be paid for under Items 28 and 30. The planning Commission reserves the right to have its vendor relocate their advertising bus shelters and/or benches.

41. **Private Facilities in Public Rights-of-Way (ROW)**

a) The Contractor shall be aware that sprinkler heads, private lamp and sign posts, signs, electric signs, electric lines, water service, oil inlets, oil lines, horticultural planting, landscaping, etc. were owned privately, but exist in the public ROW. The Contractor may be required to remove these appurtenances as ordered by the Engineer.

b) Payment for this work will be included in the price bid for various items in the Contract.

42. **Special OSHA Notes**

a) Safety Provisions in the Specifications are primarily to protect County Property and the public against unsafe acts of the Contractor. The Occupational Safety and Health Act of 1970 (OSHA) requires that "Each Employer" (1) shall furnish to each of his employee's employment and a place of employment which are free from recognized hazards that are causing or likely to cause

death or serious physical harm to his employees; (2) shall comply with the occupational safety and health standards promulgated under this Act."

The regulations in the act may be more stringent than are required by the Plans and/or Specifications. The Contractor however must conform to the OSHA Regulations and such conformance shall not be reason to demand additional payment or claim extra work.

b) Sheeting shall conform strictly to the Requirements of the OSHA Regulations for ConstructionSubpart P, Excavation, Trenching and Shoring:

1926.650	General protection requirements;
1926.651	Specific excavation requirements;
1926.652	Specific trenching requirements;
1926.653	Definitions applicable to this subpart.

43. The Contractor shall notify the Nassau County Police Department, local Fire Department and Metropolitan Suburban Bus Authority in writing as to the conditions prevailing on the construction site and detours in use. Duplicate copies of such notices shall be filed with the Engineer.

44. The Contractor shall obtain the necessary permit from the water district to allow rollers to be filled with water from fire hydrants. Intakes shall be fitted with either an "Airgap" or "Double Check Valve Assembly" to prevent water from the roller from entering the public water system.

45. The Contractor shall be required to hand out notices to the local homeowners and businesses affected by the asphalt milling and asphalt paving operations, twenty-four (24) hours prior to starting work. A sample letter is attached at the end of these General notes.

The Contractor must set up portable variable message sign boards three days prior to the start of asphalt milling and asphalt paving operations giving the dates when work is going to start and work hours, at the limits of the job site. Payment will be made under Item Number 102PVMS, "Portable Variable Message Sign."

The Contractor shall notify the local police department, fire department/district, school district, utilities and all municipalities within the proximity of the work limits or if they may be impacted by the work in any way, prior to the start of the work, as to the conditions prevailing on the construction site.

46. All areas of pavement excavated under Items 111 and 138 shall be completely filled in at the end of the work day. All lanes of traffic shall be opened at the end of each work day.

47. The Contractor shall replace wire sensors where encountered under various traffic items (Item 422L, 422LS & 422SHE).

The Contractor shall be required to place all the traffic signals to "re-call" position immidiately before milling or paving within the project limits, if the operation is going to affect the traffic signals.

48. **Schedule**: The Contractor shall provide a detailed written schedule of operations for when work will be started and completed for each Work Order to be resurfaced within the Contract one week after the Notice to Proceed is issued. Typical information to be provided includes, but is not limited to:

a) Removal and replacement of deteriorated pavement and joint;
b) Asphalt removal;
c) Asphalt placement;
d) Miscellaneous items, cleaning catch basins, remove and replace guiderail;

e) Traffic pavement markings;
f) Punch list

No claims will be processed until the County has this updated information on a bi-weekly basis until the project has been completed.

49. Test Cylinders - The Contractor will provide a place for concrete test cylinders close enough to the work so that the cylinders share the same curing conditions. The Contractor will protect these cylinders for the three days they will be left on the job site.

50. **Construction in the City of New York Rights of Way**

a) Permits - Shall be obtained by the Contractor from the City of New York for all work within City rights-of-way. He shall pay for all costs of obtaining such permits including costs of City inspection.

b) General - Acceptance of all work within City rights of way shall be subject to the inspection and approval of the Transportation Administration Administrator, Office of Construction Coordination, 40 Worth Street, New York, N.Y. 10013.

c) Payment - No separate or additional payment will be made for conforming to the various requirements of the City of New York Transportation Administration but the cost thereof will be deemed included in the appropriate Contract Items without regard to differences in materials, thickness and types of pavements and methods of construction, temporary construction or maintenance of traffic.

51. The contractor when submitting shop drawings for approval must specify the work order number and location that said shop drawings will be used.

52. Erosion and Sediment Control: The contractor shall assume responsibility for the temporary control of soil and water pollution that could potentially result from construction activities and shall be in accordance with Federal, State and Local regulations, as well as the Contract specifications and directions of the County representatives. In essence all necessary precautions shall be taken to prevent contamination of waters and surrounding areas by slit, sediments, fuels, solvents, lubricants, epoxy coating, wet concrete, concrete leachate, washings from concrete equipment or any other pollutant associated with drilling and constructions procedures. Specific reference is made to the New York State Department of Environmental Conservations' "Guidelines for Urban Erosion and Sediment Control", along with any subsequent updates. Associated costs for erosion and sediment control, inspection and maintenance of the same as mentioned above, including any permits required, shall be included in the unit prices for individual items.

53. When ordered, all concrete supplied for Items 26, 27 and 28 will include an admixture such as will assure compressive strength cores of 2500 PSI in 48 hours. The admixture will be added to the concrete at a rate recommended by the supplier. The cost of the admixture will be included under Items 26, 27 & 28.

54. The contractor shall have a full time Supervisor, fluent in English on the project at all times.

55. No permanent asphalt top course will be allowed to be placed after December 1st (unless approved by the Commissioner and as long as other conditions are met per specification).

56. All layout of traffic pavement markings must be completed immediately after paving and prior to opening the newly paved surface to traffic. The cost of all layout of traffic pavement markings shall be included in the various items of the Contract.

57. The contractor must contact the Resident Engineer or Harold Lutz of the Nassau County Traffic Engineering by calling (516) 571-9453, within 48 to 72 hours prior to final pavement marking placement. On all roadways resurfaced under this contract, epoxy reflectorized pavement markings shall be placed within 3 business days of final paving. A $1,000.00 per day penalty will be deducted from the various asphalt items after 3 business days until the epoxy is placed.

58. The contractor must notify the Resident Engineer and Jeff Lindgren of the Nassau County Traffic Management Section prior to any lane closures by calling (516) 571-6998, by email jlindgren@nassaucountyny.gov, or TrafficHelp@nassaucountyny.gov; two (2) of the three (3) forms of contact must be used to ensure contact has been made.

The contractor must submit any lane closure to Nassau County Traffic Management website: https://apps.nassaucountyny.gov/trafficmanagement/closureform.php

59. Any existing traffic signal post, pole, mast arm shaft, or strain pole affected by the installation of handicap ramps or change in grade must be height adjusted to bring the base plate to match new grades, including removing the pole/post and adjusting the anchor nuts, and reinstallation of the pole and equipment. Existing raincap is to be removed and new one installed as per Nassau County traffic signal foundation item specifications. All signal head heights must be checked before any pole height is adjusted so that they continue to meet signal head height requirements.

All traffic signal pushbuttons need to be adjusted in height to be ADA compliant, if affected by the ramp installation which includes changes in grade from existing and meet the Nassau County traffic signal specifications.

All traffic signals shall be placed on recall mode prior to any milling or asphalt paving.

The contractor must notify the Resident Engineer and Sheila M. Dukacz of the Nassau County Traffic Signal Management Section by calling (516) 572-0465, ext. 20958 or by email sdukacz@nassaucountyny.gov prior to any work involving alteration of traffic signal equipment or infrastructure including placing traffic signals within the work area on recall if required and return them to the existing operation once all work is completed. A Nassau County Traffic inspector must be present upon the completion of this work.

60. The contractor must notify the Resident Engineer or Nassau County Project Manager and coordinate with Nassau County Traffic Signal Management Section all required traffic loop installations.

61. The contractor is to notify all privately owned utilities at least 5 business days before starting work to permit the utility time to adjust their facilities.

62. The contractor will also be required to adjust all municipality owned drains, sewers, and/or water - manholes, surface inlets, and/or meter pits, under Item 16X-Adjusting Manholes, and Water Valves under Item 114 - Adjustment of Water Valve Box Elevations.

The contractor must notify all water districts and/or municipality owned water companies of any water valves that cannot be opened so that they can be adjusted, prior to resurfacing the roadways. Any complaints that the County receives for manholes and/or water valves not raised will be referred to the contractor to rectify at no cost to the County of Nassau.

If any water valve and/or gas valve box tops are milled off, complete replacement of the valve box top section will be required at no cost to the County of Nassau.

63. Under Item 116A a depth of l" – 2" is required. Any depth greater than 2" and/or as ordered by the Engineer shall be prorated for payment. On a completely milled roadway, temporary 4" wide traffic lines shall be painted directly after the milling has been completed. The cost shall be included

in Item 102.

64. Survey Stakeout - Survey work shall be paid for under Survey Stakeout (Item 136S) only when done with prior written approval of the project manager. When the work is completed in less than an 8 hour shift the payment will be prorated for the actual time required. Survey work done to determine the contractors' payment will not be paid for under this item.

65. **Sanitary Sewer Notes**

a. The Contractor shall notify the Water/Wastewater Engineering a minimum of two (2) working days prior to work involving any sanitary sewer facilities. Notification is to be made by calling (516) 571-6841

b. All work shall be in accordance with NCDPW Standard Specifications and Details for the Construction of Sanitary Sewers, latest edition 2003. All work must be performed in the presence of a Nassau County inspector.

c. All sanitary sewer house connections and laterals shall be located prior to any excavation by Contractor.

d. The Horizontal/Vertical separation of sewer and drainage pipe or water main/services shall meet or exceed the requirements outlined in the RECOMMENDED STANDARDS FOR SEWAGE WORKS (Ten States Standards), latest edition.

e. Where sanitary or house connection sewers cross over a drainage trench area, the sewer shall be replaced with Ductile Iron extending a minimum of five feet (5') each side of crossing to undisturbed soil. The same replacement shall apply for sewers under a drainage trench area within twelve-inch (12") clearance, bottom of drain to top of sewer.

f. All pipes, manholes and appurtenances shall have the County approval stamp thereon or written certification acceptable to the County, before the material can be installed.

g. Where it is necessary to raise sanitary sewer manhole castings to grade for repaving, fixed frame castings must be raised either by adjusting the height of the brick masonry or using an approved insert (metal inserts are not permitted). Adjustable frame type manholes may be raised by adding up to a maximum of two, one-inch (1") adjustment rings to achieve final grade.

h. All non-adjustable sewer manhole castings will be replaced with new adjustable manhole castings under Item 34-Miscellaneous Metals and installed under Item 16X. The cost of painting them with two coats of asphaltum paint shall be included in the various items of the contract.

Proper adjustment of sanitary sewer manholes to finished grade will be required on all Nassau County owned facilities. The contractor shall notify Water/Wastewater Engineering of Nassau County, two (2) working days prior to work involving our sanitary sewer facilities. Notification is to be made by calling (516) 571-7502 or (516) 571-7505.

No inserts are to be used. Manholes must be physically raised, except Adjustable Frame type (see below).

Where sanitary sewer manholes are of the adjustable frame type, a maximum of two (2) one-inch

adjustment rings will be allowed to bring casting to finished grade.
No payment will be made for manholes that are not set to proper grade.

Prior to final acceptance of the project, the contractor has to make a final inspection with the County representative of all sanitary sewer manholes to make sure there is no debris inside the manholes that would cause a blockage. If any debris is found, it must be cleaned out immediately. Also, if a blockage is caused by the contractor's carelessness in raising the manhole, he will be responsible for any cost incurred for cleaning the blockage and any legal suits that are brought against the County of Nassau for damage caused by this blockage.

i. The contractor shall comply with all OSHA requirements for entry into a confined space whenever it is necessary for a contractor's employee to enter a Nassau County sanitary sewer manhole. The minimum requirements the contractor must comply with are:

   a. Contractor issued ENTRY PERMIT.
   b. Confined space entry monitor to test for toxic, explosive and oxygen deficient atmosphere.
   c. Confined space rescue and retrieval equipment.

   The contractor will not be permitted to work in a Nassau County sanitary sewer manhole unless he complies with *all* applicable OSHA requirements.

66. At all times during the life of this contract, the Contractor shall maintain safe vehicular traffic and access to adjacent private properties located throughout the entire length of the contract.

67. All concrete required for this Contract shall be air entrained. Except as otherwise specified, all cement used on this project shall be Type 2A (air entraining) or Type 2 with an approved air entraining agent added to the mix to produce air entranced concrete. Air entraining admixtures shall conform to the requirements of Volume One, Part Two, Section B, material M21, Admixtures of the 2009 Nassau County Standard Specifications.

68. The Contractor will provide a place for concrete test cylinders in proximity to the work so that the cylinders share the same curing conditions as the newly placed concrete. The Contractor will protect these cylinders for the three days they will be left on the job site.

69. Nassau County Drainage Manholes

All Nassau County drainage manhole frames and castings raised under Item 16X, shall be replaced with new adjustable two part manhole frame and casting including new cover. No adjustment rings will be allowed in these castings. They must be raised to the proposed roadway grade. Payment for these new frames, covers, and castings shall be made under Item 34 - Miscellaneous Metals. No payment will be made for manholes that are not set to proper grade. If any debris is found by the contractor's carelessness in raising the drainage manholes it must be cleaned out immediately.

70. The contractor will be required to remove all existing plowable markers prior to the paving operation. Payment for the removal of existing plowable markers will be included in the cost of the various bid items. The voids left from the removal of the plowable markers will immediately be filled with Asphalt Cement, Type lA, which will be paid for under Item 36DRAR. Plowable markers will be replaced as ordered by the Engineer.

Where there are fire hydrants situated along a section of roadway where markers are to be installed,

blue double faced markers shall be installed in line with the hydrant (as required).

71. The contractor will be required to remove the following traffic markings just prior to the paving operations: *crosswalks, arrows, and stop lines.* Payment for removing these traffic markings will be included in the cost under Item 36DRAR. Non paving areas (side streets) traffic pavement markings shall be removed under Item 137.

72. When the final yield factor is not within the tolerances specified of the County worksheets for Item 36DRAR, plus the leveling used in Item 36DRAR, maximum payment of asphalt in those items shall be shown below:

Percent over Engineer's Estimate: Maximum Payment

5 to 10 Percent	95 percent of the total asphalt material delivered to the project
11 to 20 Percent	90 percent of the total asphalt material delivered to the project
21 to 25 Percent and Over	85 percent of the total asphalt material delivered to the project

73. GA-GC -Asphalt Quality Control at Asphalt Plants – if ten (10) Nassau County DPW Lab samples fail due to low AC content and/or 15 gradation samples fail, the approved job mix formula, one (1) percent for each infraction of asphalt concrete produced from that plant will be deducted from the total for Item 36DRAR - Rut Avoidance Asphalt Type lA.

74. The Contractor is responsible to coordinate efforts with NC Permit Dept. and Utilities to resolve pending 239F applications within construction site. Any restoration performed must conform to NCDPW Standard Specifications. NCDPW Permits Department contact information: (516) 571-6840 / 6841.

75. The Contractor is required to coordinate his work with Public Agencies and Private Utility companies to avoid conflicts and to arrange for castings and appurtenances which are to be adjusted by others in advance of performing any final pavement overlay work. The contractor is required to obtain approval for limits of proposed pavement milling and overlay work, sidewalk ramp type and layout of proposed pavement markings from a County representative prior to performing any proposed work.

76. **Supplies**

a) As per Item 1M - Mobilization: All the provisions of the Item 1M shall apply with the following modifications: Contractor shall provide one (1) cell phone under this item, so that County's Engineer may maintain contact with inspection forces. It must be a smart phone (type to be approved by the Engineer) with a minimum 256 GB storage capacity along with a mobile charger and a hard-protective cover. No work may begin until the phone is provided, and service is activated. The smart phone service shall be maintained for the duration of the contract. The phone shall be replaced at no additional cost to the County if damaged or lost, otherwise cease the operation.

b) The contractor shall supply the following equipment at the start of the project, those items shall be shown below:

MINIMUM SPECIFICATION

Measuring Wheel:	Provide one (1) new measuring wheel (Wheel Master DigiRoller Plus 3 Model 6575 or approved equal) at the start of the project
Calculator:	Provide one (1) Construction Master - ProDesktop Model 44080 or approved equal
Mark Out Paint:	Provide four (4) cases of Seymour Stripe Inverted Tip Marker white paint or approved equal
Boots:	Provide four (4) pairs of Timberland Pro – Helix Soft Toe work boots or approved equal

At the completion of the Contract, all above referenced equipment, with exception to the cell phone, shall become the property of Nassau County. The cost of this equipment shall be included in the cost of Item 1M-Mobilization.

Addenda Notes and Modification to the Nassau County Specifications

NOTE: Where a standard Nassau County item has been modified for use under this agreement for payment purposes all the provisions of the standard item will apply unless indicated otherwise herein.

ITEM 12H-X – CLEANING EXISTING DRAINAGE SYSTEM CATCH BASIN

All the provisions of Item 12H, "Cleaning Existing Drainage System" shall apply with the following modifications and/or additions:

1. Description

Under this Item the Contractor shall clean existing catch basins and surface inlets where shown on the Plans and/or as directed by the Engineer.

2. Construction Details

The existing catch basins and/or surface inlets shall be cleaned by removing all debris to the bottom of the basin. Special care shall be taken not to undermine the walls of the structures.

The removal of asphalt pavement from the asphalt removal and asphalt paving operations shall not be included in this Item. The Contractor will be required to remove this asphalt debris at his own expense.

3. Method of Measurement

The quantity to be paid for will be the number of each catch basin and surface inlet cleaned in accordance with the Plans and Specifications.

No payment will be made for asphalt material that went into the basins from the asphalt removal and/or asphalt pavement operation and this material must be removed at the Contractor's own expense.

4. Basis of Payment

The unit price bid for this item shall include the cost of furnishing all labor.

ITEM 36CX – ASPHALT CONCRETE TRUING AND LEVELING COURSE TYPE 1A

All provisions of Item 36C, "Asphalt Concrete Truing & Leveling Course Type 1A" shall apply with the following modifications and/or additions.

- This Item will be utilized to fill all joints and cracks greater than one-inch (1") in the existing pavement, as outlined in Item 133X, Clean and Fill Joints and Cracks.

ITEM 133X – CLEAN AND FILL JOINTS AND CRACKS

All the provisions of Item 133, "Clean and Fill Joints and Cracks" of the NCDPW2009 Standard Specifications and as amended shall apply with the following modifications:

1. Description

Under this Item the Contractor shall clean, seal and fill all joints and cracks ¼" to 1" wide in the existing pavement prior to resurfacing as shown on the Plans and/or as directed by the Engineer.

2. Materials

a. The materials shall conform to the requirements listed below and shall be mixed to a mortar consistency, Mortar Sand – M3A. CATONIC ASPHALT EMULSION Tests on Emulsion.

	Min.	Max.
Viscosity, Saybolt Furol, 77F (25C), Sec	20	100
Viscosity, Saybolt Furol, 122F (50C), Sec	-	-
Storage Stability Test, 1 Day (Difference in percent Residue)	-	1
Stone Coating Test	-	-
Particle Charge Test	Positive Note 1	
Sieve Test, percent	-	0.10
Cement Mixing Test (percent)	-	2.0
Residue by Distillation, percent	57	-
Oil Distillate, Volume Total Emulsion, percent	-	-

b. Tests on Residue from Distillation Test

	Min.	Max.
Penetration, 77F (25C), 100g, 5 sec	40	90

c. Tests on Asphalt Base for Emulsion

	Min.	Max.
Penetration, 77F (25C), 100g, 5 sec	60	100
Solubility in trichloroethylene, percent	99.0	-
Dutility, 77F (25C) 5 cm/min, cm	50	-
Flash Point, degrees F	435	-
Flash Point, degrees C	225	-

d. Suggested Temperature Range

	Min.	Max.
Mixing, degrees F	75	150
Mixing, degrees C	24	66
Spraying, degrees F	75	150
Spraying, degrees C	24	66

e. Note: If the Particle Charge Test result is inconclusive, material having a maximum pH value of 6.7 will be acceptable.

3. Construction Details

All unsealed and inadequately sealed joints and cracks, as determined by the Engineer, shall be subjected to a compressed air stream of at least 80 psig measured at the source. Joints and cracks in the pavement as designed by the Engineer, shall be cleaned of all dirt and loose material holding the cleaning jet 1-inch (1") above the pavement surface. Old joint and crack sealer remaining after such cleaning operation need not be removed. The cracks shall be kept clean until the sealing, filling and paving operations are completed.

Joints and cracks in the existing pavement from one-quarter-inch (1/4") to one-inch (1") wide shall be sealed with a bituminous material meeting the above requirements. This work shall be completed at least 24 hours but not more than two weeks in advance of the paving operations.

4. Method of Measurement

Payment for cleaning and filling joints and cracks will be made on a lump sum basis.

5. Basis of Payment

The amount bid for this Item shall include the cost of furnishing all labor, materials, tools, equipment and incidentals necessary to satisfactorily complete the required work. **Asphalt used to fill cracks and/or joints greater than one-inch (1") shall be paid under Item 36CX, "Asphalt Concrete Type 1A Truing and Leveling."**

ITEM 136X- SURVEY STAKEOUT

All of the provisions of Item 136 apply except as outlined below.

1. Payment under this item will be made on a per 8-hour shift basis. If less than a full shift is required, the payment will be pro-rated to actual hours worked.

ITEM 199AX- ASPHALT PRICE ADJUSTMENT

All of the provisions of Item 199A apply except as outlined below.

1. Adjustments to payment formula under this item will be made on a $15.00 increment both for increases and decreases.

ITEM 206.03010010 - CONDUIT EXCAVATION AND BACKFILL - (RESTORING TOP SURFACES NOT INCLUDED)

The provisions of Section 206 pertaining to conduit excavation and backfill shall apply except as noted:

Subsection 206-5.04 shall not apply. The following shall apply; "The unit price bid per linear foot shall include the cost of all labor, materials and equipment necessary to excavate and backfill the trench. The cost of replacing pavement, shoulder and sidewalk courses, subcourses, curbs, drives, lawns and other top surfaces necessary to complete the work will be paid for under their respective items, or under various items of the Contract, as noted in the Contract Documents."

The cost of any necessary saw cutting will be paid for under specific saw cutting items.

ITEM 206.03100010 - TRAFFIC SIGNAL CONDUIT EXCAVATION AND BACKFILL

DESCRIPTION. This work shall consist of the excavation and necessary backfill required for traffic signal conduits. All such excavation shall be unclassified excavation as defined in subsection 203-1.01.

The work shall include saw cutting any existing portland cement concrete and asphalt concrete top surfaces and the restoration of any pavement, shoulder, and sidewalk courses, subcourses, curbs, drives, lawns and other top surfaces.

MATERIALS. Materials for the restoration of top surfaces shall be as indicated in the plans and as approved by the Engineer.

CONSTRUCTION DETAILS. The requirements of subsection 206-3 shall apply with the following additions:

When the Contractor is required to excavate through portland cement concrete and asphalt concrete pavement, sidewalk, curb, or other top surfaces, he shall saw cut along neat lines as shown in the plans or as ordered by the Engineer. An approved power saw shall be used to saw cut to the depth specified in the plans or as directed by the Engineer.

The conduit excavation and backfill, and the restoration of top surface courses shall also conform to the applicable Notes and Details shown in the plans.

Any damage to existing pavement, sidewalk, curb, or other facilities caused by the Contractor's operations shall be repaired by the Contractor to the satisfaction of the Engineer.

METHOD OF MEASUREMENT. Subsection 206-4.03 shall apply.

BASIS OF PAYMENT. The unit price bid per linear foot shall include the cost of furnishing all labor, materials and equipment necessary to complete the work including excavation, backfill, saw cutting, and restoring any pavement, shoulder, and sidewalk courses, subcourses, curbs, drives, lawns and other top surfaces.

Any repairs to existing pavement, sidewalk, curb, or other facilities made necessary by the Contractor's operations shall be done to the satisfaction of the Engineer at no additional cost to the State.

Item 419S-05 Furnish and Install 1/2 Inch Diameter Steel Conduit
Item 419S-075 Furnish and Install 3/4 Inch Diameter Steel Conduit
Item 419S-1 Furnish and Install 1-1/4 Inch Diameter Steel Conduit
Item 419S-2 Furnish and Install 2 Inch Diameter Steel Conduit
Item 419S-3 Furnish and Install 3 Inch Diameter Steel Conduit
Item 419S-4 Furnish and Install 4 Inch Diameter Steel Conduit

1. Scope

1.1 The purpose of this specification is to establish the minimum requirements to furnish and install steel conduits.

2. Basic Requirements

2.1 All requirements of General Item 419 shall apply except Sections 2.2, 4, and 5.

3. Grounding

3.1 All conduits shall be grounded, using No. 6 AWG solid or stranded bare copper wire.

3.2 Grounding to be in accordance with latest NEC regulations.

4. Method of Measurement

4.1 The quantity of conduit to be paid under this item shall be the number of linear feet measured along the centerline of the conduit installed from the edge of the foundation, pullbox or other terminations. The measurement shall include any bends within the run, but not bends installed in the foundation.

5. Basis of Payment

5.1 The unit price for conduit shall include the cost of the conduit, couplings excavation, ground wire, bushings, bends, dragline, mandrel, brushes, rodding equipment, backfilling, transportation, fittings, equipment, tools, labor, and materials necessary to complete the work

5.2 Item numbers are as follows:

Item	Description
419S-05	Furnish and Install 1/2 Inch Diameter Steel Conduit
419S-075	Furnish and Install 3/4 Inch Diameter Steel Conduit
419S-1	Furnish and Install 1-1/4 Inch Diameter Steel Conduit
419S-2	Furnish and Install 2 Inch Diameter Steel Conduit
419S-3	Furnish and Install 3 Inch Diameter Steel Conduit
419S-4	Furnish and Install 4 Inch Diameter Steel Conduit

Item 420R REGRADING PULLBOX FRAME AND COVER

1. Scope:

1.1 The purpose of this specification is to establish the minimum requirements for regrading pullbox frames and covers.

2. Materials;

2.1 Bricks to be used in the adjustment collar shall be concrete bricks

2.2 Standard cement mortar shall consist of one (1) part Portland Cement and two (2) parts fine aggregate.

3. Basic Requirements for Regrading

3.1 In asphalt or concrete pavements, the contractor shall saw cut the surrounding pavements to full depth and not more than six (6) inches from the outside edge of the frame. The soil shall be removed to the top of the pullbox

3.2 In grass or soil areas, the contractor shall remove the sod or soil to the top of the pullbox.

3.3 The frame and cover shall be removed, cleaned, and painted with two (2) coats of black asphaltum paint.

3.4 The existing adjustment collar of brick and mortar shall be removed and disposed of by the contractor. Additional material shall be removed by chipping.

3.5 A new adjustment collar of concrete bricks and mortar shall be installed to insure proper grade of the frame and cover.

3.6 The disturbed area shall be restored to pre-construction condition or as ordered by the engineer.

4. Method of Measurement

4.1 The quantity to be paid will be the number of pullbox frames and covers regraded in accordance with the plans, Intersection Item Sheets or as ordered by the engineer.

5. Basis of Payment

5.1 The unit price for regrading pullbox frame and covers shall include paint, concrete bricks, mortar, tools, equipment, disposing of soil, restoration of the disturbed area, and all labor necessary to complete the work.

5.2 Item numbers are as follows:

Item	Description
420R	Regrade a Pullbox Frame and Cover

NASSAU COUNTY
TRAFFIC SIGNAL SPECIFICATION
FOR
LOOP VEHICLE DETECTORS

Item 422L Furnish and Install Loop Wire
Item 422LS Furnish and Install Loop Saw Cut

1. Scope

1.1 The purpose of this specification is to establish the minimum requirements to furnish and install wire loops in saw cuts for the purpose of inductance loop vehicle detection.

2. Saw Cut

2.1 The Contractor shall slot the roadway, at the locations shown on the plans or as ordered by the Engineer, using a diamond or abrasive power saw, with a blade approximately 3/8 inches in width. Slots shall be cut to the following minimum depths:

	Concrete Roadway	Asphalt Roadway
1, 2 or 3 wires in slot	1 1/2 inches	2 inches
4 or 5 wires in slot	2 inches	2 1/2 inches

2.2 In asphalt pavement, the saw cut shall be made thru the top course into the base course.

3. Wire

3.1 The wire shall conform to the following: IMSA Specification 51-5 Polyvinyl chloride insulated, Nylon jacketed, loosely encased in a polyvinyl chloride or a polyethylene tube, #14 AWG Stranded.

3.2 This wire shall be used to form a roadway vehicle loop and lead-in wires to the amplifier, nearest terminal point, pullbox, or to location designated by the Engineer

3.3 All roadway loops, including lead-in wires to the nearest terminus point shall be one continuous length of wire with no splices. A terminus point shall be considered as a pullbox where the lead-in wire is spliced to #14 AWG stranded Traffic Signal Cable, or the terminals of the detector amplifier. Lead-in wire shall have a minimum twist of one (1) turn per foot.

3.4 All splices at the terminus point shall be made in accordance with the specifications for installing cable.

3.5 Each roadway vehicle loop shall have a separate pair of wires for the lead-in to the controller cabinet unless otherwise specified or as ordered by the Engineer.

3.6 The wire shall be installed all the way down into the saw cut slot. A piece of wood or a stick, similar to a wooden paint stirrer, shall be used to seat the loop wire at the bottom of the slot or channel. In no case shall a screw driver or similar sharp tool be used for this purpose.

3.7 The wire shall be laid in the slot so that there are no kinks or curls, and no straining or stretching of the insulation around the corners of the slot, or into the pullbox.

3.8 Prior to installation, the loop wire shall be inspected for any cuts, breaks or nicks in the insulation. In the course of installation, if any cuts, breaks, or nicks are made in the insulation, the Contractor shall install another length of wire, at no additional expense to the County. Any wire with cuts, breaks or nicks in the insulation shall not be sealed in the roadway.

3.9 After placing the wire in the slot, it shall be rechecked for slack, raised portions, and tightness. If any of the foregoing conditions are found, they shall be corrected before the compound is applied. The wire shall be installed so that it is pressed to the bottom of the slot and against one another.

4. Installation

4.1 The material to be used to seal the saw cuts shall be an insulating compound. The compound shall be approved by the Engineer

4.2 All saw cuts with the wire installed shall be inspected and approved by the Engineer prior to the installation of the insulating compound.

4.3 The Contractor shall strictly adhere to the insulating compound manufacturer's directions, specifications, application bulletins, and instructions, relative to mixing, application, and pouring in addition to this specification.

4.4 The compound shall not be poured into saw cuts when precipitation of any kind prevails at the site unless otherwise ordered by the Engineer.

4.5 The Contractor shall be sure that the saw cut is completely filled with compound and that there are no bubbles in the compound below the surface.

4.6 The compound shall be installed in the saw cut and not on the roadway alongside the cut. Any compound that is on the roadway, and not in the saw cut, shall be removed by the contractor.

4.7 The compound shall not be overpoured so that there is any bulge or bump, higher than the surrounding surface of concrete or asphalt. When the compound hardens, there shall be neither a bulge or a depression, but rather a smooth surface, level with the immediate surrounding roadway surface.

4.8 The viscosity of the compound used shall be such that it can be readily poured into the slot. Any compound that is lumpy or stiff before being poured, or that becomes lumpy or stiff while being poured into slot shall not be poured or forced into a saw cut slot.

4.9 The compound shall be regulated by the Contractor, in accordance with temperatures of the air and pavement so that the compound will cure in not more than two hours. In all cases, the Contractor is advised to make sure that the compound has sufficiently hardened before allowing traffic to move over the area.

4.10 All saw cut slots filled with cured compound shall be water and moisture proof, and the wires confined within said slot shall not be subject to movement by traffic vibrations. Cured compound, in the saw cut slot, shall be securely bonded to the pavement. The compound shall have sufficient strength and resiliency to withstand stresses set up by normal vibration and differences in expansion and contraction due to temperature changes.

5. Testing

5.1 The following tests shall be conducted by the contractor on the completed loop, in the presence of the Engineer, prior to final acceptance.

5.1.1 Measure and record the loop resistance to ground. The ohmic value shall be one (1) megohm or greater.

5.1.2 Measure and record the total loop resistance between the two lead-in wires. The ohmic value shall be 1/4 ohms to 4-1/2 ohms.

5.1.3 A failure of either one or both of the above tests shall be sufficient cause for rejection of the loop installation and the installation of a new loop at the Contractor's expense.

6. Method of Measurement

6.1 Loop Wire

The quantity to be paid shall be the number of linear feet of loop wire furnished and installed in accordance with the plans, Intersection Item Sheet, or as ordered by the Engineer.

6.2 Loop Sawcut

The quantity to be paid for under this item shall be the number of linear feet of saw cut (loop) installed in accordance with the plans, Intersection Item Sheet, or as ordered by the Engineer.

7. Basis of Payment

7.1 Loop Wire - The unit price shall include the cost of wire, all connections, splices to traffic signal cables, and all labor, materials, and incidentals necessary to complete the work.

7.2 Loop Sawcut -The unit price shall include the cost of making the saw cut, insulating compound, compressed air, and all materials, equipment, tools, labor, and incidentals necessary to complete the work.

7.3 Item numbers are as follows:

Item	Description
422L	Furnish and Install Loop Wire
422LS	Furnish and Install Loop Saw Cut

SECTION 606 - GUIDE RAILING, MEDIAN BARRIER, AND CONCRETE BARRIER

(Last Revised January 1, 2020)

606-1 DESCRIPTION. This work shall consist of the construction, reconstruction, removal, disposal, storage, and resetting of highway barrier systems and component parts in accordance with the specifications, standard sheets, manufacturer's drawings, manufacturer's directions and contract documents to the lines and grades shown on the plans or established by the Engineer.

The types of barrier systems are designated as follows:

Cable Guide Railing and Median Barrier.
Corrugated Beam Guide Railing and Median Barrier
Modified Heavy Post Blocked-Out (HPBO (Mod.)) Corrugated Beam Guide Railing and Median Barrier
Box Beam Guide Railing and Median Barrier
Concrete Barrier

606-1.01 I-Beam Posts for Existing Highway Barrier. Under this work the Contractor shall furnish and install I-beam posts and necessary hardware for existing highway barriers in accordance with the plans, specifications, and as directed by the Engineer.

606-1.02 Guide Railing with Extra Long Posts. Under this work the Contractor shall furnish and install guide railing of the type specified with extra long (7 foot) posts in accordance with the contract documents, and as directed by the Engineer.

606-1.03 Retensioning Existing Cable Guide Railing And Median Barrier. Under this work the Contractor shall retension existing guide rail and median barrier cables in accordance with the Contract Documents.

606-2 MATERIALS. Materials shall meet the requirements specified in the following subsections of Section 700-- Materials and Manufacturing and ASTM Specifications:

Concrete Grouting Material	701-05
Anchoring Materials-Chemically Curing	701-07
Precast Concrete Barrier	704-05
Premolded Resilient Joint Filler	705-07
Joint Filler	ASTM D1056
Wire Fabric For Concrete Reinforcement	709-02
Epoxy Coated Bar Reinforcement, Grade 60	709-04
Wood and Timber Posts and Timber Blockouts	710-13
Galvanized Steel Barrier Posts	710-14
Corrugated Beam Guide Railing End Terminal (Energy-Absorbing)	710-17
HPBO (Mod.) Corrugated Beam Guide Railing End Terminal (Energy-Absorbing)	710-18
HPBO (Mod.) Corrugated Beam Median Barrier End Terminal (Energy-Absorbing)	710-19
Corrugated Beam Guide Railing and Median Barrier	710-20
Box Beam Guide Railing and Median Barrier	710-21
Cable Guide Railing and Median Barrier.	710-22
Box Beam End Assembly Type III and Box Beam Median Barrier End Assembly, Type C	710-24
Plastic and Synthetic Block-Outs for Heavy Post Guiderail Systems	710-26

Anchor Bolts for Guide Railing	710-28
Galvanized Coatings And Repair Methods	719-01
Reflective Sheeting	730-05 (Materials Designation 730-05.02)
Paint for Galvanized Surfaces	708-06
Rolled Steel Channels for Continuity Connections	ASTM A36
Steel Plates for Continuity Connections	ASTM A36

606-2.01 Steel Hardware. Steel posts, plates, channels, stiffeners, block-outs, angles, brackets, slipbases and other miscellaneous steel hardware not referenced to or specified by §710-14, §710-20, §710-21, §710-22, §710-24 or other sections of this specification shall be fabricated as shown in the contract plans and documents from steel meeting the requirements of ASTM A36 unless specified otherwise. All components shall be galvanized in accordance with §719-01, Type I or II. Components shall be fabricated prior to galvanizing.

606-2.02 Anchor Bolts. For the purpose of the guide railing specifications, the term anchor bolt will be used when referring to anchor rods, hooks, or studs.

Unless otherwise specified, anchor bolts embedded or grouted in concrete for securing post and railing base plates, or transitioning to concrete walls, parapets, and barriers shall meet the requirements of §710-28.

Anchor bolts embedded in concrete anchorage units for terminating guide rail and median barrier systems shall have minimum yield and tensile strength meeting the requirements of ASTM F1554 Grade 36.

Anchor bolts, nuts, and washers shall be galvanized in accordance with §719-01, Galvanized Coatings and Repair Methods, Type II, unless indicated otherwise on the plans or Standard Sheets.

Grout for anchor bolts shall conform to the requirements of §701-07 or §701-05.

606-2.03 Fasteners. Bolts, nuts and washers shall conform to the following, unless specified otherwise on the plans, standard sheets, manufacturer's drawings', or in the contract documents.

Bolts	Bolts ASTM A307 Grade A	Nuts	ASTM A563 Grade A or Better
Washers	ASTM F436		

Bolts, nuts and washers shall be galvanized in accordance with the provisions of §719-01 Galvanized Coatings and Repair Methods, Type II.

606-2.04 I-Beam Posts for Existing Highway Barrier. I-beam posts for existing highway barrier shall conform to the requirements of §710-14 Galvanized Steel Barrier Posts. Posts shall conform to the details shown on the plans or the latest edition of the standard sheet for the guide railing or median barrier affected. Hardware (nuts, bolts, "J" bolts, offset beams or block-outs, back up plates, washers, and shelf angles) necessary shall conform to the requirements of the current specifications and standard sheets for the highway barrier affected.

606-2.05 Extra Long Guide Rail Posts. Extra long Guide Rail Posts shall conform to the requirements of §710-14 Galvanized Steel Barrier Posts. The posts shall conform to the details for extra long posts shown on the standard sheets or plans.

606-2.06 Concrete for End Assembly Anchorage Units. Cast-in-place concrete shall meet the requirements of Class A Concrete in Section 501 Portland Cement Concrete-General. The Contractor may submit, for approval by the Director of the Materials Bureau, a mix at least equivalent to the specified Class A Concrete, with a minimum cement content of 575 lb/cu yd.

Precast concrete anchorage units, when selected as an alternate to cast-in-place units by the Contractor, shall meet the requirements of Section 704-03 Precast Concrete-General.

606-2.07 Concrete Barrier

A. Precast Concrete Barrier. The requirements of §704-05 shall apply

B. Cast-in-Place Concrete Barrier. Concrete shall meet the requirements specified for Class A Concrete in §501, Portland Cement Concrete--General. Reinforcement shall meet the material requirements §606-2 and be of the type and sizes as indicated on the standard sheets and plans.

C. Machine Formed Concrete Barrier. The concrete shall meet the requirements specified for Class I Concrete in §501, Portland Cement Concrete--General. Reinforcement shall meet the material requirements of §606-2 and shall be of the type and sizes as indicated on the standard sheets and plans.

606-2.08 Resetting Guide Railing, Median Barrier, Anchorage Unit Assemblies and End Assemblies. The materials comprising the existing system shall be used if they conform to the materials requirements specified for new guide rail systems and are found to be in satisfactory condition as determined by the Engineer. The Contractor shall supply all new hardware (splice tongues, plates, nuts, bolts, washer, etc.) Replacement materials shall meet the material requirements specified for new guide rail systems. Galvanizing of railing and posts may be repaired in accordance with §719-01, Galvanized Coatings and Repair Methods. HPBO guide railing and median barrier (pre-2013 design) shall be reset as detailed in the current standard sheets, including 12 inch block-outs.

606-2.09 HPBO (Mod.) Corrugated Beam Guide Railing and Median Barrier. The material requirements of §710-20 Corrugated Beam Guide Railing and Median Barrier shall apply except that posts, block-outs, soil plates, anchor bolts, hardware, and fasteners shall be as detailed on the Standard Sheets. The Wood and Timber Posts and Timber Block-Outs shall conform to §710-13. The Plastic and Synthetic Block-Outs for Heavy Post Guiderail Systems shall conform to §710-26.

606-2.10 Corrugated Beam Guide Rail Transition To Bridge Rail, Concrete Barrier and Concrete Parapets. Corrugated beam rail sections shall conform to the requirements of §710-20 and as detailed on the Standard Sheets or Bridge Detail Sheets. Thrie beam shall conform to the material specifications of 710-20 and shall be as detailed on the Standard Sheets.. All remaining material shall conform to the requirements of §710-23 except that:
A. Steel tubular block-outs and stiffening channels, where specified, shall conform to ASTM A36.
B. All components shall be galvanized in accordance with §719-01 *Galvanized Coating and Repair Methods*, Type I or Type II. If required by the plans, the components shall be painted to match the existing railing. Painting shall be done in accordance with Section 657 except that:
1. Painting with rollers will not be permitted.
2. Spray painting will be allowed only if the components are painted at a location, away from the work site, acceptable to the Engineer.
C. Shop drawings will not be required. Approval of the system will be made by the Engineer.

606-2.11 Vacant.

606-2.12 Vacant

606-2.13 (Vacant)

606-2.14 Transitions Constructed of, or with, Concrete. Concrete transition between concrete barriers of different shapes and the concrete elements of transitions between metal barriers and concrete

barriers shall conform to §606-2.07 Concrete Barrier, A. Precast Concrete Barrier or, with the permission of the Engineer, B. Cast-in-Place Concrete Barrier.

606-3 CONSTRUCTION DETAILS

606-3.01 General. All barrier systems and transitions described by these specifications shall be subject to the following requirements.

A. Inspection of Rail Elements. Immediately prior to erection, the rail elements shall be inspected for damage. Bends or kinks in the railing, not specifically required by the contract documents, shall constitute sufficient cause for rejection. Straightening of such bends or kinks will not be allowed.

Erection of all guide rail, median barrier, transitions and connections shall be subject to the inspection of the Engineer who shall be given all facilities required for a visual inspection of workmanship and materials.

B. Field Galvanizing For Repair. Field galvanizing repair shall be allowed only when the total damaged area on each piece or component is less than 2 percent of the coated surface, or 16 square inches, whichever is less. Any single piece or component with total damaged area greater than the amount specified above shall be rejected and replaced by the Contractor. Field galvanizing repair shall be done in accordance with the requirements of the Repair section of §719-01 Galvanized Coating And Repair Methods.

C. Field Welding. Field welding shall not be permitted unless noted in the contract documents. When specified, welding shall comply with the requirements of the SCM.

D. Erection. Posts, railing, barrier systems, rail transitions, end assemblies, and anchorage units shall be erected as specified in the contract plans or manufacturer's drawings. Where drilling and grouting is required, Section 586 – *Miscellaneous Structural Reconstruction* shall apply, unless otherwise approved. Rail mounting height shall be within +/- 1/4 inch of that indicated on the Standard Sheets and plans.

Prior to installing guide rail, median barrier, transitions, or end terminals, the Contractor shall determine the locations of all structures, including underground structures, that may be affected by the installation. If there are conflicts between the proposed installation and other structures, the Contractor shall discuss with and recommend to the Engineer alternative locations or types of barrier, transitions, or end terminals that will not be in conflict with the structure.

Posts and foundation tube(s) shall be driven unless otherwise specified by the Engineer. The driving shall be accomplished with approved equipment and methods that will leave the posts and foundation tube(s) in their final position, free of any distortion, burring or other damage. When posts and foundation tube(s) are driven through asphalt concrete or a bituminous treated material, the Contractor shall take care to prevent damage to the paved or treated areas. Large holes and voids caused by driving the posts and foundation tube(s) shall be filled and compacted with a bituminous treated material or asphalt concrete similar to that damaged. The small area adjacent to the post and foundation tube(s) disturbed during installation or where gaps exist at the post and foundation tube(s) after pavement repairs shall be sealed with a bituminous material approved by the Engineer.

As an alternate to driving posts and foundation tube(s) on unpaved medians and where site conditions are such that driving is not possible, the Contractor shall carefully excavate for all post and foundation tube(s) holes. Post and foundation tube(s) holes and post and foundation tube(s) foundation structures shall be backfilled and backfilled material compacted in accordance with Section 203, *Select Granular Fill* .

On structures, concrete anchors, and paved medians, base plates for posts shall be anchored as shown in the Contract Documents. Alternate construction methods and equipment for drilling and

grouting of holes shall be submitted to the Engineer for approval before operations begin. The work of installing the guide railing system when it abuts stabilized shoulder courses shall be coordinated and progressed to provide the least disturbance between the two phases of the work.

All posts shall be aligned to a tolerance of 1/4 inch for plumb and grade line.

Box beam to be installed on a curved alignment shall be shop bent or shop curved in accordance with Table 606-1.

TABLE 606-1 SHOP BENDING AND SHOP MITERING OF BOX BEAM GUIDE RAILING AND MEDIAN BARRIER

Barrier Type	Shop Bending Required	Shop Mitering Required
Box Beam Guide Railing	Radius over 20 ft and less than 720 ft	Radius of 20 ft or less
Box Beam Median Barrier	Radius over 30 ft and less than 1525 ft	Radius of 30 ft or less

When shop bending or shop mitering of box beam guide railing or box beam median barrier is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.

Corrugated beam guide railing and median barrier shall require shop curving if the radius is equal to or less than 150 feet. When shop curving of corrugated beam is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.

E. Concrete Anchorage Units. Concrete anchors shall be constructed as detailed on the standard sheets. Excavation shall meet the requirements of §206-3 of the Standard Specifications. The bottom of the anchor shall have a full and even bearing on the surface under it. After the concrete anchor is in place, the excavation shall be backfilled in accordance with Section 203, *Select Granular Fill* .

F. End Terminals and Assemblies. Installation of all proprietary products shall follow the manufacturer's instructions. The following shall apply to end terminals or assemblies to be installed under this section.

1. Drawings. For end terminals and end assemblies not shown on standard sheets or detailed in the plans, the Contractor shall submit two copies of the manufacturer's drawings, modified as necessary to reflect site conditions, to the Engineer for approval prior to ordering any materials required under this section. Drawings of parts not detailed on the plans, but which are necessary to develop the full performance of the end assemblies or terminals shall also be provided. The Contractor shall commence work of installation of end assemblies or terminals only after approval of the above mentioned drawings and authorization from the Engineer to do so.

2. Manuals. In addition to the drawings mentioned above, the Contractor shall deliver to the Engineer two (2) copies of design manuals, installation manuals, parts lists, and maintenance manuals prepared for each type end terminal or assembly being installed but not shown on the standard sheet.

3. Coordination with Other Work. The work of furnishing and installing all types of end assemblies shall be coordinated with the removal of existing impact attenuators or end assemblies, the installation of guide railing or median barrier, or the installation of the object to be shielded, so as to minimize the time that motorists are exposed to the possibility of collision with the shielded object, unprotected ends of barriers, or incomplete end terminals or assemblies. Also, the contractor shall minimize exposure of approaching vehicular traffic to the possibility of impact on the back of the end assembly. Unless modified in the Contract Documents, minimization shall mean seven (7) or fewer calendar days.

4. Traffic Protection. Traffic protection shall be provided as specified in Section 619 *Work Zone Traffic Control.*

5. Reflective Sheeting. End terminals and assemblies which have a vertical face towards approaching traffic and are located on or closely adjacent to the shoulder shall be provided with reflective sheeting in accordance with Section 2C.65 of the MUTCD. The yellow and black stripe widths shall be 4 inches.

606-3.02 Cable Guide Railing and Median Barrier. Beginning with the first post where the rail is parallel to the edge of pavement, every sixth post in the line of guide rail shall be reflectorized (96 foot spacing for reflectors) except those posts in the approach terminal and intermediate anchorage area, which curve away from the shoulder, or used in a median barrier. The reflector and method of attachment shall be as indicated on the standard sheet.

A. Anchorage Unit Assemblies. After the posts are driven to the specified line and grade, anchor angles and anchor posts shall be adjusted in the field to provide a full and even bearing on the underlying surface.

B. Cable Tensioning. The Contractor shall install and tension the cable of guide railing and median barrier as follows: Properly seat the spring compensation device and then permanently mark the unloaded position. Complete the assembly of the guide railing and set the compensating devices to a spring compression of 3 1/2 inches. Leave the springs at this setting for at least 2 weeks, then set them to the proper setting according to temperature from the data in the table on the standard sheets.

C. Cable Splicing. The Contractor shall install cable splices in the following manner:
Place a splice end over the cable. Twist the cable to separate the three strands. Insert the wedge into the center of the strands, leaving at least one inch of excess cable, and pull the cable back until the wedge is snug to the splice. Pound the wedge into the splice. Crimp at least one wire of the cable over the wedge. Repeat the procedure for the other cable. Connect the two splice ends together.

606-3.03 Box Beam Guide Railing and Median Barrier. Rail sections for tangent runs shall be at least 18 feet long. Rail splices shall be a minimum of 18 inches from the centerline of any post.

606-3.04 Weak Post and HPBO (Mod.) Corrugated Beam Guide Railing and Median Barrier In the erection procedures, the free end of the rail element shall not be allowed to swing free and cantilever around the mounting bolt. The free end shall be supported in a manner approved by the Engineer while the splice bolts and mounting bolts are fastened. Rail splicing shall be as shown on the Standard Sheets.

A. Weak Post Corrugated Beam Guide Railing and Median Barrier. The rail elements shall be installed so the weight of the beam rests on the double nutted support bolt before the 5/16 inch mounting bolts are torqued. Before the final torquing, six of the 5/16 inch mounting bolts in the installation shall be selected at random and with a suitable torque wrench tightened to failure. The six readings shall be averaged, the six failed bolts replaced and all the mounting bolts in the installation torqued to 50% of the average value.

Support bolts shall be installed on all the guide rail posts except the three posts adjacent to the anchors.

B. HPBO (Mod.) Corrugated Beam Guide Railing and Median Barrier. HPBO (Mod.) guide railing shall be erected from the approach-end anchorage unit and downstream along the flow of traffic.

HPBO (Mod.) median barrier shall be erected from one of the anchorage sections and shall be completed as the work progresses.

HPBO (Mod.) guide railing and median barrier connections to walls or Concrete Barriers shall be as specified on the plans or the Standard Sheets.

During non-working hours, no uncompleted anchorage units or heavy posts without rail will bepermitted to be exposed to traffic on either guide railing or median barrier.

606-3.05 Concrete Barrier. Unless specified otherwise in the contract documents the Contractor shall have the option of providing precast concrete barrier, cast-in-place concrete barrier, or machine formed barrier. No intermixing in any run of barrier will be permitted unless shown otherwise in the contract documents except that precast transition sections and ends may be used with cast-in-place or machine formed concrete barriers.

Unless otherwise specified, excavation shall be performed in accordance with §206-3. Granular back fill shall conform to Section 304 and shall match the subbase course type used on the adjacent roadway.

Half section concrete barrier shall be erected with the appropriate back-up posts and continuity plates as shown on the Standard Sheets and plans.

A. Precast Concrete Barrier

1. Placement. Immediately prior to installation, the Engineer shall inspect the sections for manufacturing defects or shipment damage. Damaged or defective sections shall be rejected or repaired in accordance with §704-05. Precast Concrete Barrier, Repair. The sections shall be placed in accordance with the contract plans and proposals.

2. Vertical Expansion Joint. Sections shall be separated by 1/2 inch nominal joint openings. The joint opening, at any point in the plane of the joint, shall not vary by more than 1/4 inch. Premolded Resilient Joint Filler conforming to the requirements of §705-07 or Joint Filler conforming to the requirements of ASTM D1056 class 2B1 or 2B2 shall be placed in the joint as shown on the plans, standard sheet or as directed by the Engineer.

3. Dimensional Tolerance.

a. Cross-sectional dimensions shall not vary from the dimensions shown by more than 1/4 inch.
b. The barrier shall not be out of plumb by more than 1/4 inch.
c. Longitudinal dimensions shall not vary from the dimensions shown by more than 1/4 inch per 10 foot of the barrier.
d. When checked with a 10 foot straight edge, irregularities shall not exceed 1/4 inch.

4. Placement Adjacent to Cement Concrete. The barrier shall be separated from cement concrete pavement or shoulders by a ½" thick (± ⅛") premolded resilient joint filler meeting §705-07. The joint filler shall cover the entire pavement/shoulder face. A joint sealant reservoir ¼" - ½" deep shall be formed or routed in the joint filler. The Contractor shall abrasive blast the barrier and pavement/shoulder in the reservoir, and seal the joint using material meeting §705-02, Highway Joint Sealant, Type IV. Sealing shall be done in accordance with the manufacturer's instructions, a copy of which shall be provided to the Engineer prior to commencement of work.

B. Cast-in-Place Concrete Barrier

1. Placing. Cast-in-place concrete barriers and footings shall not extend more than 200 feet without an expansion joint. The Contractor shall have the option of placing the cast-in-place concrete barrier with a monolithic cross-section or with a horizontal construction joint at the top of the footing. When the Contractor elects to cast a separate footing, the horizontal joint details must conform to those on the Standard Sheets or in the plans, or the Contractor must prepare joint details and submit them to the Regional Director for approval.

2. Joints

a. *Contraction Joints*. Cast-in-place concrete barrier shall have contraction joints every 20 feet in both the footing and the stem. When cast separately, the joints in the stem shall line up with the joints in the footing. Contraction joints shall be formed in or saw cut normal to the pavement. The joints shall conform to the dimensions as shown on the plans or Standard Sheets. If the joints are saw cut, they shall be saw cut as soon as no damage to the concrete will result, with a maximum time of 2 hours after the forms are removed to avoid early formation of uncontrolled shrinkage cracks. Clear curing compound shall be promptly applied to the saw cut.

b. *Expansion Joints*. Expansion joints shall be formed normal to the pavement with Premolded Resilient Joint Filler meeting the requirements of §705-07 and shall provide for expansion of ½ inch. The filler material shall be cut to fully cover and conform to the cross section of the barrier, or to the footer and stem separately if they are cast separately.

In addition to the maximum separation of 200 feet, expansion joints shall be located at all immovable objects (bridge substructures, etc.), where shown on the plans, and/or as directed by the Engineer.

c. *Construction Joints.* When the Contractor's operations require the use of a construction joint, one of the two following procedures may be used. However, if operations will not resume within 24 hours, only method A may be used.

Method A. Construct an expansion joint as detailed in the preceding section.

Method B. After initial set has taken place, remove the end form to expose the concrete. Roughen the surface to achieve a good interlock and increased bond area when the concrete operations are resumed. A one-inch strip around the periphery of the end surface should remain undisturbed to serve as a neat, linear contraction joint. The end surface shall be covered with several layers of wetted burlap to prevent drying. All reinforcing steel shall extend beyond the face to provide adequate lapping.

3. Forms. Forms shall be metal and of such construction that there will be minimum interference to inspection for grade and alignment. Forms shall be braced and secured adequately so that no discernible displacement from alignment or grade will occur during placement of concrete.

4. Concrete Placing and Vibrating. Concrete shall be placed in the barrier forms in accordance with the requirements of §555-3.04 Handling and Placing Concrete. Concrete shall be compacted by means of immersion type mechanical vibrators approved by the Engineer. The vibrator shall be inserted into the concrete at one foot intervals. The vibrators shall be of size and weight sufficient to thoroughly vibrate the entire concrete mass without damaging or misaligning the forms or reinforcement.

5. Removal of Forms and Finishing Surfaces. Forms shall be left in place for 24 hours or until, in the judgment of the Engineer, the concrete has sufficiently set so that the forms may be removed without injury to the barrier. Immediately after the forms have been removed, surfaces

exposed to view shall have all projections and irregularities carefully removed and all cavities neatly filled with mortar of the proportion used in the concrete. The same brand of cement and the same kind of fine aggregate shall be used for filling cavities as was used in the original concrete mix. Surfaces repaired by plastering will not be allowed.

6. Curing. The median barrier shall be cured using a clear curing compound meeting the requirements of §711-05. The compound shall be sprayed on the concrete surfaces at a rate of 1 gal/ 150 sf within one hour of form removal.***7. Reinforcement.*** The Contractor shall incorporate reinforcement as indicated on the standard sheets and plans. All reinforcing steel shall be epoxy coated meeting the requirements of §709-04.

8. Placement Adjacent to Cement Concrete Pavement or Shoulders. The barrier shall be separated from the cement concrete pavement or shoulder by a 1/2 inch wide vertical joint extending down to the bottom of the pavement or shoulder. The joint shall be formed with and contain Premolded Resilient Joint Filler conforming to the requirements of §705-07. A recess of approximately one inch shall be provided at the top of the joint for installation of a backer rod and joint sealant. The joint sealant shall be a silicone sealant appearing on the Department's Approved List and shall be applied in accordance with the manufacturer's instructions.

9. Dimensional Tolerance

a. Cross-sectional dimensions shall not vary from the dimensions shown by more than 1/4 inch.
b. The barrier shall not be out of plumb by more than 1/4 inch.
c. Longitudinal dimensions shall not vary from the dimensions shown by more than 1/4 inch per 10 foot of the barrier.
d. When checked with a 10 foot straight edge, irregularities shall not exceed 1/4 inch.

C. Machine Formed Concrete Barrier

1. Weather Limitations. The requirements of §502-3.01 shall apply.

2. Equipment. The slipforming equipment shall be self-propelled and shall be capable of placing, consolidating and finishing concrete to the proper line and grade. The Engineer may require the Contractor to demonstrate that the specific equipment proposed for use is capable of satisfactorily placing the concrete mix. The Contractor shall furnish the manufacturer's data regarding machine operation to the Engineer.

3. Preparation of the Subbase Course. Before any concrete may be placed, the subbase course shall be compacted and fine graded to a tolerance of □□□ 1/2 inch of the true grade at any location under the barrier. Whenever possible, as determined by the Engineer, concrete placing operations shall not begin until the subbase course has been fine graded ahead at least 1000 feet.

4. Reinforcement. The Contractor shall incorporate reinforcement as indicated on the standard sheets and plans. All reinforcing steel shall be epoxy coated meeting the requirements of §709-04.

5. Placing Operations

a. Central and Transit Mixed Concrete. The provisions of §501-3.03 C and D shall apply for Central Mixed and Transit Mixed Concrete respectively, except that water may be added at the point of deposition to maintain the desired slump. The water addition may be made at any time after the beginning of the discharge until approximately two-thirds (2/3) of the load, as

determined by the Engineer, has been discharged. After the water addition the concrete shall be mixed at least 30 revolutions in the mixing range. When the water additions made after discharge the total number of revolutions shall not be more than 190.

b. Truck Mixed Concrete. The provisions of §501-3.03 E shall apply except that after the initial slump has been achieved, water may be added to the mixture one additional time to maintain the desired slump. The water addition may be made anytime after the beginning of discharge until approximately two-thirds (2/3) of the load, as determined by the Engineer, has been discharged. After the water addition, the concrete shall be mixed at least 30 revolutions in the mixing range.

The slipforming equipment shall have as nearly a continuous forward movement as possible to provide uniform progress with stopping and starting of the equipment held to a minimum. Any edge slump resulting from slipforming operations in excess of 1/4 inch, as measured from the top surface of the median barrier, exclusive of edge rounding, shall be corrected before the concrete has hardened.

Concrete supply shall be sufficient to produce a continuous, completely shaped barrier. If concrete placement is interrupted for a period of time where the delay will affect the quality and structural integrity of the barrier, the contractor shall terminate his operations by one of the following procedures. The Engineer shall determine when the slipform operation is to be terminated.

Method A. Construct a cast in place expansion joint system as detailed on the standard sheets.

Method B. Remove existing unset concrete to a vertical score line with hand tools. The vertical surface resulting from the removed concrete shall remain reasonably rough and unfinished to facilitate interlock and increased bond area when concrete operations are to be resumed. The vertical surface shall be touched up with hand tools, as directed by the Engineer, to correct unacceptable voids, tears and lack of consolidation resulting from the concrete removal. The surface shall be covered with several layers of wet burlap to prevent drying. All reinforcing steel shall extend beyond the face to provide adequate lapping.

Concreting operations may resume at the terminated face when the terminated portion has achieved enough rigidity to withstand the sequence of operations it will be subjected to without sustaining damage. All loose or unacceptable concrete and material shall be removed from the terminated face as directed by the Engineer. Concrete barrier damaged as a result of the contractor's operations shall be repaired to the satisfaction of the Engineer.

Termination of slipform operations at the end of the day for an uncompleted run shall be by method A or B above.

6. Curing. The median barrier shall be cured using a clear curing compound meeting the requirements of §711-05. The compound shall be sprayed on the concrete surface immediately following the placing operation at a rate of 1 gal/ 150 sf.

7. Placement Adjacent to Cement Concrete Pavement or Shoulders. The barrier shall be separated from the cement concrete pavement or shoulder by a 1/2 inch wide vertical joint extending down to the bottom of the pavement or shoulder. The joint shall be formed with and contain Premolded Resilient Joint Filler conforming to the requirements of §705-07. A recess of approximately one inch shall be provided at the top of the joint for installation of a backer rod and joint sealant. The joint sealant shall be a silicone sealant appearing on the Department's Approved List and shall be applied in accordance with the manufacturer's instructions.

8. Contraction Joints. Contraction joints shall be formed or saw cut normal to the pavement. The spacing shall be every 20 feet, as shown on the plans or as ordered by the Engineer. The joints shall conform to the dimensions as shown on the plans or standard sheets. If the joints are saw cut, they shall be saw cut as soon as no damage to the concrete will result, with a maximum time of 8 hours. The clear curing compound shall be reapplied at the saw cut.

9. Expansion Joints. Machine formed concrete barriers shall not extend more than 400 feet without an expansion joint. Expansion joints shall be formed normal to the pavement with Premolded Resilient Joint Filler meeting the requirements of §705-07 and shall provide for expansion of 1/2 inch. The filler material shall be cut to conform to the cross section of the barrier.

The expansion joints shall be located at all immovable objects (bridge substructures, etc.), where shown on the plans, and/or as directed by the Engineer. Expansion joints shall not be required at regular intervals unless shown on the plans.

10. Tolerances. All concrete barrier produced by this method shall conform to the following tolerances:

a. Placing Tolerances

(1) Bar Reinforcement Cover 0 to + 1/2 inch.
(2) Width (top) 0 to + 1/4 inch.
(3) Width (base) 0 to + 1/2 inch.

b. Dimensional Tolerance

(1) Cross-sectional dimensions shall not vary from the dimensions shown by more than 1/4 inch.
(2) The barrier shall not be out of plumb by more than 1/4 inch.
(3) Longitudinal dimensions shall not vary from the dimensions shown by more than 1/4 inch per 10 foot of the barrier.
(4) When checked with a 10 foot straight edge, irregularities shall not exceed 1/4 inch.

11. Defects. Defects are divided into two categories Minor defects and major defects. Minor defects in the barrier may be repaired in the field. Major defects shall be cause for rejection of the section, or the section shall be repaired in the manner directed by the Engineer.

a. Minor Defects. Minor defects are defined as holes, honeycombing or spalls which are 6 inches or less, in diameter, and which do not expose the outermost surface of the steel reinforcement. Surface voids 5/8 inch, or less, in diameter and 1/4 inch, or less, in depth are not considered defects and they do not require repair.

b. Major Defects. Major defects are defined as:
(1) Any defect which does not meet the definition of a minor defect.
(2) Minor defects which, in aggregate, comprise more than five percent (5%) of the surface area of the barrier section.

12. Repair. Repair of hardened concrete shall be as follows:

a. Minor Defect Repair. Repair shall be made with a material meeting the requirements of §701-04 or §701-12. Methods of repair shall be acceptable to the Engineer. The color of the repaired portion shall match as nearly as practicable, the color of the surrounding concrete. Repaired portions shall exactly match shape requirements. The repaired portion shall withstand a moderate blow from a 16 ounce hammer.

b. Major Defect Repair. Major defect repair shall be preapproved by the Engineer.

13. Hand Finishing. The Contractor shall make provisions to allow hand finishing, when directed by the Engineer, on all surfaces. Hand finishing, if done shall be done immediately after the passage of the slipforming equipment. Curing compound shall be applied only after hand finishing has been completed at any particular location.

14. Transitions and Tapered End Sections. Transitions and tapered end sections shall be either cast-in-place or precast, at the Contractor's option."

606-3.06 Resetting Guide Railing, Median Barrier and Precast Concrete Barrier. The Contractor shall remove, store, clean and reset railing, posts, and precast concrete barrier as shown on the plans or as directed by the Engineer. The Contractor shall remove designated existing guide railing, median barrier and precast concrete barrier and neatly store them at locations approved by the Engineer. The work shall be done in a workmanlike manner so as to salvage all usable parts. The reset guide railing and/or median barrier shall be placed in accordance with the requirements of §606-3.01 General and the subsection for each specific system. Unless otherwise specified by the designer, all existing hardware, i.e., post bolts, J-bolts, splice bolts, etc., shall be replaced with new hardware.
Cable systems shall be retensioned and all existing splice couplings and wedges shall be replaced. HPBO guide railing and median barrier (pre-2013 design) shall be reset as detailed in the current standard sheets, including 12 inch block-outs. The existing block-outs shall become the property of the Contractor.

606-3.07 Resetting Guide Railing and Median Barrier (New Posts). The construction details of §606-3.06 shall apply, except that the Contractor shall furnish and install new posts and remove the old posts from the site.

606-3.08 Removing and Storing Guide Railing, Median Barrier, and Precast Concrete Barrier. The Contractor shall remove designated existing guide railing, median barrier and precast concrete barrier and neatly store the component parts in separate piles at locations designated for future pick up by Department forces, or its designee. The work shall be done in a workmanlike manner so as to salvage all usable parts. Unusable material shall be disposed of by the Contractor.

606-3.09 Removing and Disposing of Guide Railing, Median Barrier, Concrete Barrier, Guide Posts, Guide Rail Posts, and Median Barrier Posts. The Contractor shall remove designated existing guide railing, median barrier, concrete barrier, guide posts, guide rail posts, and median barrier posts and remove them from the site of work. Holes shall be backfilled with a suitable material and compacted in a manner approved by the Engineer.

606-3.10 I-Beam Posts for Existing Highway Barrier. I-beam posts for existing highway barrier shall be installed at the locations indicated in the contract documents or where directed by the Engineer. The driving shall be in accordance with the requirements of §606-3.01 and the applicable standard sheet(s). All hardware necessary for mounting the rail elements or cable to the post shall be supplied by the Contractor. New heavy post block-outs shall be supplied to replace damaged or unusable block-outs. S3x5.7 posts installed as intermediate posts to reduce post spacing on weak post corrugated beam guide railing and median barrier and on box beam guide railing shall not be attached to the rail element.

All reflectors, delineators, reference markers, or other items, which are to remain in place, that are damaged by or during the Contractor's operations shall be replaced by the Contractor.

606-3.11 Retensioning Existing Cable Guide Railing and Median Barrier. Cable guide rail and median barrier shall be retensioned in accordance with the cable tensioning requirements of §606-3.02.

606-3.12 Resetting Anchorage Unit Assemblies and End Assemblies for Guide Rail and Median Barrier. The Contractor shall remove, store, clean and reset existing anchorage units and terminals for Guide Railing and Median Barrier as shown on the plans or as directed by the Engineer. The anchorage units and terminals shall be reset and placed in accordance with the requirements of §606-3.01 General.

Any anchor blocks that will not remain in use in their existing location are to be removed and the holes backfilled as detailed in §606-3.13

The Contractor shall take care so reusable parts are not damaged by their operations. Any parts damaged in handling and placing shall be replaced by the Contractor. Unusable material shall be disposed of by the Contractor.

Surface areas disturbed during the removal operations shall be reestablished, as nearly as possible, to match the adjacent surfaces to remain.

606-3.13 Removing and Storing Anchorage Unit Assemblies and End Assemblies for Guide Railing and Median Barriers The construction details of §606-3.08 shall apply. However, concrete anchor blocks shall be completely removed, and the resulting holes backfilled.

If the center of the anchor block is inboard from a line six feet beyond the theoretical shoulder break, the Contractor shall backfill with material meeting the requirements of §733-04 compacted in 6-inch lifts.

If the center of the anchor block is more than six feet past the shoulder break, the backfill material and compaction shall be replaced in kind, character and condition, compacted in 6-inch lifts.

Other excavation and backfill shall conform to the requirements outlined in §606-3.01E.

Roadway edge drains damaged due to the Contractor’s operations shall be repaired or replaced at no additional cost to the State.

606-3.14 Removing and Disposing Anchorage Unit Assemblies and End Assemblies for Guide Railing and Median Barriers. The construction details of §606-3.13 shall apply except the anchor blocks and terminals become the property of the Contractor and shall be removed from the project.

606-3.15 Box Beam Guide Rail Transition to Concrete Barrier. The contractor shall construct a guide rail transition from concrete barrier to box beam guide rail at the locations indicated and as detailed on the contract plans. The work shall conform to the requirements of §606-3.01.

606-3.16 Corrugated Beam Guide Rail Transition to Bridge Rail, Concrete Barrier and Concrete Parapets. The contractor shall construct corrugated beam guide transitions to bridge rail, concrete barrier and/or concrete parapets at the locations and as detailed on the contract plans. The requirements of §606-3.01 shall apply together with the following: Railing shall be erected so that the rails are parallel to the roadway, except in those sections where it is necessary to vertically transition the highway barrier to the bridge railing, or barrier. Bending or curving of rail elements in order to fit alignment requirements in the field shall not be permitted. The Engineer may order some bending or curving to allow for necessary minor adjustments. The Contractor shall exercise care in attaching the guide rail to the bridge rail so as not to damage the rails, posts, or joints, or splices. Any damage to the material attributable to the

Contractor's operation shall require that the material be repaired, or replaced. The decision to repair, or replace, shall rest solely with the Engineer.

606-3.17 Vacant.

606-3.18 Vacant

606-3.19 Transitions Constructed of, or with, Concrete. Transitions constructed of concrete and the concrete elements of transitions constructed of metal components and concrete elements shall be constructed at the locations indicated in the contract documents, or those indicated by the Engineer, in accordance with these specifications, the contract documents, and the directions of the Engineer. The shapes indicated on the Standard Sheets are standard. The Deputy Chief Engineer (Design) will consider other shapes for approval.

§606-3.05 Concrete Barrier, A. Precast Concrete Barrier and B. Cast-in-Place Concrete Barrier shall apply.

606-4 METHOD OF MEASUREMENT

606-4.01 Cable, Corrugated Beam or Box Beam Guide Railing and Median Barrier. The quantity to be measured for payment will be in feet to the nearest foot of guide railing or median barrier installed, measured along the axis of the railing and between its pay limits as shown on the plans and/or standard sheets. The quantity to be measured for payment will be in feet to the nearest foot of shop bent or shop mitered guide railing or median barrier installed. If the guide railing does not terminate at an anchorage unit, end assembly, or transition to another type of barrier, but is anchored to a structure, the railing will be measured up to the structure.

606-4.02 Anchorage Units, End Assemblies and Transitions for Guide Railing or Median Barrier. Anchorage units, end assembly units and transitions between various highway guide railing and median barrier systems will be measured by the actual number of units installed in accordance with the plans, standard sheets, manufacturer's drawings', manufacturer's directions and/or as directed by the Engineer.

The payment limits for the Box Beam Guide Rail End Assembly Type III and Box Beam Median Barrier End Assembly, Type C will be separated by a distance of 50 feet extending along the end assembly from the front of the Nose Assembly to a point 50 feet removed. These payment limits apply regardless of whether the Type III End Assembly or Type C End Assembly employs crushable fiberglass elements or beam bursting type mandrels to absorb the energy of the impacting vehicle.

The limits of payment for the Corrugated Beam Guide Railing End Terminal (Energy-Absorbing) will extend a distance of 100 feet from the outer end of the terminal. At that point, payment will begin for corrugated beam guide railing.

The limits of payment for HPBO (Mod.) Corrugated BeamGuide Railing End Terminal (Energy-Absorbing) will extend a distance of 50 feet from the outer end of the terminal. At that point, payment will begin for heavy post blocked-out corrugated beam guide railing.

The limits of payment for HPBO (Mod.) Corrugated BeamMedian Barrier End Terminal (Energy-Absorbing) will extend a distance of 50 feet from the outer end of the terminal. At that point, payment will begin for heavy post blocked-out corrugated beam median barrier.

606-4.03 Concrete Barrier and Terminal Sections. The quantity of concrete barrier and terminal sections measured for payment will be the number of feet placed in accordance with the plans and specifications, measured along the axis of the barrier and between its extreme outer limits, unless otherwise indicated on the plans or in the proposal.

606-4.04 Resetting Guide Railing, Median Barrier and Precast Concrete Barrier. The quantity of reset guide railing or median barrier measured for payment will be the number of feet reset in accordance with the specifications, plans and as directed by the Engineer, exclusive of anchorage units and end assemblies. If the guide railing is anchored to a structure instead of an anchorage unit or end assembly, measurement will be made up to the structure. The quantity of reset precast concrete barrier measured for payment will be the number of feet placed in accordance with the plans and specifications measured along the axis of the barrier between its extreme outer limits.

606-4.05 Resetting Guide Railing and Median Barrier (New Posts). The Method of Measurement of §606-4.04 will apply.

606-4.06 Removing and Storing Guide Railing, Median Barrier and Precast Concrete Barrier. The quantity of removed and stored guide rail and median barrier measured for payment will be the number of feet removed in accordance with the specifications, plans, and as directed by the Engineer, exclusive of anchorage units and end assemblies. If the guide rail or median barrier is anchored to a structure, measurement will be made up to the structure. The quantity of removed and stored precast concrete barrier measured for payment will be the number of feet removed in accordance with the specifications and plans, measured along the axis of the barrier between its extreme outer limits.

606-4.07 Removing and Disposing of Guide Railing, Median Barrier and Concrete Barrier. The quantity of guide rail and median barrier measured for payment will be the number of feet of railing and posts removed and disposed of in accordance with the specifications and plans, exclusive of anchorage units and end assembly components that would not be used in the middle of a continuous run. The quantity of concrete barrier measured for payment will be the number of feet removed and disposed of in accordance with the specifications and plans measured along the axis of the barrier between its extreme outer limits and including any backup posts.

606-4.08 Removing and Disposing of Guide Posts, Guide Rail Posts, and Median Barrier Posts. The quantity to be measured for payment will be the number of posts removed and disposed of in accordance with the specifications and plans and as directed by the Engineer.

606-4.09 Resetting Anchorage Unit Assemblies and End Assemblies for Guide Railing and Median Barrier This work shall be measured by the number of anchorage units and/or terminals reset in accordance with the requirements of the contract documents.

606-4.10 Removing and Storing or Disposing of Anchorage Unit Assemblies and End Assemblies for Guide Railing and Median Barrier. This work shall be measured by the number of Anchorage Units or End Assemblies properly removed and stored for pick up by others or removed and disposed of in accordance with the contract documents and to the satisfaction of the Engineer

606-4.11 Retensioning Existing Cable Guide Railing and Median Barrier. Quantity measured for payment will be the number of sections retensioned. A section shall consist of the length of cable guide rail or median barrier running between two concrete anchorage units.

606-4.12 Vacant.

606-4.13 Corrugated Beam Guide Rail Transition to Bridge Rail, Concrete Barrier and Concrete Parapets. Measurement will be taken as the actual number of transition units installed in accordance with the plans and specifications.

606-4.14 Box Beam Guide Rail Transition to Concrete Barrier. Measurement will be taken as the actual number of transition units installed in accordance with the specifications, plans and standard sheets.

606-4.15 Vacant

606-4.16 I-Beam Posts for Existing Highway Barrier. I-beam posts for existing highway barrier will be measured by the actual number of posts installed in accordance with the contract documents and as directed by the Engineer.

606-4.17 Transition between Concrete Sections. Transitions will be measured by the actual number of units installed in accordance with the plans, standard sheets and/or as directed by the Engineer.

TABLE 606-2 PAYMENT FACTORS FOR GUIDE RAIL AND MEDIAN BARRIER POST SPACING

Payment Factor	**1.0**	**1.1**	**1.3**	**1.4**	**1.6**	**1.8**	**1.9**
Rail Type	**Post Spacing Center to Center in Feet & Inches**						
Cable*	16’	12’	---	8’	—	---	4’
Box Beam	6’	---	3’	---	---	---	---
Corrugated Beam	12’6”	---	---	6’3”	4’2”	---	3’ 1 1/2”
HPBO (Mod.) Corrugated Beam	6’3”	---	---	---	---	3’ 1 1/2”	---

* For cable guide rail, the post spacing in the typical approach, terminal sections and typical intermediate anchorage sections as indicated on the standard sheets, shall have payment factors of 1.0.

606-5 BASIS OF PAYMENT

606-5.01 Guide Railing, Median Barrier, Concrete Barrier and Terminal Sections; Various Types. The unit price bid per foot for the above work shall include the cost of all labor, equipment and material necessary to complete the work, including the cost of any repairs required, and the costs of bending any rail element to the required curvature.

Payment for corrugated guide rail and median barrier, or bent box beam guide rail, will be determined using the payment factors for the various typical post spacings listed in Table 606-2. Payment will be the sum of the products obtained by multiplying the unit price bid for a rail or median barrier by the payment factors listed in Table 606-2 for the relevant post spacings and multiplying each of those products by the length of rail having that given post spacing.

Payment for mitered box beam and median barrier with 6 foot post spacings will be made at the unit prices bid. If a reduced post spacing of 3 feet is used for mitered box beam guide rail, the payment will be determined by multiplying the unit price bid by a payment factor of 1.1for the length installed.

When posts are driven through asphalt concrete or bituminous treated material, any repairs to damage paved or treated areas shall be at the Contractor's expense. Progress payments will be made when the metal railing and/or metal barrier is erected in the position and manner indicated on the standard sheets and in a manner approved by the Engineer, exclusive of bituminous repair and final alignment. Payment will be made, at the unit price bid, for 90% of the measured quantity erected. The balance of the quantity erected will be paid for upon proper repair to the bituminous surfaces and alignment of the metal railing and/or metal barrier to the specified tolerances.

606-5.02 End Assembly, End Anchorage Units and Transitions for Guide Railing and Median Barrier. The unit price bid for each end assembly, end anchorage unit or transition shall include the cost of furnishing all labor, materials and equipment necessary to complete the work, including the necessary concrete, excavation, backfill, reflectorization, object markers when required at driveways and vehicle

openings, and spring cable assembly (compensating device) and/or steel turnbuckle cable end assembly required for cable guide rail.

606-5.03 Resetting; Removing and Storing; Removing and Disposing; of Guide Railing, Median Barrier and Concrete Barrier. The unit price bid per foot for the above work items shall include the cost of furnishing all labor, equipment and materials necessary to complete the work and restore the system to full operating capacity.

Any materials damaged due to Contractor's operation shall be replaced by him and the cost shall be included in the price bid for this item.

Payment for resetting guide rail and median barrier shall include the unit price bid multiplied by the measured quantity multiplied by the payment factor for the various typical post spacings listed in Table 606-2, except that posts required to reduce the post spacing from the original post spacing shall be paid for under the appropriate I-beam post for existing highway barrier item.

A. Progress payments for resetting guide rail, median barrier and precast concrete barrier will be made as follows:
1. 25% of the unit price bid for the quantity of guide rail, median barrier or precast concrete barrier removed and stored in accordance with the provisions of §606.3-06 Resetting Guide Railing, Median Barrier and Precast Concrete Barrier.
2. 65% of the unit price bid for the measured quantity of guide railing, median barrier or precast concrete barrier cleaned and reset in accordance with the provisions of §606-3.06.
3. The balance of the unit price bid for the quantity of the guide railing, median barrier or concrete barrier will be paid upon repair to the bituminous surfaces damaged by the resetting operations.

B. Progress payments for removing and disposing or storing of guide railing, median barrier or concrete barrier will be made as follows:
1. 75% of the unit price bid for the measured quantity of guide railing, median barrier or concrete barrier removed and stored or disposed of as specified.
2. The balance of the unit price bid for the measured quantity of guide railing and/or median barrier removed and stored or disposed of as specified will be paid when any voids have been backfilled and disturbed areas are reestablished to the satisfaction of the Engineer.

606-5.04 Removing and Disposing of Guide Posts, Guide Rail Posts and Median Barrier Posts. The unit price bid per post for the above work items shall include the cost of furnishing all labor, equipment and material necessary to complete the work.

606-5.05 Resetting; Removing and Storing; Removing and Disposing; of Anchorage Unit Assemblies and End Assemblies for Guide Railing and Median Barrier. The unit price bid for each of these items shall include the cost of furnishing all labor, equipment and material necessary to complete the work including excavation and backfill.

If the Contractor elects to install new concrete anchors, in lieu of removing and resetting the existing ones, the cost of furnishing and installing the new anchor as well as the cost for necessary adjustments to the existing one shall be included in the price bid for these items.

A. Progress payments for resetting anchorage units and terminals for guide rail and median barrier will be made as follows:

1. 25% of the unit price bid for the quantity of anchorage units and/or terminals removed and stored in accordance with the provisions of §606-3.12 Resetting Anchorage Units and Terminals for Guide Rail and Median Barrier.
2. 65% of the unit price bid for the quantity of anchorage units and/or terminals cleaned and reset in accordance with the provisions of §606-3.12 Resetting Anchorage Units and Terminals for Guide Rail and Median Barrier.

3. The balance of the unit bid price for the quantity of anchorage units reset upon the reestablishment of surface areas disturbed.

B. Progress payments for removing and storing or removing and disposing of anchorage units and/or terminals for guide railing and/or median barriers will be made as follows:

1. 75% of the unit price bid for the quantity of anchorage units and/or terminals removed and stored or disposed of as specified.

2. The balance of the unit price bid for the quantity of anchorage units and/or terminals removed and stored or disposed of as specified will be paid upon the establishment of surface areas disturbed.

606-5.06 Vacant 606-5.07 Corrugated Beam Guide Rail Transition to Bridge Rail, Concrete Barrier and Concrete Parapets. The unit price bid per guide rail transition shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work, including back-up posts, connections and hardware.

606-5.08 Box Beam Guide Rail Transition to Concrete Barrier. The unit price bid per guide rail transition shall include the cost of all labor, equipment, and material necessary to satisfactorily complete the work, including back-up posts, necessary rail curvature, splices, connections and hardware.

606-5.09 Vacant

606-5.10 I-Beam Posts for Existing Highway Barrier. The unit price bid for I-beam posts for existing highway barrier shall include the cost of furnishing all labor equipment and material necessary to complete the work. Removal of damaged posts and hardware is included in other items of work.

When posts are driven through asphalt concrete or bituminous treated material, any repairs to damaged paved or treated areas shall be at the Contractor's expense.

606-5.11 Retensioning Existing Gable Guide Railing and Median Barrier. The unit price bid for retensioning a section of cable guide railing or median barrier shall include the cost of all labor, materials and equipment necessary to complete the work.

606-5.12 Transition between Concrete Sections. The unit price bid per concrete transition shall include the cost of all labor, equipment, and material necessary to satisfactorily complete the work, including back-up posts, connections and hardware.

Payment will be made under:

Item No.	Item	Pay Unit
606.01	Cable Guide Railing	Foot
606.0101	Cable Guide Railing With Extra Long Posts	Foot
606.0201	Anchorage Units for Cable Guide Railing	Each
606.03	Cable Median Barrier	Foot
606.0310	Anchorage Units for Cable Median Barrier	Each
606.10	Box Beam Guide Railing	Foot
606.100002	Box Beam Guide Railing (Shop Bent or Shop Mitered)	Foot
606.100003	Box Beam Guide Railing (Shop Mitered)	Foot
606.1001	Box Beam Guide Railing With Extra Long Posts	Foot
606.100102	Box Beam Guide Railing with Extra Long Posts (Shop Bent or Shop Mitered)	Foot
606.100103	Box Beam Guide Railing with Extra Long Posts (Shop Mitered)	Foot
606.11	Box Beam Median Barrier	Foot
606.110002	Box Beam Median Barrier (Shop Bent or Shop Mitered)	Foot
606.110003	Box Beam Median Barrier (Shop Mitered)	Foot

606.120101	Box Beam End Piece	Each
606.120102	Box Beam Guide Railing End Assembly Type I	Each
606.120103	Box Beam Guide Railing End Assembly Type I with 18 ft Extension	Each
606.120201	Box Beam Guide Railing End Assembly Type IIA	Each
606.1203	Box Beam End Assembly Type III	Each
606.1401	Box Beam Median Barrier End Assembly, Type A	Each
606.1402	Box Beam Median Barrier End Assembly, Type B	Each
606.1403	Box Beam Median Barrier End Assembly, Type C	Each
606.16	Corrugated Beam Guide Railing	Foot
606.160001	Corrugated Beam Guide Railing (Shop Curved)	Foot
606.1601	Corrugated Beam Guide Railing With Extra Long Posts	Foot
606.160101	Corrugated Beam Guide Railing With Extra Long Posts (Shop Curved)	Foot
606.17	Corrugated Beam Median Barrier	Foot
606.170001	Corrugated Beam Median Barrier (Shop Curved)	Foot
606.18	Modified Weak-Post, Corrugated Beam Guide Rail	Foot
606.180001	Modified Weak-Post, Corrugated Beam Guide Rail (Shop Curved)	Foot
606.1801	Modified Weak-Post, Corrugated Beam Guide Rail With Extra Long Posts	Foot
606.180101	Modified Weak-Post, Corrugated Beam Guide Rail With Extra Long Posts (Shop Curved)	Foot
606.22	Anchorage Units for Corrugated Beam Guide Railing	Each
606.2201	Anchorage Units for Corrugated Beam Guide Railing Buried In Back Slope	Each
606.23	Anchorage Units for Corrugated Beam Guide Railing (Driveways, Walkways, and Other Openings)	Each
606.24	Anchorage Units for Corrugated Beam Median Barrier	Each
606.26	Corrugated Beam Guide Railing End Terminal (Energy-Absorbing)	Each
606.27	HPBO (Mod.) Corrugated Beam Guide Railing End Terminal (Energy-Absorbing)	Each
606.2701	HPBO (Mod.) Corrugated Beam Guide Railing	Foot
606.270101	HPBO (Mod.) Corrugated Beam Guide Railing (Shop Curved)	Foot
606.2702	HPBO (Mod.) Corrugated Beam Guide Railing with Extra Long Posts	Foot
606.270201	HPBO (Mod.) Corrugated Beam Guide Railing with Extra Long Posts (Shop Curved)	Foot
606.2703	Anchorage Units for HPBO (Mod.) Corrugated Beam Guide Railing	Each
606.2704	Anchorage Units for HPBO (Mod.) Corrugated Beam Guide Railing Buried in Back Slope	Each
606.28	HPBO (Mod.) Corrugated Beam Median Barrier End Terminal (Energy-Absorbing)	Each
606.2801	HPBO (Mod.) Corrugated Beam Median Barrier	Foot
606.280101	HPBO (Mod.) Corrugated Beam Median Barrier (Shop Curved)	Foot
606.2802	Anchorage Units for HPBO (Mod.) Corrugated Beam Median Barrier	Each
606.3001	Concrete Barrier Type A (Optional)	Foot
606.3002	Concrete Barrier Type B (Optional)	Foot
606.3003	Concrete Barrier Type C (Optional)	Foot
606.3004	Half Section Concrete Barrier (Optional)	Foot
606.3011	Concrete Barrier Type A (Precast)	Foot
606.3012	Concrete Barrier Type B (Precast)	Foot
606.3013	Concrete Barrier Type C (Precast)	Foot
606.3014	Half Section Concrete Barrier (Precast)	Foot

606.3021	Concrete Barrier Type A (Cast-in-Place)	Foot
606.3022	Concrete Barrier Type B (Cast-in Place)	Foot
606.3023	Concrete Barrier Type C (Cast-in Place)	Foot
606.3024	Half Section Concrete Barrier (Cast-in Place)	Foot
606.3031	Concrete Barrier Type A (Machine Formed)	Foot
606.3032	Concrete Barrier Type B (Machine Formed)	Foot
606.3033	Concrete Barrier Type C (Machine Formed)	Foot
606.3034	Half Section Barrier (Machined Formed)	Foot
606.3041	Single-Slope Concrete Median Barrier (Optional)	Foot
606.3042	Single-Slope Concrete Median Barrier (Precast)	Foot
606.3043	Single-Slope Concrete Median Barrier (Cast-in-Place)	Foot
606.3044	Single-Slope Concrete Median Barrier (Machine Formed)	Foot
606.3051	Single-Slope Concrete Median Barrier - Wide (Optional)	Foot
606.3052	Single-Slope Concrete Median Barrier - Wide (Precast)	Foot
606.3053	Single-Slope Concrete Median Barrier - Wide (Cast-in-Place)	Foot
606.3054	Single-Slope Concrete Median Barrier - Wide (Machine Formed)	Foot
606.3061	Single-Slope Concrete Half Section Barrier (Optional)	Foot
606.3062	Single-Slope Concrete Half Section Barrier (Precast)	Foot
606.3063	Single-Slope Concrete Half Section Barrier (Cast-in-Place)	Foot
606.3064	Single-Slope Concrete Half Section Barrier (Machine Formed)	Foot
606.4701	I-Beam Posts for Existing Cable Median Barrier	Each
606.48	Retensioning Existing Cable Guide railing or Median Barrier	Each
606.4801	I-Beam Posts for Existing Cable Guide Railing	Each
606.4803	Extra Long I-Beam Posts for Existing Cable Guide Railing	Each
606.4805	I-Beam Posts for Existing Corrugated Beam Guide Railing	Each
606.4807	Extra Long I-Beam Posts for Existing Corrugated Beam Guide Railing	Each
606.4809	I-Beam Posts for Existing Box Beam Guide Railing	Each
606.4811	Extra Long I-Beam Posts for Existing Box Beam Guide Railing	Each
606.4813	I-Beam Posts for Existing Corrugated Beam Median Barrier	Each
606.4815	I-Beam Posts for Existing Box Beam Median Barrier	Each
606.4818	I-Beam posts for Existing HPBO (Mod.) Corrugated Beam Guide Railing	Each
606.4820	Extra Long I-Beam Posts for Existing HPBO (Mod.)Corrugated Beam Guide Railing	Each
606.4822	I-Beam Posts for Existing HPBO (Mod.) Corrugated Beam Median Barrier	Each
606.4824	Extra Long I-Beam Posts for Existing HPBO (Mod.) Corrugated Beam Median Barrier	Each
606.50	Resetting Cable Guide Railing	Foot
606.5010	Resetting Cable Median Barrier	Foot
606.5048	Resetting Cable Guide Railing (New Posts)	Foot
606.5049	Resetting Cable Median Barrier (New Posts)	Foot
606.51	Resetting Corrugated Beam Guide Railing	Foot
606.5148	Resetting Corrugated Beam Guide Railing (New Posts)	Foot
606.52	Resetting Corrugated Beam Median Barrier	Foot
606.5248	Resetting Corrugated Beam Median Barrier (New Posts)	Foot
606.53	Resetting Box Beam Guide Railing	Foot
606.5348	Resetting Box Beam Guide Railing (New Posts)	Foot
606.54	Resetting Box Beam Median Barrier	Foot
606.5448	Resetting Box Beam Median Barrier (New Posts)	Foot
606.5501	Resetting HPBO Corrugated Beam Guide Railing (New 12 in. Blockouts)	Foot
606.5601	Resetting HPBO Corrugated Beam Median Barrier (New 12 in. Blockouts)	Foot
606.57	Resetting Precast Concrete Barrier	Foot

606.5710	Resetting Precast Concrete Barrier- Half Section	Foot
606.58	Resetting HPBO (Mod.) Corrugated Beam Guide Railing	Foot
606.5801	Resetting HPBO (Mod.) Corrugated Beam Guide Railing (New Posts)	Foot
606.5810	Resetting HPBO (Mod.) Corrugated Beam Median Barrier	Foot
606.581001	Resetting HPBO (Mod.) Corrugated Beam Median Barrier (New Posts)	Foot
606.5901	Resetting Anchorage Units for Cable Guide railing or Median Barrier	Each
606.5910	Resetting Anchorage Units for Corrugated Beam Guide Railing or Median Barrier	Each
606.5920	Resetting Box Beam Guide Rail Turned-Down Terminal	Each
606.5921	Resetting Box Beam Guide Rail Energy-Absorbing Terminal	Each
606.5930	Resetting Box Beam Median Barrier End Assembly--Type A	Each
606.5931	Resetting Box Beam Median Barrier End Assembly--Type B	Each
606.5941	Resetting Anchorage Units for HPBO (Mod.) Corrugated Beam Guide Railing	Each
606.5946	Resetting Anchorage Units for HPBO (Mod.) Corrugated Beam Median Barrier	Each
606.60	Removing and Storing Cable Guide Railing	Foot
606.6010	Removing and Storing Cable Median Barrier	Foot
606.61	Removing and Storing Corrugated Beam Guide Railing	Foot
606.62	Removing and Storing Corrugated Beam Median Barrier	Foot
606.63	Removing and Storing Box Beam Guide Railing	Foot
606.64	Removing and Storing Box Beam Median Barrier	Foot
606.65	Removing and Storing Precast Concrete Barrier	Foot
606.6510	Removing and Storing Precast Concrete Barrier-Half Section	Foot
606.66	Removing and Storing HPBO (Mod.) Corrugated Beam Guide Railing	Foot
606.67	Removing and Storing HPBO (Mod.) Corrugated Beam Median Barrier	Foot
606.6910	Removing and Storing Anchorage Units for Corrugated Beam Guide Railing and Median Barriers	Each
606.6911	Removing and Storing Weak- and Heavy-Post Corrugated Beam Terminals	Each
606.6920	Removing and Storing Box Beam Guide Railing End Assembly	Each
606.6932	Removing and Storing Box Beam Median Barrier End Assembly-Type C	Each
606.6941	Removing and Storing Anchorage Units for HPBO (Mod.) Corrugated Beam Guide Railing	Each
606.6946	Removing and Storing Anchorage Units for HPBO(Mod) Corrugated Beam Median Barrier	Each
606.70	Removing and Disposing Cable Guide Railing	Foot
606.7010	Removing and Disposing Cable Median Barrier	Foot
606.71	Removing and Disposing Corrugated Beam Guide Railing	Foot
606.7101	Removing and Disposing HPBO (Mod.) Corrugated Beam Guide Railing	Foot
606.72	Removing and Disposing Corrugated Beam Median Barrier	Foot
606.7201	Removing and Disposing HPBO (Mod.) Corrugated Beam Median Barrier	Foot
606.73	Removing and Disposing Box Beam Guide Railing	Foot
606.74	Removing and Disposing Box Beam Median Barrier	Foot
606.75	Removing and Disposing Concrete Barrier	Foot
606.7510	Removing and Disposing Concrete Barrier-Half Section	Foot
606.76	Removing and Disposing of Guide Posts, Guide Rail Posts, and Median Barrier Posts	Each
606.79	Removing and Disposing Anchorage Units for Cable Guide railing or Median Barrier	Each

606.7910	Removing and Disposing Anchorage Units for Corrugated Beam Guide Railing and Median Barrier	Each
606.7911	Removing and Disposing Weak- and Heavy-Post Corrugated Beam Energy-Absorbing Terminals	Each
606.7920	Removing and Disposing Box Beam Guide Rail Turned-Down Terminal	Each
606.7921	Removing and Disposing Box Beam Energy-Absorbing Terminal	Each
606.7930	Removing and Disposing Box Beam Median Barrier End Assembly-Type A	Each
606.7931	Removing and Disposing Box Beam Median Barrier End Assembly--Type B	Each
606.7932	Removing and Disposing Box Beam Median Barrier End Assembly-Type C	Each
606.7941	Removing and Disposing Anchorage Units for HPBO(Mod) Corrugated Beam Guide Railing	Each
606.7946	Removing and Disposing Anchorage Units for HPBO(Mod) Corrugated Beam Median Barrier	Each
606.8101	Guide Rail Transition Weak-Post Corrugated Beam to Box Beam Guide Rail (One or Two Way Operation)	Each
606.8201	Guide Rail Transition Box Beam to Weak-Post Corrugated Beam Guide Rail (One Way Only)	Each
606.83	Guide Rail Transition Cable to Box Beam (One or Two Way Operation)	Each
606.84	Guide Rail Transition Box Beam to Cable (One Way Only)	Each
606.8501	Median Barrier Transition Weak-Post Corrugated Beam to Box Beam	Each
606.86	Guide Rail Transition Corrugated Beam to Thrie Beam	Each
606.8701	Corrugated Beam Guide Railing Transition Assembly Two Rail Steel Bridge Railing	Each
606.8702	Corrugated Beam Guide Railing Transition Assembly Four Rail Steel Bridge Railing	Each
606.8703	Corrugated Beam Guide Railing Transition Assembly Discontinuous Steel Bridge Railing	Each
606.8704	Corrugated Beam Guide Railing Transition Assembly Concrete Parapets, or Concrete Barrier	Each
606.8801	Box Beam Guide Rail Transition to Concrete Barrier (One or Two Way Operation)	Each
606.8802	Box Beam Guide Rail Transition to Concrete Barrier (One Way-Trailing End)	Each
606.8803	Transition Between Box Beam Guide Rail and Single Slope Half Section Concrete Barrier (One or Two Way Operation)	Each
606.8804	Transition Between Single Slope Half Section Concrete Barrier and Box Beam Guide Rail (One Way - Trailing End of Barrier)	Each
606.8805	Transition Between Box Beam Median Barrier and Single Slope Concrete Median Barrier	Each
606.8901	Transition: HPBO (Mod.) Corrugated Guide Railing to Beam Box Beam Guide Railing	Each
606.8902	Transition: HPBO (Mod.) Corrugated Beam Guide Railing to Weak Post Corrugated Beam Guide Railing	Each
606.8903	Transition: HPBO (Mod.) Corrugated Beam Guide Railing to Single Slope Concrete Half Section Barrier	Each
606.8904	Transition: HPBO (Mod.) Corrugated Beam Median Barrier to Beam Box Beam Median Barrier	Each
606.8905	Transition: HPBO (Mod.) Corrugated Beam Median Barrier to Weak Post Corrugated Beam Median Barrier	Each

606.8906	Transition: HPBO (Mod.) Corrugated Beam Median Barrier to Single Slope Concrete Median Barrier	Each
606.9001	Transition between Standard (NJ) Concrete Barrier and Single-Slope Concrete Barrier	Each
606.9002	Transition between Wide and Normal Single Slope Concrete Median Barrier	Each
606.9003	Transition between Half-Section and Full-Section Single Slope Concrete Barrier (Left Pocket)	Each
606.9004	Transition between Half-Section and Full-Section Single Slope Concrete Barrier (Right Pocket)	Each

SECTION 680 - TRAFFIC SIGNALS

680-1 DESCRIPTION

680-1.01 Work. This work shall consist of furnishing and installing new traffic signal equipment, in accordance with the plans, specifications, standard sheets, or directions of the Engineer.

680-1.02 Definitions. The following definitions shall apply to all work, equipment, and materials included under this section:

1. Actuation - The operation of any type of detector.
2. Controller - That part of a controller assembly which performs the basic timing and logic functions.
3. Controller Assembly - The complete assembly for controlling the operation of a traffic signal, consisting of a controller together with all auxiliary equipment, housed in a weatherproof cabinet or cabinets.
4. Cycle Length - The time in seconds required for one complete signal cycle.
5. Detector - A device for indicating the passage or presence of vehicles or pedestrians.
6. Inductance Loop Detector - A detector consisting of a wire loop embedded in the roadway surface connected to an electronic device that is capable of sensing the passage or presence of either moving or stationary vehicles by a change in the electrical inductance characteristics of the wire loop.
7. Interval - That part or parts of a signal cycle during which signal indications do not change.
8. Phase - That part of a signal cycle allocated to any traffic movement receiving the right of way or to any combination of traffic movement receiving the right of way simultaneously during one or more intervals. Each phase shall consist of at least one green interval and one yellow clearance interval.
9. Signal Cycle - A complete sequence of signal indications.
10. Signal Face - That part of a signal head provided for controlling traffic in a single direction and consisting of one or more signal sections. Turning indications may be included in a signal face.
11. Signal Head - An assembly containing one or more signal faces which may be designated accordingly as one-way, two-way, etc.
12. Signal Indication - The illumination of a traffic signal lens or equivalent device, or a combination of several lenses or equivalent devices at the same time.
13. Signal Section - A complete unit for illuminating a lens consisting of a housing, lens, reflector, lamp receptacle, and lamp.
14. Type I Traffic Signal Section. A Type I Traffic Signal Section is a standard or polycarbonate traffic signal section without reflector, reflector ring, lens, and lamp receptacle.
15. Type I Pedestrian Signal Section. A Type I Pedestrian Signal Section is a standard or polycarbonate pedestrian signal section without reflector, lens, and lamp receptacle.

680-2 MATERIALS

680-2.01 Traffic Signal Equipment. The specific components used in the construction of new traffic signal systems shall meet the requirements of the following subsections included under Section 700-Materials and Manufacturing:

Bar Reinforcement, Grade 60	709-01
Iron Castings	715-05
Breakaway Transformer Base	723-15
Rigid Plastic Conduit	723-19
Metal Steel Conduit, Zinc Coated	723-20
P.V.C. Coated Galvanized Steel Conduit	723-23
Flexible Liquid-Tight Steel Conduit	723-24
Cast Iron Junction Boxes	723-40
Precast Reinforced Concrete Pullboxes	723-45

Signal Cable	724-01
Span Wire	724-02
Traffic Signal Poles	724-03
Traffic Signal Heads	724-04
Shielded Communication Cable	724-08
Signal Cable with Integral Messenger	724-09
Shielded Communication Cable with Integral Messenger	724-10
Fire Pre-emption Tell Tale Light	724-15
Inductance Loop Wire	724-20
Shielded Lead-in Cable	724-21
Roadway Loop Embedding Sealer	724-22
Pedestrian Push Button and Sign	724-23
Fiberoptic Pedestrian Signal Heads	724-04
Fiberoptic Dual Indication Arrow	724-04
Strobing Signal Indication	724-04
LED Traffic Signal Modules	724-04
LED Pedestrian Signal Modules	724-04

680-2.02 Concrete. All cast-in-place pullboxes, signal pole foundations and controller cabinet bases shall meet the requirements of Class A concrete in section 501, Portland Cement Concrete General, except that the requirements for inspection facilities, automated batching controls and recordation do not apply. The batching, mixing and curing methods and the inspection facilities shall meet the approval of the Department or its representative. The Contractor may submit, for approval by Director, Materials Bureau, a mix at least equivalent to the specified Class A Concrete.

All precast concrete pullboxes, signal pole foundations and controller cabinet bases shall meet the requirements of §723-45 Precast Reinforced Concrete Pullboxes.

680-2.03 Messenger Wire. Messenger wire shall meet the requirements of §724-02 Span Wire.

680-2.04 Guy Wire. Guy wire shall meet the requirements of §724-02 Span Wire.

680-2.05 Pullbox Frames and Covers. Frames and covers shall meet the requirements of §715-05 Iron Castings.

680-3 CONSTRUCTION DETAILS

680-3.01 Equipment List and Drawings. Unless otherwise waived, the Contractor shall submit to the Regional Director within 30 days following the award of contract, detailed specifications, catalog cuts, parts list, instruction sheets, and shop drawings of equipment and materials which he proposes to install.

680-3.02 (Vacant)

680-3.03 Negotiations with Utility Company. The Contractor shall be responsible for all negotiations involving utility companies.

The Contractor shall comply with utility company regulations.

When a entry into a service manhole or attachment to any utility company pole is required, the Contractor shall notify the utility company sufficiently in advance. Entry into a service manhole or attachment to any pole shall not be made without the presence of a utility company representative if the utility company so requires. The service points shown on the plans are approximate only and the Contractor shall determine the exact location from the serving utility company.

The Contractor shall make arrangements with the local utility company to complete the service connection.

680-3.04 Underground Facilities. The Contractor shall locate all existing underground facilities in accordance with the provisions of Industrial Code Rule 753. It shall be the Contractors responsibility to satisfy himself as to existing conditions and to protect and support in a suitable manner all underground facilities encountered during the trenching and excavating operations. The Contractor shall repair any damage to these lines caused by his operations, and if the nature of the damage is such as to endanger the operations of these services and utilities and the necessary repairs are not immediately made by the Contractor, the work may be performed by the State or other Contractor and the cost thereof charged against the Contractor.

680-3.05 Test Holes. Prior to excavating for pole placement and after locating all existing underground facilities, the Contractor shall dig a test hole or holes at the proposed location of each pole. If obstructions are encountered the Contractor shall properly backfill the test hole and move to a new location as directed by the Engineer.

680-3.06 Work Sites. The Contractor shall perform all work within the work site in a workmanlike manner and in accordance with U.S. Department of Labor's Occupational Safety and Health Standards.

The sites of the work and adjacent premises shall be kept as free from material, debris and rubbish as is practicable. All such material or debris that accumulates during the work shall be removed by the Contractor as the work progresses.

Neither the materials excavated, nor the materials used, shall be placed so as to prevent access to any fire hydrants, water valves, manholes, police call boxes or fire alarm boxes.

680-3.07 Schedule of Work. The Contractor shall notify the local power company at least 72 hours (or as required by the company) in advance of the time that the individual installation is complete and ready for operation in order that taps may be made by the power company to distribution lines.

Upon completion of a signal installation the signal may be placed in service prior to the completion of other installations or the signal head may be covered. The Contractor shall place the signal in operation or cover the head as directed by the Engineer.

When the traffic signal is placed in operation, it shall be operated in accordance with timing schedules to be supplied by the Department.

680-3.08 Contractor Responsibility with Utilities. All attachments to utility company poles shall be made in accordance with the specifications and subject to the inspection of the utility companies owning the poles. The height of all proposed attachments above the ground and their locations on the poles shall be in accordance with the plans, standard sheets or as directed by the Engineer and shall meet the approval of the utility companies owning the poles.

The Contractor shall protect all property and materials of the utility companies and shall be responsible for the repair or replacement of any damaged material or property. In the event that the point of attachment or location of the risers is such that the risers interfere with or do not provide proper clearance with existing utility company attachments, the Engineer, in consultation with the utility companies owning the poles, shall make the necessary adjustments in heights and location to eliminate such interference.

680-3.09 Excavation. All excavation shall be performed in accordance with Section 206 Trench, Culvert and Structure Excavation, including the protection of workers and the public.

Excavation shall not be performed until immediately before installation of the conduit, direct burial cable, footings, pullboxes or any other appurtenances. The excavated material shall be placed in a location or locations approved by the Engineer. These locations shall be selected by the Contractor so as to cause

the least inconvenience to vehicular and pedestrian traffic and to cause the minimum interference with the surface drainage. All surplus excavated material shall be removed and disposed of by the Contractor as specified in Section 203, *Disposal of Surplus Excavated Material*.

Excavation shall be backfilled as specified in Section 203, *Select Granular Fill* After backfilling, the excavation shall be kept well filled and maintained in a smooth and well drained condition until permanent repairs are made.

The outline of all areas to be removed in sidewalks, driveways, and pavement shall be saw cut to a depth of at least 3 inches prior to removing the sidewalk, driveway or pavement. Cuts shall be neat and true along score lines with no shatter outside the removal area. Damaged saw cut areas shall be recut.

Pavement, shoulder, sidewalks, curbs, driveways, lawns, plants and other such features shall be replaced in kind with material of equal quality or as shown on the plans, standard sheets or as directed by the Engineer.

Whenever a part of a square or slab of existing concrete sidewalk, curb, gutter or driveway is broken or damaged, the entire square, section or slab shall be removed and replaced with the same kind and quality of material.

For transverse sidewalk, curb or gutter cuts in concrete the entire square or section shall be removed and replaced with the same kind and quality of material. For longitudinal cuts in concrete sidewalks only the area removed between sawcuts shall be replaced unless specified otherwise on the plans.

680-3.10 Pole Excavation and Concrete Foundation. Foundations shall be constructed as shown in the contract documents or as directed by the Engineer. However, the Contractor has the option to use either Cast-in-Place or Precast Concrete foundations for the signal poles.

If the Contractor elects to install a cast-in-place foundation, the signal pole may be installed on the foundation three (3) days after concrete placement. However, the span wire and signal heads may not be installed until the concrete cylinder strength reaches at least 2200 psi. Therefore, the Contractor shall assist the Engineer in making a sufficient number of test cylinders of the foundation concrete, store these cylinders at the location directed by the Engineer, and transport these cylinders to the State testing facility in order to install the traffic signal as soon as possible.

If the Engineer requests the submittal of design computations for one or more signal poles, the Contractor shall not start construction of the foundations for those signal poles until the Engineer's review of the submittal is completed. The Engineer will have twenty (20) working days to review the design computation for one signal pole, and an additional two (2) working days for each additional signal pole.

For those poles on which a traffic signal cabinet will be mounted, the Contractor shall orient the pole foundation to align the signal cabinet and cabinet wiring access hole as specified on the plans. If no orientation is specified on the plans, the Contractor shall orient the signal cabinet and cabinet wiring access hole 180° from the span wire or load attachment to the pole, unless otherwise directed by the Engineer. The Contractor shall notify the Engineer three (3) working days in advance of doing any pole foundation work and provide the intended pole orientation.

680-3.11 Poles. Poles shall be erected as specified on the plans, standard sheets and as directed by the Engineer.

Pole and signal locations shown on the contract plans shall be field checked for any condition that may affect their placement, where changes are necessary the exact location will be determined by the Engineer.

When field conditions require a change in pole position from that shown in the contract plans, the pole length requirements may vary. It shall be the Contractor’s responsibility to verify pole length before ordering poles.

Pole erection shall include installation of mast arms and lighting arms and attachment of fittings as specified on the plans and standard sheets as follows:

1. Anchor bolt covers if specified.

2. Weatherheads and couplings as required.
3. Service bracket.
4. Pole cap and mast arm end caps.
5. Cabinet mounting fittings, plates, brackets as needed for the cabinet being installed.
6. Reinforced couplings for wire entrances to cabinets.
7. Galvanized eyebolt, nuts and washers for attaching span wire assembly.
8. Galvanized pole clamps with eyes for attaching tether wires.

In addition, the Engineer may require the contractor to submit, at any time, design computations for any or all of the traffic signal poles in the contract. The design computations must be approved, stamped and signed by a professional engineer licensed in New York State. The Engineer shall have twenty (20) working days to review the design computations for one traffic signal pole, and an additional two (2) days for each additional signal pole.

If the Engineer's review of a pole's design indicates a problem(s) exists, the Contractor will be notified within the time allotted for the review. In these cases a meeting will be held between the Engineer and the Contractor to resolve the Engineer's concerns.

680-3.12 Grounding. A copper clad ground rod, ground wire and fittings shall be installed as shown on the plans, standard sheets or as directed by the Engineer. The ground system shall be electrically connected to the grounding terminal on the pole or controller cabinet.

The ground system when completed shall be tested in accordance with §680-3.32. If the requirements of this test are not met, additional ground rods, ground rod extensions, electrical bonding of metallic conduit or other grounding measures may be required as directed by the Engineer.

680-3.13 Conduit and Direct Burial Cable. Conduit and direct burial cable shall be installed as specified on the plans, standard sheets or as directed by the Engineer. Underground conduit and direct burial cable installations shall have a minimum cover of 18 inches except under roadways, where the minimum cover shall be 24 inches unless specified otherwise on the plans, or standard sheets. The conduit shall be laid on a uniform grade to allow any condensation to drain to pull boxes or "T" drains. Conduit shall be backfilled in accordance with Section 203, *Select Granular Fill* In rock excavations a bedding of select backfill must be placed and tamped before laying the conduit.

Conduit may be placed under pavement by jacking or boring methods approved by the Engineer. Pavement may not be disturbed without permission of the Engineer. In the event obstructions are encountered, small test holes may be cut in the pavement upon approval of the Engineer. Jacking or boring pits shall be kept 2 feet clear of the edge of pavement and shoulder whenever possible. Excavation for jacking or boring pits shall be in accordance with §680-3.09 Excavation.

Conduit or direct burial cable may be placed by machine methods approved by the Engineer.

All bends in conduit shall be made without kinking, flattening or appreciably reducing the internal diameter of the conduit. A hydraulic or power pipe bender shall be employed for all bends in steel conduit. Any evidence of destruction of the protective coating will be cause for rejection. All connections in metallic conduit shall be tight. Ends of conduit shall be reamed to remove burrs and rough edges.

Conduit ends in pullboxes, junction boxes, cabinet, etc. shall be equipped with insulating bushings.

All conduits installed shall be tested for clear bore and correct installation by the Contractor in the presence of the Engineer.

All empty conduit after testing shall be immediately sealed by the Contractor.

After a conduit is properly installed, the Contractor shall furnish and install in each conduit run a No. 10AWG galvanized steel drag wire or nylon or polypropylene rope with a tensile strength of at least 500 lb. At least 3 feet of extra wire or rope shall be left at each end.

680-3.14 Pullboxes. Pullboxes shall be constructed and installed in accordance with the details specified on the standard sheets or as directed by the Engineer.

Cast iron frames and covers shall be furnished and placed on each pullbox. They shall be set in mortar and placed true to line and grade and make full and even bearing on the underlying construction surface. The frame and cover shall be as shown on the standard sheet. Frames and covers which do not fit together properly, will be rejected by the Engineer and shall be removed from the site.

680-3.15 Signal Control Cable and Shielded Communication Cable. Cable shall be installed to form a continuous circuit between the proper equipment terminals. All terminal connections shall be made with approved solderless lugs of the proper size using a crimping tool that is self-releasing when proper compression has been applied. Only connectors that provide continuity and physical contact around the circumference of the connector and conductor shall be used.

During installation of the cable, the Contractor shall take care not to damage conductors, insulation, or outer covering. The length of cable installed shall not cause excessive stress on the conductors or any part of the cable.

An insert lubricant approved by the Engineer shall be used in placing cable in conduit. Cable shall be pulled into conduit by hand and the use of winches or other power actuated pulling equipment will not be permitted.

At least 3 feet but not more than 5 feet of slack shall be left for each cable at each pullbox or junction box. Short bends of cable shall be avoided inside pullboxes. Cable in pullboxes or junction boxes shall not cross over any other cables already in place nor block any conduit. All cable shall be identified as to function in each pullbox, junction box or cabinet by the use of aluminum or brass cable markers. If a wire numbering system is used for identification, the key to the system shall be placed along with the wiring diagram in the controller cabinet.

Conductors in controller cabinets shall be dressed neatly with tie wraps. Spare conductors shall be taped and coiled neatly in the bottom of the cabinet. Ends of spare conductors shall be taped. Field wiring entering controller cabinets shall be identified as to function.

Splices in shielded communication cable will not be allowed between equipment terminals. Where cable is installed on span wire, or messengers, it shall be supported at intervals not greater than 15 inches by messenger rings, stainless steel cable straps or other non-corrosive metal lashing approved by the Engineer. Taping and plastic cable ties will not be permitted.

Integral messenger cable shall be installed in accordance with the details specified on the standard sheets or as directed by the Engineer.

When integral messenger cable is installed on utility company poles, the Contractor shall make all arrangements with the utility company for the installation. The Contractor shall observe all utility company requirements for attachments to poles and clearances with utility wires. The Contractor shall notify the utility company prior to start of the work and observe the utility company requirements for accomplishment of the work.

All necessary hardware used with integral messenger cable shall develop the full breaking strength of the integral messenger wire. Poles at each end and at each change of direction shall be guyed as specified on the plans or directed by the Engineer. When installed on utility company poles, guys shall be installed as directed by the utility company.

680-3.16 Cable Splices. Unless otherwise specified, cable splices will be permitted only in pullboxes, junction boxes, utility manholes, and at traffic signal heads. All cable runs between units of equipment shall be without splices unless shown on the plans or authorized by the Engineer. Conductors in controller cabinets shall not be spliced. Splices in overhead cable, when necessary, shall be made with the approval of, and as specified by the Engineer.

All splices shall be capable of satisfactory operation under continuous submersion in water. Multi-conductor cables shall be spliced and insulated to provide a watertight joint and to prevent absorption of moisture by the cable.

Moisture shall be excluded from the joint during the splicing operation and the work shall be done in dry weather or under shelter. Perspiration from the splicer's hand should be wiped off with dry material. All materials and tools involved in the splicing process shall be kept dry.

One of the following methods shall be used for making a watertight and electrically insulated splice:

Method No. 1. The outer covering and insulation shall be removed from each conductor for a minimum length necessary for the use of a pressure release crimping tool. The conductor ends shall be bared and joined with a seamless, solderless type sleeve connector of the same AWG size as the conductor being spliced, using a pressure release crimping tool designed for the size connector being used. After crimping the sleeve connector shall maintain proper contact with both conductors around the circumference of the splice and along the length of the sleeve.

The portion of each conductor where insulation has been removed, and the sleeve connector, shall be reinsulated using a coat of fast drying sealing agent of electrical grade, wrapped tightly with overlapping layers of rubber tape, a second coat of the sealing agent applied, and then wrapped tightly with overlapping layers of polyvinylchloride tape.

The sealing agent and tape shall extend at least 1 inch onto the undisturbed insulation of each conductor. Sufficient layers of tape shall be applied to equal 1.5 times the thickness of the original insulation.

Rejacketing the cable shall be accomplished in a similar manner as described above except that the sealing agent and tape shall extend at least 4 inches onto the undisturbed outer covering of each cable.

Individual splices in each conductor shall be staggered to minimize the outside diameter of the spliced cable.

Method No. 2. All of the requirements for splicing. specified in Method No. l. shall apply. except that the completed splice including sleeve connector and the portion of each conductor where the insulation has been removed. shall be reinsulated and the cable rejacketed by using an acceptable mold poured full with a two component electrical insulating resin approved by the Engineer. The resin shall not require external heating to produce satisfactory pouring consistency.

680-3.17 Span Wire Assembly. Span wire assemblies including necessary hardware shall be installed and constructed in accordance with the details on the standard sheets or as directed by the Engineer.

Span wire assemblies shall be either single span wire, dual span wire with upper tether or dual span wire with lower tether as specified on the plans.

The Contractor shall determine the span and tether wire diameter based upon pole design load using the table on the standard sheets. All necessary hardware for attaching span and tether wires to the poles shall develop the full breaking strength of the span or tether wire with which it is used, except that breakaway links for lower tether wires shall develop the strength specified on the standard sheets.

Sag shall be adjusted so that it is a minimum of 5 percent of the span when the traffic signal system, including overhead signs, is complete.

The Contractor shall determine the length of suspension and tether wire required to span the distance between poles, allow sufficient length for fastening and sag and after adjustments, make the whole assembly consistent with the plans, standard sheets or as directed by the Engineer.

680-3.18 Messenger Assembly. The messenger shall be installed in accordance with the details on the standard sheets or as directed by the Engineer.

When a messenger is installed on utility company poles the Contractor shall make all arrangements with the utility company for the installation. The Contractor shall observe all utility company requirements for attachments to poles and clearance with utility wires. The Contractor shall notify the utility company prior to the start of the work and observe the utility company requirements for accomplishment of the work.

All necessary hardware used with the messenger assembly shall develop the full breaking strength of the messenger strand. Poles at each end and at each change of direction along the run of messenger shall be guyed as specified on the plans or directed by the Engineer. When installed on utility company poles, guys shall be installed where required by the utility company. The signal control cable shall be fastened to the messenger at intervals not greater than 16 inches by messenger rings, stainless steel cable straps or other non-corrosive metal lashings approved by the Engineer. Taping and plastic cable bands will not be permitted.

680-3.19 Guy Assembly. Guys shall be installed and constructed in accordance with the details on the standard sheets or as directed by the Engineer. Guys on utility company poles shall meet the utility company requirements.

Excavation for the anchor shall be of the minimum width possible to accept the unexpanded anchor. All backfill shall be compacted.

680-3.20 Riser Assembly. Risers and weatherheads shall be installed and constructed in accordance with the details on the standard sheets or as directed by the Engineer. Risers on utility company poles shall meet the utility company requirements.

680-3.21 Signal Heads. Signal heads shall be installed as specified on the plans, standard sheets or as directed by the Engineer. Each signal head shall be assembled from signal sections and brackets in the configuration specified on the plans. Signal heads shall be properly aligned to the satisfaction of the Engineer. All mounting hardware shall be securely tightened to prevent loosening by the wind.

Until signal heads are placed in operation they shall be bagged with opaque or other material, as approved by the Engineer, that is adequately secured in a neat and orderly manner.

Optically programmed signal heads shall be installed, directed and veiled in accordance with the manufacturer's instructions, plans, standard sheets and the Engineer's visibility requirements. Each section of the signal shall be masked with prescribed materials in an acceptable and skillful manner.

LED Traffic or Pedestrian Signal Modules, which are supplied by the State, shall be installed in new or existing traffic or pedestrian signal heads as shown on the plans or as ordered by the Engineer. When the Contractor is required to furnish the LED module, unless otherwise waived, the Contractor shall submit to the Regional Director within 30 days following the award of contract, detailed specifications and catalog cuts of the equipment he/she proposes to install. In either case, the Contractor shall first remove any existing components necessary to install the LED modules, and the removed components shall remain the property of the State.

680-3.22 Wiring Color Code. The following wire color code system, unless otherwise shown on the plans, shall be used for wiring signal heads:

A. Through C. (Vacant)

D. 1 Through 8 Phases

1. Priority of assigning signal phases, overlaps and double clearances to Groupings of Color - Coded Wire for Signal Heads:

PRIORITY	FUNCTION		PRIORITY	FUNCTION
1	Phase 5		**8**	Phase 4
2	Phase 1		**9**	Overlap No. 1
3	Phase 6		**10**	Overlap No. 2

4	Phase 2		**11**	Overlap No. 3
5	Phase 7		**12**	Overlap No. 4
6	Phase 3		**13**	Double Clearance No. 1
7	Phase 8		**14**	Double Clearance No. 2

2. Groupings of color coded wire for signal heads:

GROUP NUMBER	INDICATION	WIRE COLOR CODE*		GROUP NUMBER	INDICATION	WIRE COLOR CODE*
1	Red	14/19C-1-R		**4**	Red	14/19C-1-B/R
	Yellow	14/19C-1-0			Yellow	14/19C-1-O/R
	Green	14/19C-1-G			Green	14/19C-1-BL/R
	Ground Wire	14/19C-1-W			Ground Wire	14/19C-1-W/R
2	Red	14/19C-1-R/B		**5**	Red	14/19C-2-R
	Yellow	14/19C-1-O/B			Yellow	14/19C-2-O
	Green	14/19C-1-G/B			Green	14/19C-2-G
	Ground Wire	14/19C-1-W/B			Ground Wire	14/19C-2-W
3	Red	14/19C-1-R/W		**6**	Red	14/19C-2-R/B
	Yellow	14/19C-1-BL/W			Yellow	14/19C-2-O/B
	Green	14/19C-1-G/W			Green	14/19C-2-G/B
	Ground Wire	14/19C-1-B/W			Ground Wire	14/19C-2-W/B

GROUP NUMBER	INDICATION	WIRE COLOR CODE*		GROUP NUMBER	INDICATION	WIRE COLOR CODE*
7	Red	14/19C-2-R/W		**11**	Red	14/19C-3-R/W
	Yellow	14/19C-2-BL/W			Yellow	14/19C-3-BL/W
	Green	14/19C-2-G/W			Green	14/19C-3-G/W
	Ground Wire	14/19C-2-B/W			Ground Wire	14/19C-3-B/W
8	Red	14/19C-2-B/R		**12**	Red	14/19C-3-B/R
	Yellow	14/19C-2-O/R			Yellow	14/19C-3-O/R
	Green	14/19C-2-BL/R			Green	14/19C-3-BL/R
	Ground Wire	14/19C-2-W/R			Ground Wire	14/19C-3-W/R
9	Red	14/19C-3-R		**13**	Red	14/10C-1-R
	Yellow	14/19C-3-O			Yellow	14/10C-1-O
	Green	14/19C-3-G			Green	14/10C-1-G
	Ground Wire	14/19C-3-W			Ground Wire	14/10C-1-W
10	Red	14/19C-3-R/B		**14**	Red	14/10C-1-R/B
	Yellow	14/19C-3-O/B			Yellow	14/10C-1-O/B
	Green	14/19C-3-G/B			Green	14/10C-1-G/B
	Ground Wire	14/19C-3-W/B			Ground Wire	14/10C-1-W/B

E. Groupings of Color Coded Wire for Preempts (Blue Light) and Pedestrian Signals:

1. Preempts (Blue Light).

WIRE COLOR CODE	INDICATION
14/2C-1-B	Blue Light
14/2C-1-W	Ground Wire

2. Pedestrians Signals.

PED NUMBER	WIRE COLOR CODE*	INDICATION		PED NUMBER	WIRE COLOR CODE*	INDICATION
1	14/5C-1-P/R	DONT WALK		3	14/5C-3-P/R	DONT WALK
	14/5C-1-P/G	WALK			14/5C-3-P/G	WALK
	14/5C-1-P/B	Switch Wire			14/5C-3-P/B	Switch Wire
	14/5C-1-P/O	Switch Wire			14/5C-3-P/O	Switch Wire
	14/5C-1-P/W	Ground Wire			14/5C-3-P/W	Ground Wire
2	14/5C-2-P/R	DONT WALK		4	14/5C-4-P/R	DONT WALK
	14/5C-2-P/G	WALK			14/5C-4-P/G	WALK
	14/5C-2-P/B	Switch Wire			14/5C-4-P/B	Switch Wire
	14/5C-2-P/O	Switch Wire			14/5C-4-P/O	Switch Wire
	14/5C-2-P/W	Ground Wire			14/5C-4-P/W	Ground Wire

*** Key for Wire Color Code:**

XX /	**XXC** -	**X** -	**X** /	**X**
AWG	No. of Conductors	Cable No. For the Given Conductor Size	Color of Wire	Tracer Color

Colors: R-Red, O-Orange, G-Green, BL-Blue, W-White, B-Black.

F. Notes:

The following steps should be used to determine the appropriate color coded wiring for a given signal installation:

1. Determine which functions are used in the signal operation.
2. Assign the color coded wire to the functions used in numerical order according to the priority given to the function .
3. Use the minimum number of conductors required to maintain the color code.

EXAMPLE: Signal X is a four phase signal

Step No.1-- Phase 1, 5, 6, 4, and an overlap of Phase 6 + 4 is used in the Signal operation.

Step No. 2--	Priority	Function	Color Coded Group No.
	1	5	1
	2	1	2
	3	6	3
	8	4	4
	9	Overlap No. 1	5

Step No.3-- Use one 19 conductor cable and one five conductor cable

680-3.23 Pedestrian Push Button and Sign. The push button and sign shall be installed and constructed in accordance with the details specified on the standard sheets. Push button and sign shall be installed on either an existing pole, a newly installed signal pole or on its own post and footing as specified on the plans.

The orientation shall be convenient to pedestrians intending to cross the street controlled by the push button at the marked or obvious crosswalk.

680-3.24 Fire Pre-Emption Tell Tale Light. The Tell Tale Light shall be installed in accordance with details on the standard sheets or as directed by the Engineer.

The light shall be wired in such a manner as to simultaneously display a blue light during the emergency pre-emption interval and at other times remain unlighted. It shall be oriented in the position which provides the best view to the emergency equipment approach roadway.

680-3.25 Flashing Beacon Sign Assembly. The flashing beacon sign assembly shall be constructed as shown on the plans, and standard sheets. It shall be installed on either an existing sign and post or a new pole as specified on the plans.

The sign panel shall be constructed in accordance with the appropriate subsections of Section 645, Signs. The flashing beacon signal heads and solid state flasher and cabinet shall be installed as shown on the standard sheets.

When not mounted behind guiderail, the pole shall be equipped with an approved breakaway base or transformer base fabricated in accordance with §723-15.01--Breakaway Transformer Base (Aluminum).

680-3.26 Inductance Loop Installation. Loops shall be installed in accordance with the details specified on the plans, Standard Sheets or as directed by the Engineer. Loop dimensions shall be as specified on the plans.

Pullboxes, conduits and curb cuts shall be completed before beginning the loop installation.

The loop shall be outlined on the pavement to conform to the specified configuration. A power saw and wet cutting techniques shall be used to cut a slot in the pavement. Dry cutting techniques shall be used if directed by the Engineer and with appropriate measures to safeguard nearby vehicle and pedestrian traffic. The cut shall be 3/8 inch in width and the depth specified on the standard sheets. The corners shall be cored, drilled or chipped out as shown on the standard sheets. Sharp edges in the corners shall be smoothed. All saw cuts and corners shall be of the same depth.

Immediately after sawing by either wet or dry methods, the slot and pavement shall be flushed with pressurized clean water to remove the saw slurry, dust or other cutting debris. Filtered compressed air shall be used to remove all dust and moisture from the slot. If the slot is damp, do not proceed with the installation until it is dry. Hot air may be used to dry the saw slot.

At the edge of pavement or curb a 1 inch minimum diameter, Metal Steel Conduit, Zinc Coated, Flexible Liquid-Tight Steel Conduit or Rigid Plastic Conduit shall be installed between the pavement and pullbox in accordance with details specified on the standard sheets. The curb or pavement shall be cut or scored to leave a permanent mark to show where the conduit runs under the curb or pavement.

The loop wire shall be installed starting at the roadside pullbox, passed around the loop for the specified number of turns and brought back to the pullbox. Splices shall not be permitted outside the pullbox. The wire shall be depressed in the slot without the use of sharp objects which might damage the wire insulation.

The loop shall be held in place every 2 feet with 1 inch (approximate) strips of rubber, neoprene, flexible tubing or foam backer rod as approved by the Engineer. These hold down strips shall be left in place when the slot is filled with Roadway Loop Embedding Sealer.

The pair of loop wires between the edge of pavement and the splice to the shielded lead-in cable in the pullbox shall be twisted together with at least five turns per 1 foot.

The splice between the loop wires (twisted pair) and the shielded lead-in cable shall be moisture proof and shall have a dielectric strength at least equal to that of the original insulation.

The bared conductor ends shall be either twisted and soldered or joined using an uninsulated, size coded solderless type connector of the correct size using an appropriate crimping tool. The splice shall be reinsulated in accordance with §680-3.16 Cable Splices, Method No. I except that heat shrinkage polyolefin tubing may be used as an alternate to the rubber tape; also, the first layer of PVC tape and sealing agent shall be extended as needed to cover a minimum of 1 inch of the inductance loop wire tube. The polyolefin tubing shall be at least as thick as the original insulation. Upon completion of the reinsulating, a final waterproof coating shall be applied over the entire splice.

The loop wires (twisted pair) and the splice to the shielded lead-in cable with the pullbox shall be held by wire hangers as near as possible to the top of the box in order to prevent their immersion in water. The shielded lead-in cable shall be continuous (no splices) from the splice to the loop wires to the controller cabinet terminals. The drain or ground wire in the shielded cable shall be grounded at the controller cabinet terminals only.

The completed loop installation including the shielded lead-in to the controller cabinet shall have a minimum of 50 megohms leakage resistance to ground. This resistance shall be tested before the loop is sealed in the pavement and after the splice is made between the loop wires (twisted pair) and shielded lead-in. Resistance to ground shall be tested in accordance with the Insulation Resistance Test in §680-3.32.

When it is determined that the resistance to ground requirements are met, the slot shall be filled with Roadway Loop Embedding Sealer. The pavement temperature shall be at least 40°F and rising before the sealer is placed. All work involving the sealer shall be done in compliance with the manufacturer's specifications. When the loop embedding sealer has set sufficiently to open the loop to traffic, but the surface remains tacky, the loop may be dusted with cement dust to facilitate opening the loop to traffic.

680-3.27 Concrete Base for Controller Cabinet. Bases shall be installed and constructed in accordance with the details specified on the standard sheets. Bases shall be either pre-cast or cast-in-place. Anchor bolts shall be placed in the footing at the proper location. Conduits shall be installed in the footing as required by the plans.

Where the base is installed in unpaved areas a work pad shall be constructed in front of the cabinet door.

Excavation shall be in accordance with §680-3.09, Excavation.

680-3.28 Power Meter Base. At each power source, the Contractor shall provide 6 feet of slack in the traffic signal cable used for power supply and neatly coil this slack within the controller cabinet.

The Contractor shall install a meter base as shown on the standard sheets or as ordered by the Engineer. The meter base will be furnished by the utility company. The additional length of power cable in the controller cabinet shall be extended through the cabinet wall into the meter base and back to the controller circuit breaker. All meter base fittings shall be weather tight.

680-3.29 Overhead Traffic Signs. Sign and mounting brackets shall be installed as shown on the plans and standard sheets. Signs shall be aligned to the satisfaction of the Engineer.

Sign Panels shall be aluminum and constructed in accordance with the appropriate subsections of section 645-Signs.

680-3.30 Field Galvanizing. All abrasions of galvanized steel due to handling equipment, erection, etc., and all points of attachment, shall be field repaired as specified in §719-01--Galvanized Coatings and Repair Methods.

680-3.31 Cast Iron Junction Boxes. Junction boxes shall be installed at the locations and according to the details on the plans or as directed by the Engineer. Dimensions shall be as shown on the plans.

680-3.32 Tests. The Contractor shall perform all tests described herein in the presence of the Engineer or his representative. Testing equipment shall be supplied by the Contractor.

Prior to placing a signal in operation, the Contractor shall perform the following tests:

A. Continuity Test. Each circuit shall be tested for continuity.

B. Ground Test. All traffic signal grounding systems when completed in place shall have a resistance to ground of not more than that shown in the table below as determined in the following manner:
1. Temporarily connect a 10 ampere load between the AC + side of the equipment cabinet fuse and the ground system. It should be assured that the power company applied voltage is 120 volts AC at the time of the test.
2. Disconnect the power company AC neutral from the ground system.
3. Connect a voltmeter between the power company AC neutral and the ground system.

Controller Installed	**Voltmeter Reading (Volts)**	**Equivalent Resistance (Ohms)**
2 Phase	20	2.0
Model 170 Microcomputer	20	2.0
All others	10	1.0

If the voltmeter reading is higher than the appropriate voltage shown in the above table under the 10 ampere load, the grounding system has an unacceptable resistance to ground. Additional grounding, including electrical bonding of underground metallic conduit, may be necessary in order to meet the requirements of this test.

C. Insulation Resistance Test. An insulation resistance test at 500 volts DC shall be made on each circuit between the circuit and ground. The insulation resistance shall not be less than 10 megohms on each circuit except that inductive loop detector circuits shall have an insulation resistance of not less than 50 megohms.

The insulation resistance test shall not be performed on magnetometer sensing elements. Splices in the pullbox adjacent to the magnetometer sensing elements shall not be made prior to performing an insulation resistance test on the lead-in conductors between the pullbox and the controller cabinet field terminals.

D. Functional Test. After satisfactory completion of all other tests, a functional test of the traffic signal control equipment shall be performed to demonstrate that every part of the signal system operates in accordance with the plans, specifications and to the satisfaction of the Engineer. The functional test for each signal system shall consist of not less than ten days of continuous satisfactory operation. If unsatisfactory performance of the system components is discovered during this time, the condition shall be corrected and the test repeated until ten days of continuous satisfactory operation is obtained.

Functional tests shall not begin on a Friday or on the day before a legal holiday. On the day the functional test begins, initial turn-on shall be made between the hours of 9:00 am and 2:00 pm unless otherwise ordered by the Engineer. Prior to turn-on all signal control equipment required for signal system shall be installed and ready for operation including pedestrian signal indications, pedestrian signs and push buttons, and vehicle detectors. All louvers, visors, and signal heads shall be directed to provide maximum visibility.

Temporary shut downs caused by power interruption or traffic accidents shall not constitute discontinuity of the functional test.

680-3.33 Fiberoptic Pedestrian Signal Heads. Fiberoptic pedestrian signal heads shall be installed according to the requirements of §680-3.21 Signal Heads.

680-3.34 Fiberoptic Dual Indication Arrow. Fiberoptic dual indication arrows shall be installed according to the requirements of §680-3.21 Signal Heads.

680-3.35 Strobing Signal Section. Strobing Signal Sections shall be installed according to the requirements of §680-3.21 Signal Heads.

680-3.36 LED Traffic Signal Module. LED Traffic Signal Modules shall be installed in Type I Traffic Signal Sections according to the requirements of §680-3.21 Signal Heads.

680-3.37 LED Pedestrian Signal Module. LED Pedestrian Signal Modules shall be installed in Type I Pedestrian Signal Section according to the requirements of §680-3.21 Signal Heads.

680-4 METHOD OF MEASUREMENT

680-4.01 Each Unit. The following items will be measured for payment as the number of each unit furnished and installed in accordance with the contract documents or as directed by the Engineer:

Span Wire Assembly
Guy Assembly
Pedestrian Signal Section
Pullbox
Cast Iron Junction Box
Controller Assembly Component
Fire Pre-Emption Tell Tale Light
Concrete Base for Controller Cabinet
Fiberoptic Dual Indication Arrow
LED Pedestrian Signal Module
Type I Pedestrian Signal Section
Pedestrian Push Button and Sign
Traffic Signal Section
Strobing Signal Indication
Traffic Signal Bracket Assembly
Traffic Signal Disconnect Hanger
Riser Assembly
Traffic Signal Pole
Overhead Sign Assembly
Flashing Beacon Sign Assembly
Fiberoptic Pedestrian Signal Section
LED Traffic Signal Module
Type I Traffic Signal Section

680-4.02 Linear Foot Measurements. The following items will be measured for payment as the number of feet actually installed in accordance with the contract documents or as directed by the Engineer:

Inductance Loop Wire
Shielded Lead-ln Cable
Inductance Loop Installation
Messenger Assembly
Signal Cable
Shielded Communication Cable
Signal Cable with Integral Messenger
Shielded Communication Cable w/ Integral Messenger
Conduit

Inductance loop wire shall be the actual number of feet of wire used and left in place. Measurement of inductance loop installation shall be the number of feet of pavement sawcut.

680-4.03 Pole Excavation and Concrete Foundation. The payment quantity of pole excavation and concrete foundation shall be the number of cubic yard of concrete shown in the table on the standard sheet for Traffic Signal Pole Foundations for the specified footing size. No adjustment will be made when the Contractor elects to install a square footing. When a square footing is specified on the plans, the payment quantity shown in the table will be multiplied by a factor of 1.3.

680-4.04 Conduit Jacking or Boring. The quantity of conduit jacking or boring shall be the number of linear feet as computed from the payment limits specified in the contract documents.

680-5 BASIS OF PAYMENT

680-5.01 General. The unit price bid for all items of work encompassed by this Section shall include the furnishing of all labor, materials, tools, equipment, safety requirements as determined by U.S. Department of Labor's Occupational Safety and Health Standards, and incidentals as necessary to complete the work of the item installed in place and performing all tests to the satisfaction of the Engineer. No direct payment will be made for the installation of the power service connection and meter base but the cost shall be covered in the various traffic signal items. Items with additional provisions are as follows:

680-5.02 Pedestrian Signal Section. The unit price bid for each section shall include one "WALK" and one "DONT WALK" indication, and all necessary internal wiring, visor(s) and lamp(s).

680-5.03 Pedestrian Signal Bracket Assembly. The unit price bid for each bracket assembly shall include the bracket, fittings, wiring of the head assembly and installation.

680-5.04 Pole Excavation and Concrete Foundation. The unit price bid per cubic yard shall include the excavation, any protective system(s) required to ensure the safety of the workers and the public, backfill (select granular backfill or concrete), form work, concrete, bar reinforcement for concrete, excavation and backfilling of test holes, conduit bends and fittings, restoration of surfaces in kind, and sawcutting.

Progress payments will be made at the unit price bid for 80 percent of the quantity for each foundation properly installed except for the mesh installation and restoration. The remaining 20 percent will be paid for upon satisfactory completion of each footing.

680-5.05 Pullbox. The unit price bid for each pullbox shall include all concrete, reinforcing steel, crushed stone or gravel, extensions, sawcutting, excavation, backfill, frames, covers, restoration of surfaces and incidentals as required.

680-5.06 Conduit. The unit price bid shall include all handling, cutting, bending, fitting, capping, painting, testing, furnishing and placing pull lines, condulets and concrete inserts, expansion and incidental fittings as required. Conduit bends and fittings in concrete footings will be paid for under the respective footing item. Conduit excavation and backfill and jacking or boring will be paid for under their respective items.

680-5.07 Inductance Loop Installation. The unit price bid per linear foot shall include the cost of all pavement sawing and drilling, loop embedding sealer, and pavement cut-outs. Inductance Loop Wire, pullboxes, Shielded lead-in Cable, Vehicle Detector Inductance Loop, Conduit, and Conduit Excavation and Backfill shall be paid under their respective items.

680-5.08 Controller Assembly. The unit price bid for each component of the Controller Assembly shall include all labor, material and equipment necessary to complete the work. The cost of the necessary grounding system shall be included in the unit price bid for the controller assembly components.

Progress payments will be made in the following manner:

Sixty-five percent of the bid price of each component will be paid after it is installed and ready for testing.

Twenty-five percent of the bid price will be paid after satisfactory completion of all tests required by these specifications, including the function test for ten days of continuous satisfactory operation of the traffic signal system at each signalized location.

The remaining ten percent will be paid when all the traffic signals in the contract are functioning to the satisfaction of the Engineer.

680-5.09 Fire Pre-Emption Tell Tale Light. The unit price bid shall include the light fixture, bulb, nipple, guard, and all attachments and fittings as required.

680-5.10 Concrete Base for Controller Cabinet. The unit price bid for each base shall include the cost of all sawcutting, excavation, backfill, form work, restoration of surfaces, concrete, test holes, conduit bends and fittings, and concrete work pad.

680-5.11 Pedestrian Push Button and Sign. The unit price bid shall include the push button, sign, mounting hardware, pole drilling, and necessary fittings as required. Where the push button and sign is installed on its own post the unit price shall also include the cost of the post, sawcutting, excavation, backfill, concrete, restoration of surfaces, and conduit bend and fittings.

680-5.12 Jacking or Boring. The unit price bid per foot shall include excavation, backfilling for jacking or boring pits; test holes; and restoration of surfaces in kind.

680-5.13 Signal Cable and Shielded Communication Cable. The unit price bid per foot shall include the connectors, lashing or messenger rings or plastic cable bands, splices when permitted, testing, cable markers, and incidental fittings for the cable connected in place.

680-5.14 Signal Cable with Integral Messenger and Shielded Communication Cable with Integral Messenger. The unit price bid per foot shall include connectors, splices when permitted, testing, cable markers, hardware and fittings to attach the cable to the pole and other incidentals for the cable connected in place.

680-5.15 Traffic Signal Sections. The unit price bid shall include housing, visors, lamps, lenses and incidentals to make an individual signal head section.

680-5.16 Traffic Signal Bracket Assembly. The unit price bid shall include all brackets, elbows, arms and fittings to attach the signal to span wire, pole and mast arm. It shall include all labor and materials to assemble the individual signal sections and brackets to form a complete signal head including internal wiring and installation on the span wire, pole and mast arm.

680-5.17 Traffic Signal Disconnect Hanger. The unit price bid shall include the disconnect hanger, wiring to the signal head and signal cable and installation on the signal head.

680-5.18 Traffic Signal Poles. The unit price bid for each pole shall include all the items specified in §680-3.11 and the necessary grounding system, anchor bolts, mast arms, lighting arms, pole assembly and erections, and field galvanizing as required. Breakaway transformer bases when specified shall be included in the price bid for each pole.

680-5.19 Overhead Sign Assembly. The unit price bid shall include the mounting brackets attaching the sign to signal head, span wire, pole, and mast arm, sign panel and incidental hardware and fittings.

680-5.20 Flashing Beacon Sign Assembly. The unit price bid shall include the flashing beacon signal head, two circuit flasher and cabinet, sign panel and mounting brackets and all other necessary hardware.

The cost of the pole and pole excavation and concrete foundation will be paid for under their respective items. The cost of any necessary breakaway base shall be included in the cost of the pole.

680-5.21 LED Traffic Signal Module. The unit price bid shall include the LED module, the removal of existing components if necessary, and installation of the LED module on the signal head.

680-5.22 LED Pedestrian Signal Module. The unit price bid shall include the LED module, the removal of existing components if necessary, and installation of the LED module on the pedestrian signal head.

680-5.23 Type I Traffic Signal Section. The unit price bid shall include housing, door, visor and incidentals to make an individual Type I Signal Head Section.

680-5.24 Type I Pedestrian Signal Section. The unit price bid shall include housing, door, visor and incidentals to make an individual Type I Pedestrian Signal Section.

680-5.25 LED Traffic Signal Module Installation. The unit price bid shall include the cost of labor, materials, and equipment required to remove existing components if necessary, and install the State supplied Traffic Signal Modules as shown on the plans or as ordered by the Engineer.

680-5.26 LED Pedestrian Signal Module Installation. The unit price bid shall include the cost of labor, materials, and equipment required to remove existing components if necessary, and install the State supplied Pedestrian Signal Modules as shown on the plans or as ordered by the Engineer.

Payment will be made under:

Item No.	**Item**	**Pay Unit**
680.5001	Pole Excavation and Concrete Foundation	Cubic Yard
680.5002	Concrete Base for Controller Cabinet	Each
680.51XXYY	Pullbox	Each
XX= Size	*YY= Type*	
01 – 15 inch	*01 - Reinforced Concrete*	
02 - 18 inch	*02 - Optional Reinforced*	
03 - 24 inch	*Concrete/Bituminous*	
04 - 30 inch	*Fiber*	
05 - Rectangular 26 x 18 inch		
06 - Rectangular 26 x 18 inch or 24 inch Diameter		
07 - Rectangular 26 x 18 inch or 30 inch Diameter		
680.5120	Cast Iron Junction Box	Each
680.52XXYY	Conduit	Foot

XX = Type	*YY = Diameter*
01 - Metal Steel, Zinc Coated	*01 - ½”*
02 - Flexible Liquid Tight Seal	*02 - ¾”*
04 - PVC Coated Galvanized Steel	*03 - 1”*
05 - Rigid Plastic, Class 1	*04 - 1 1/4”*
06 - Rigid Plastic, Class 2	*05 - 1 ½”*
07 - Rigid Plastic, Class 1 or 2	*06 - 2”*
08 - Flexible, Liquidtight PVC	*07 - 2 1/2”*
09 – PVC Schedule 80, 4 Ducts	*08 - 3”*
10 - Fiberglass – Multi-Cell-4 Duct	*09 - 3 ½”*
80 – PVC Schedule 80	*10 - 4”*
	12 – 5”

680.53	Conduit Jacking or Boring	Foot
680.54	Inductance Loop Installation	Foot
680.56	Emergency Pre-emption System	Each
680.60XXYY	Traffic Signal Pole--Span Wire	Each
680.61XXYY	Traffic Signal Pole--Span Wire with Lighting Arm	Each
XX = Load in kips (1, 2, 3, 4, ...)		
*YY = Length in whole feet **		
680.62XXYY	Traffic Signal Pole--Mast Arm	Each
680.63XXYY	Traffic Signal Pole--Dual Mast Arm**	Each
680.64XXYY	Traffic Signal Pole--Mast Arm with Lighting Arm	Each
680.65XXYY	Traffic Signal Pole--Dual Mast Arm** with Lighting Arm	Each
*XX=Mast arm mounting height in feet**		
YY=Mast arm length in whole feet		
680.67XX	Traffic Signal Pole--Post Top Mount	Each
680.68XX	Traffic Signal Pole--Bracket Mount	Each
680.69XX	Traffic Signal Pole Bracket Mount with Lighting Arm	Each
*XX=Mounting height in feet**		
680.7001	Single Span Wire Assembly	Each
680.7002	Dual Span Wire Assembly with Upper Tether Wire	Each
680.7003	Dual Span Wire Assembly with Lower Tether Wire	Each
680.7004	Messenger Assembly	Foot
680.7005	Guy Assembly	Each
680.700602	Riser Assembly, 1/2 inch Diameter	Each
680.700603	Riser Assembly, 1 inch Diameter	Each
680.700604	Riser Assembly, 1 1/2 inch Diameter	Each
680.700606	Riser Assembly, 2 inch Diameter	Each
680.700607	Riser Assembly, 2 1/2 inch Diameter	Each
680.700608	Riser Assembly, 3 inch Diameter	Each
680.700609	Riser Assembly, 3 1/2 inch Diameter	Each
680.700610	Riser Assembly, 4 inch Diameter	Each
680.700612	Riser Assembly, 5 inch Diameter	Each
680.700613	Riser Assembly, 6 inch Diameter	Each
680.71	Shielded Lead-in Cable	Foot
680.72	Inductance Loop Wire	Foot
680.73XXYY	Signal Cable	Foot
680.74XXYY	Signal Cable with Integral Messenger	Foot
XX = Number of Conductors		
YY = Wire Gauge		
680.75XXYY	Shielded Communication Cable	Foot
680.76XXYY	Shielded Communication Cable with Integral Messenger	Foot
XX = Number of Pairs		
YY = Wire Gauge		
680.810101	Traffic Signal Module - 12 inch, Red Ball, LED	Each
680.810102	Traffic Signal Module - 12 inch, Red Arrow, LED	Each
680.810103	Traffic Signal Module-12 inch Yellow Ball, LED	Each
680.810104	Traffic Signal Module-12 inch Yellow Arrow, LED	Each

680.810105	Traffic Signal Module - 12 inch, Green Ball, LED	Each
680.810106	Traffic Signal Module - 12 inch, Green Arrow, LED	Each
680.810107	Traffic Signal Section - Type I, 12 inch	Each
680.810108	Traffic Signal Module - 12 inch, Bi-Modal Yellow/Green Arrows, LED	Each
680.8102	Traffic Signal Section, Optically Programmed - 12 inch	Each
680.810301	Traffic Signal Module - 8 inch, Red Ball, LED	Each
680.810302	Traffic Signal Module - 8 inch, Red Arrow, LED	Each
680.810303	Traffic Signal Module- 8 inch Yellow Ball, LED	Each
680.810304	Traffic Signal Module- 8 inch Yellow Arrow, LED	Each
680.810305	Traffic Signal Module - 8 inch, Green Ball, LED	Each
680.810306	Traffic Signal Module - 8 inch, Green Arrow, LED	Each
680.810307	Traffic Signal Section - Type I, 8 inch	Each
680.810308	Install Ball/Arrow LED Traffic Signal Module	Each
680.810601	Traffic Signal Section - Polycarbonate, Type I, 12 inch	Each
680.810701	Traffic Signal Section - Polycarbonate, Type I, 8 inch	Each
680.8111	Traffic Signal Bracket Assembly 1 Way	Each
680.8112	Traffic Signal Bracket Assembly 2 Way	Each
680.8113	Traffic Signal Bracket Assembly 3 Way	Each
680.8114	Traffic Signal Bracket Assembly 4 Way	Each
680.8115	Traffic Signal Bracket Assembly 5 Way	Each
680.8120	Traffic Signal Disconnect Hanger	Each
680.813101	Pedestrian Signal Module - 12 inch, Hand Symbol, LED	Each
680.813102	Pedestrian Signal Module - 12 inch by 12 inch MAN LED	Each
680.813103	Pedestrian Signal Section - Type I, 12 inch	Each
680.813104	Install LED Pedestrian Signal Module	Each
680.813105	Pedestrian Signal Module - 12 inch, Bi-Modal Hand/Man Symbols, LED	Each
680.813106	Pedestrian Signal Section - Polycarbonate, Type I, 12 inch	Each
680.813107	Pedestrian Signal Module – 16 inch by 18 inch Bi-Modal HAND/MAN LED	Each
680.813108	Pedestrian Signal Section, Type I - for 16 inch by 18 inch LED module	Each
680.813109	Pedestrian Signal Section - Polycarbonate, Type I- for 16 inch by 18 inch LED module	Each
680.8141	Pedestrian Signal Bracket Mount Assembly	Each
680.8142	Pedestrian Signal Post Top Mount Assembly	Each
680.82XX *XX = Type*	Overhead Sign Assembly	Each
680.8220	Flashing Beacon Sign Assembly	Each
680.8225	Pedestrian Push Button and Sign - without Post	Each
680.8226	Pedestrian Push Button and Sign - with Post	Each
680.8230	Fire Pre-Emption Tell Tale Light	Each

NOTE: SEE PAY ITEM CATALOG FOR ITEM NUMBERS CONTAINING VARIABLES.
* Mast arm mounting heights, and span wire pole length and load, are as defined on the `Standard Traffic Signal Poles' standard sheets and in §724-03, Traffic Signal Poles. The nominal luminaire mounting height and span shall be as indicated on the plans.
** The mast arm length and mounting height indicated by the item number is for only one of the mast arms. The other mast arm length and mounting height shall be as indicated on the plans.

ITEM 685.0715XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 15 MILS THICK (WET NIGHT VISIBILITY SPHERES)

ITEM 685.0720XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 20 MILS THICK (WET NIGHT VISIBILITY SPHERES)

DESCRIPTION:

Under this work the contractor shall furnish and apply epoxy reflectorized pavement markings in accordance with these specifications, the Contract Documents, the NYSMUTCD, or as ordered by the Engineer. Items for Special Markings include stop bars and crosswalks.

Yield line symbols are isosceles triangles with height equaling 1.5 times the base dimension:
A small yield line symbol shall have a base dimension of one foot.
A large yield line symbol shall have a base dimension of two feet.
Yield line symbols are to be installed with the Apex of the triangle oriented towards oncoming traffic.

The epoxy marking material shall be hot-applied by spray methods onto bituminous and portland cement concrete pavement surfaces at the thickness and width shown on the Contract Documents. Following a simultaneous application of Standard Glass Beads (Type 2) and Wet/Night Visibility Beads (Type 1), the cured epoxy marking shall be an adherent reflectorized stripe that will provide wet night retro-reflectivity.

MATERIALS REQUIREMENTS:

Epoxy Paint	727-03
Glass Beads for Pavement Markings	727-05

Reflective Glass Spheres

Retro-reflective beads shall be a double drop system of glass spheres consisting of Standard Beads (Type 2) and Wet/Night Visibility Beads (Type 1) as defined in §727-05 Glass Beads for Pavement Markings.

EPOXY APPLICATING EQUIPMENT

In general, a mobile applicator shall be a truck mounted, self-contained pavement marking machine, specifically designed to apply epoxy resin materials and reflective glass spheres in continuous line patterns. The applicating equipment shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. In addition, the truck mounted unit shall be provided with accessories to allow for the marking of cross hatching and other special patterns as directed by the Engineer.

At any time throughout the duration of the project, the Contractor shall provide free access to his epoxy applicating equipment for inspection by the Engineer or his authorized representative.

The Engineer may approve the use of a portable applicator in lieu of mobile truck mounted accessories for use in applying special markings only, provided such equipment can demonstrate satisfactory application of reflectorized epoxy markings in accordance with these specifications.

ITEM 685.0715XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 15 MILS THICK (WET NIGHT VISIBILITY SPHERES)

ITEM 685.0720XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 20 MILS THICK (WET NIGHT VISIBILITY SPHERES)

Mobile applicating equipment shall be capable of installing up to 19 miles of epoxy reflectorized pavement markings in an eight hour day and shall include the following features:

1. Individual tanks for the storage of Part A and Part B of the epoxy resin.

2. Individual tanks for the storage of Standard (Type 2) and Wet/Night Visibility (Type 1) glass spheres. Each tank shall have a minimum capacity of 3000 lbs.

3. Heating equipment of sufficient capacity to maintain the individual epoxy resin components at the manufacturer's recommended temperature for spray application.

4. Individual dispensers for the simultaneous application of Standard (Type 2) and Wet/Night Visibility (Type 1) glass spheres. Each dispenser shall be capable of applying spheres at a minimum rate of 10 lbs/gal of epoxy resin composition.

5. Metering devices or pressure gauges on the proportioning pumps, positioned to be readily visible to the Engineer.

6. All necessary spray equipment, mixers, compressors, and other appurtenances for the placement of epoxy reflectorized pavement markings in a simultaneous sequence of operations as described in Construction Details, D. Application of Epoxy Reflectorized Pavement Markings.

CONSTRUCTION DETAILS

A. General

All pavement markings shall be placed as shown on the Contract Documents and in accordance with the New York State, Manual of Uniform Traffic Control Devices (MUTCD).

Before any pavement marking work is begun, a schedule of operations shall be submitted for the approval of the Engineer.

At least five (5) days prior to starting striping, the Contractor shall provide the Engineer with the epoxy manufacturer's written instructions for use. These instructions shall include, but not be limited to, material mixing ratios and application temperatures.

When pavement markings are applied under traffic, the Contractor shall provide all necessary flags, markers, signs, etc. in accordance with the MUTCD to maintain and protect traffic, and to protect marking operations and the markings until thoroughly set.

The application of pavement markings shall be done in the general direction of traffic. Striping against the direction of traffic flow shall not be allowed.

The Contractor shall be responsible for removing, to the satisfaction of the Engineer, all tracking marks, spilled epoxy, and epoxy markings applied in unauthorized areas.

When necessary the Contractor shall establish marking line points at 30 foot intervals throughout the length of the pavement or as directed by the Engineer.

B. Atmospheric Conditions

Epoxy pavement markings shall only be applied during conditions of dry weather and on substantially dry pavement surfaces. At the time of installation the pavement surface temperature shall be a minimum of 50°F and the ambient temperature shall be a minimum of 50°F and rising. The Engineer shall be the sole determiner as to when atmospheric conditions and pavement surface conditions are such to produce satisfactory results.

C. Surface Preparation

The Contractor shall clean the pavement and existing durable markings to the satisfaction of the Engineer.

Surface cleaning and preparation work shall be performed only in the area of the epoxy markings application.

At the time of application all pavement surfaces and existing durable markings shall be free of oil, dirt, dust, grease and similar foreign materials. The cost of cleaning these contaminants shall be included in the bid price of this item.

In addition, concrete curing compounds on new portland cement concrete surfaces and existing painted pavement markings on both concrete and bituminous pavement surfaces shall be cleaned and paid for in accordance with §635 Cleaning and Preparation of Pavement Surfaces for Pavement Markings.

D. Application of Epoxy Reflectorized Pavement Markings

Epoxy reflectorized pavement markings shall be placed at the width, thickness, and pattern designated in the Contract Documents.

Marking operations shall not begin until applicable surface preparation work is completed and approved by the Engineer, and the atmospheric conditions are acceptable to the Engineer.

Pavement markings shall be applied by the following simultaneous operation:

1. The pavement surface is air-blasted to remove dirt and residues.

2. The epoxy resin, mixed and heated in accordance with the manufacturer's

recommendations, is uniformly hot-sprayed onto the pavement surface at the minimum specified thickness.

3. Standard (Type 2) and Wet/Night Visibilty (Type 1) reflective glass spheres are injected into or dropped onto the liquid epoxy marking. Standard beads (Type 2) shall be applied first immediately followed by the application of Wet/Night Visibilty beads (Type 1). Each type shall be applied at a minimum rate of 10 lbs/gal of epoxy resin (minimum total application = 20 lbs/gal).

E. Defective Epoxy Pavement Markings

Epoxy reflectorized pavement markings, which after application and curing are determined by the Engineer to be defective and not in conformance with this specification, shall be repaired. Repair of defective markings shall be the responsibility of the Contractor and shall be performed to the satisfaction of the Engineer as follows:

1. Insufficient film thickness and line width; insufficient glass bead coverage or inadequate glass bead retention.

   Repair Method. Prepare the surface of the defective epoxy marking by grinding or blast cleaning. No other cleaning methods will be allowed. Surface preparation shall be performed to the extent that a substantial amount of the reflective glass spheres are removed and a roughened epoxy marking surface remains.

   Immediately after surface preparation remove loose particles and foreign debris by brooming or blasting with compressed air.

   Repair shall be made by restriping over the cleaned surface in accordance with the requirements of this specification and at the full thickness indicated on the Contract Documents.

2. Uncured or discolored epoxy*; insufficient bond (to pavement surface or existing durable marking).

   Repair Method. The defective epoxy marking shall be completely removed and cleaned to the underlying pavement surface in accordance with the requirements of Section 635 - Cleaning and Preparation of Pavement Surfaces, at the Contractor's expense.

   The extent of removal shall be the defective area plus any adjacent epoxy pavement marking material extending three feet in any direction.

   After surface preparation work is complete, repair shall be made by reapplying epoxy over the cleaned pavement surface in accordance with the requirements of this specification.

*Uncured epoxy shall be defined as applied material that fails to cure (dry) in accordance with the requirements of §727-03 Epoxy Paint; or applied material that fails to cure (dry) within a reasonable time period under actual field conditions, as defined by the Engineer.

Discoloration shall be defined as localized areas or patches of brown, grayish or black colored epoxy marking material. These areas often occur in a cyclic pattern and often are not visible until several days or weeks after markings are applied.

Other defects not noted above, but determined by the Engineer to need repair, shall be repaired or replaced as directed by and to the satisfaction of the Engineer.

All work in conjunction with the repair or replacement of defective epoxy reflectorized pavement markings shall be performed by the Contractor at no additional cost to the State.

METHOD OF MEASUREMENT

Pavement striping (regular lines, cross hatching and special markings) will be measured in feet along the centerline of the pavement stripe and will be based on a 4 inch wide stripe. Measurement for striping with a width greater than the basic 4 inches, as shown on the plans or directed by the Engineer, will be made by the following method:

$$\frac{\text{Plan Width of Striping (inches)} \times \text{Feet}}{\text{4 inches}}$$

BASIS OF PAYMENT

The accepted quantities of markings will be paid for at the contract unit price, which shall include the cost of furnishing all labor, materials and equipment to satisfactorily complete the work. The cost for maintaining and protecting traffic during the marking operations shall be included in the price bid. The cost of removal of concrete curing compounds and existing pavement markings will be paid under separate items and are not included in this item.

No payment will be made for the repair or replacement of defective epoxy reflectorized pavement markings.

PAY ITEM NO.	***DESCRIPTION***	***PAY UNIT***
685.07150110	White Epoxy Reflectorized Pavement Stripes – 15 mils	Foot

ITEM 685.0715XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 15 MILS THICK (WET NIGHT VISIBILITY SPHERES)

ITEM 685.0720XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 20 MILS THICK (WET NIGHT VISIBILITY SPHERES)

	(Wet Night Visibility Spheres)	
685.07150210	White Epoxy Reflectorized Pavement Letters - 15 mils (Wet Night Visibility Spheres)	Each
685.07150310	White Epoxy Reflectorized Pavement Symbols – 15 mils (Wet Night Visibility Spheres)	Each
685.07150410	White Epoxy Reflectorized Cross Hatching -15 mils Thick (Wet Night Visibility Spheres)	Foot
685.07150510	White Epoxy Reflectorized Pavement Stripes (Special Markings) 15 mils Thick (Wet Night Visibility Spheres)	Foot
685.07150610	Yellow Epoxy Reflectorized Pavement Stripes – 15 mils (Wet Night Visibility Spheres)	Foot
685.07150710	Yellow Epoxy Reflectorized Pavement Stripes (Cross Hatching) 15 mils Thick (Wet Night Visibility Spheres)	Foot
685.07150810	White Epoxy Reflectorized Pavement Yield Line Symbols - Small - 15 mils (Wet Night Visibility Spheres)	Each
685.07150910	White Epoxy Reflectorized Pavement Yield Line Symbols - Large - 15 mils (Wet Night Visibility Spheres)	Each
685.07200110	White Epoxy Reflectorized Pavement Stripes – 20 mils (Wet Night Visibility Spheres)	Foot
685.07200210	White Epoxy Reflectorized Pavement Letters – 20 mils (Wet Night Visibility Spheres)	Each
685.07200310	White Epoxy Reflectorized Pavement Symbols – 20 mils (Wet Night Visibility Spheres)	Each
685.07200410	White Epoxy Reflectorized Pavement Stripes (Cross Hatching) 20 mils Thick (Wet Night Visibility Spheres)	Foot
685.07200510	White Epoxy Reflectorized Pavement Stripes (Special Markings) 20 mils Thick (Wet Night Visibility Spheres)	Foot

ITEM 685.0715XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 15 MILS THICK (WET NIGHT VISIBILITY SPHERES)

ITEM 685.0720XX10-EPOXY REFLECTORIZED PAVEMENT MARKINGS 20 MILS THICK (WET NIGHT VISIBILITY SPHERES)

685.07200610	Yellow Epoxy Reflectorized Pavement Stripes – 20 mils (Wet Night Visibility Spheres)	Foot
685.07200710	Yellow Epoxy Reflectorized Pavement Stripes (Cross Hatching) 20 mils Thick (Wet Night Visibility Spheres)	Foot
685.07200810	White Epoxy Reflectorized Pavement Yield Line Symbols - Small - 20 mils (Wet Night Visibility Spheres)	Each
685.07200910	White Epoxy Reflectorized Pavement Yield Line Symbols - Large - 20 mils (Wet Night Visibility Spheres)	Each

ITEM 698.93940015 - INCENTIVE PAYMENTS/DISINCENTIVE ASSESSMENTS FOR WORK SUBJECT TO THE SPECIAL NOTE "INCENTIVE/DISINCENTIVE CLAUSE"

DESCRIPTION. There is no physical work to be accomplished under this item. This item will enable the Department to make incentive payments to (or disincentive assessments against) the Contractor for early substantial completion (or late completion) of work included in the special note titled "Incentive/Disincentive Clause" based on the time or times specified in that special note.

MATERIALS. Not applicable.

CONSTRUCTION DETAILS. There are no construction details for this item.

METHOD OF MEASUREMENT. The method of measurement will be lump sum. Actual payments-incentive (or deductions-disincentive) made under this item will be as stated below.

BASIS OF PAYMENT. The amount set forth in the proposal is a fixed price for all bidders. Any bid, other than the specified amount shown in the itemized proposal, will be adjusted by the Department to the fixed price.

The Contractor shall be entitled to payment for this item as follows: To determine the actual lump sum payment-incentive or lump sum deduction-disincentive under this pay item, the number of calendar days actually required to accomplish the work included in the Incentive/Disincentive Clause will be compared to the number of calendar days specified for the same work in that special note. Should the identified work take longer than the number of calendar days specified (as may be adjusted under the contract terms), the number of calendar days in excess thereof will be multiplied by the daily cost, and that product (lump sum) will be disincentive. Should the calendar days required to substantially complete the identified work be fewer than the number specified (as may be adjusted under the contract terms), the difference will be multiplied by the daily cost, and the product (lump sum) will be paid to the contractor as incentive.

Incentive payments shall be made for each individual I/D work period upon completion of the work included in the particular I/D period. Disincentive assessments shall be made separately for each I/D work period upon reaching the completion date established for each I/D work period.

Deductions-disincentive made under the terms of this item shall be in addition to any deductions made as Liquidated Damages (only applied to non-I/D work) as indicated in the special note entitled "Incentive/Disincentive Clause". Any payments made under this item shall be regarded by the parties to include the cost of all overhead, profit, labor, equipment, supplies, materials, scheduling and management necessary to accomplish the work within the actual number of days taken. The work of the other items in the contract will be measured and paid for separately under their appropriate items of work.

M 11/13/94

EI 99-033 Rev 12/20/99

SECTION 013560
SAFE AND HEALTHFUL WORKING CONDITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes the requirements for safe and healthful working conditions as an integral part of the project construction.

1.2 DEFINITION

A. Safety staff shall mean the safety professional and his/her safety representative(s) or the safety person.

1.3 GENERAL REQUIREMENTS

A. In prosecuting the work of this Contract, the Contractor shall provide working conditions on each operation that shall be as safe and healthful as the nature of that operation permits. The various operations connected with the work shall be so conducted that they will not be unsafe or injurious to health; and the Contractor shall comply with all regulations and published recommendations of the New York State Department of Labor and all provisions, regulations and recommendations issued pursuant to the Federal Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, as amended, and with laws, rules, and regulations of other authorities having jurisdiction, with regard to all matters relating to safe and healthful working conditions.

1. Compliance with governmental requirements is mandated by law and considered only a minimum level of safety performance.

2. All work shall also be performed in accordance with safe work practice, and contractor's Health and Safety Plan, as approved by the Construction Manager in writing.

B. The Contractor shall be responsible for the safety of the Contractor's employees, the public, and all other persons at or about the site of the work. The Contractor shall be solely responsible for the adequacy and safety of all construction methods, materials, equipment, and the safe prosecution of the work.

C. The Contractor shall employ a properly qualified safety professional familiar with all work under this contract whose duties shall be to initiate, review, and cause implementation of measures for the protection of health and prevention of accidents.

D. The safety staff shall be provided with an appropriate office on the job site to maintain and keep available safety records, up-to-date copies of all pertinent safety rules, regulations and governing legislation, material safety data sheets, and the site safety plan including information concerning foreseeable emergency conditions, location of emergency and telephone contacts for supportive actions.

E. The Contractor shall stop work whenever a work procedure or a condition at a work site is deemed unsafe by the safety staff.

1.5 SUBMITTALS

A. The Contractor shall submit a Health and Safety Plan (HASP), prepared prior to the start of any construction for acceptance by the CM, in writing.

1. The HASP shall be available to workers on site and be submitted to the Engineer and Owner at least two (2) weeks before the beginning of any field work.

2. Copies of the plan shall be provided to the Contractors' insurers and their risk managers, if any, by the Contractor.

B. Within thirty (30) days of receiving a "Notice to Proceed", the Contractor shall submit the name of a safety professional, employed by the Contractor, responsible for project safety management, and of the safety representative(s) who will work under his/her direction.

C. Documentation and/or personal references confirming the qualifications may also be required.

1. The persons proposed as a safety person, safety professional, or safety representative(s), may be rejected by the Engineer for failure to have adequate qualifications or other cause.

D. In addition, the Contractor shall submit the names, addresses, and telephone numbers of three (3) supervisory personnel who may be contacted in the event of an emergency occurring during non-working hours.

1.6 QUALIFICATIONS

A. Safety Professional:

1. Certification by the Board of Certified Safety Professional as a Certified Safety Professional.

2. Minimum of five (5) years of professional safety management experience in the types of construction and conditions expected to be encountered on the site.

B. Safety Person:

1. Qualifications of the safety person must include a minimum of five (5) years of relevant construction experience, two (2) years of which are related to safety management.

C. The Safety staff shall be completely experienced with OSHA requirements and knowledgeable of all applicable health and safety requirements of all governing laws, rules and regulations as well as of good safety practice. The safety staff shall not include the project manager, engineer, or superintendent, or anyone else working on the project. The safety staff shall have no other duties except those directly related to safety.

PART 2 PRODUCTS

2.1 HEALTH AND SAFETY PLAN

A. The Contractor shall commit to writing a specific site Health and Safety Plan before the start of any construction for acceptance by the Construction Manager.

2.2 ACCIDENT REPORTS

A. The Contractor shall promptly (within the hour of the incident) report to the Construction Manger all accidents involving injury to personnel or damage to equipment and structures, investigate these accidents and prepare a preliminary report and submit within twenty-four (24) hours of the accident. The Contractor must submit a final accident report to the Construction Manager as follows:

1. The summary report, due by the tenth (10^{th}) day of the incident, shall include descriptions of corrective actions to reduce the probability of similar accidents.

2. In addition, the Contractor shall furnish to the Engineer, a copy of all accident and health or safety hazard reports received from OSHA or any other government agency, within one (1) day of receipt, and attach the final plan.

B. In addition to the reports which the Contractor is required to file under the provisions of the Workman's Compensation Law, he/she shall submit to the Engineer on or before the tenth (10^{th}) day of each month, a report giving the total force employed on his/her Contract in man-days during the previous calendar month, the number and character of all accidents resulting in loss of time or considered reportable by OSHA, and any other information on classification of employees, injuries received on the work, and disabilities arising therefrom, that may be required by the Engineer.

1. The submittal shall also contain an audit report for the prior month, including the safety training conducted, the above equipment logs, records of the condition of the work areas, safety and health records, OSHA and ANSI Z16.1 incidence rates for frequency and severity of recordable accidents, and an evaluation of the effectiveness of the HASP with any changes necessary.

2. The safety professional or safety person and the Contractor shall sign this audit report. The Engineer will review these reports for Contractor's compliance with the safety provisions of the Contract.

2.3 SAFETY AND RESCUE EQUIPMENT

A. The Contractor shall have proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency. This equipment shall include such applicable items as: proper fire extinguishers, first aid supplies, safety ropes and harness, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, etc.

B. This equipment shall be kept in a protected area and checked at scheduled intervals. A log shall be maintained indicating who checked the equipment, when it was checked, and that it was acceptable. This equipment log shall be updated monthly and be submitted with the monthly report. Equipment that requires calibration shall have copies of dated calibration certificates on site.

C. Substitute safety and rescue equipment must be provided while primary equipment is being serviced or calibrated.

2.4 PROTECTIVE EQUIPMENT

A. All personnel employed by the Contractor or his subcontractors or any visitors whenever entering the job site shall be required to wear appropriate personal protection equipment required for that area. The Contractor shall provide all necessary personal protective equipment as requested by the Engineer for his/her designated representatives.

PART 3 EXECUTION

3.1 SAFETY STAFF DUTIES

A. The safety professional shall visit and audit all work areas as frequently as necessary (a minimum of once a week) and shall be available for consultation whenever necessary. The safety staff shall have full authority to implement and enforce the Health and Safety Plan to take immediate action to correct unsafe, hazardous, or unhealthful conditions.

B. A member of the safety staff must be at the job site full time (a minimum of eight (8) hours per working day) whenever work is in progress. When multiple shift work is in progress, more than one (1) safety representative may be required. The safety staff shall as a minimum:

1. Schedule safety training programs as required by law, the safety plan, and good safety practice. An outline of materials to be covered shall be provided with the safety plan. All employees shall be instructed on the recognition of hazards, observance of precautions, of the contents of the safety plan and the use of protective and emergency equipment.

2. Determine that operators of specific equipment are qualified by training and/or experience before they are allowed to operate such equipment.

3. Develop and implement emergency response procedures. Post the name, address, and hours of the nearest medical doctor; name and address of nearby clinics and hospitals, and the telephone numbers of the appropriate ambulance service, fire, and the police department.

4. Post all appropriate notices regarding safety and health regulations at locations which afford maximum exposure to all personnel at the job site.

5. Post appropriate instructions and warning signs in regard to all hazardous areas or conditions which cannot be eliminated. Identification of these areas shall be based on experience, on site surveillance, and severity of hazard. Such signs shall not be used in place of appropriate workplace controls. In order to alert the workers “Safety First” signs should be posted, as ordered by the Engineer at no extra cost.

6. Ascertain by personal inspection that all safety rules and regulations are enforced. Make inspections at least once a shift to ensure that all machines, tools, and equipment are in a safe operating condition, and that all work areas are free of hazards. Take necessary and timely corrective actions to eliminate all unsafe acts and/or conditions, and submit to the

Engineer each day, a copy of his/her findings on the inspection check list report forms established in the safety plan.

7. Submit to the Engineer, copies of all safety inspection reports and citations from regulating agencies and insurance companies within one (1) work day of receipt of such reports.

8. Provide safety training and orientation to authorized visitors to ensure their safety while occupying the job site.

9. Perform all related tasks necessary to achieve the highest degree of safety that the nature of the work permits.

3.2 MEASUREMENT OF PAYMENT

A. No separate payment for the article "Safe and Healthful Working Conditions" will be made. The costs of same will be included in the various bid items.

END OF SECTION 013560

(On Construction firms letterhead)

Date Issued: _____

Dear Resident:

We are sorry to inconvenience you, but in order to proceed with construction for _____ we must close and/or limit your access to your driveway. As work progresses, you will be notified on a daily basis when and how your particular residence will be affected. We assure you that every effort will be made to minimize the impact to you relative to this construction.

Our current schedule calls for the project related work to be performed in your area during the week of _____. A copy of this letter with specific dates and time for this work will be delivered at least twenty-four (24) hours in advance in order that you will have sufficient opportunity to plan for accessibility to your vehicles.

If additional information is necessary, you may contact any of the representatives listed below.

Thank you for your patience.

Contractor	_____	Phone:	_____
Inspector	_____	Phone:	_____
Project Manager	_____	Phone:	_____

_____

(On Construction firms letterhead)

Date Issued: _____

CONSTRUCTION NOTIFICATION
24 HOUR NOTICE

Date & Type of Construction: _____
How will residence be affected: _____
Approximate time of Construction: _____

Driveway access (will) (will not) be permitted.