

**FOR INFORMATIONAL USE ONLY - DO NOT USE TO SUBMIT YOUR BID**

Department of Public Works Nassau County, N.Y.

Bid Sheets for Contract: H90059-01G

Item No.	Engineers Estimate	Unit	Item Description			
1M/F	1	LS	Mobilization With Field Office	For:		
2	1570	CY	Unclassified Excavation	For:		
3	210	CY	Trench, Culvert and Bridge Excavation	For:		
4A	1140	SY	Cement Concrete Breaking (Pavement)	For:		
5C	310	CY	Selected Fill	For:		
9	200	CY	Topsoil	For:		
10A-1	140	SF	Excavation Protection System	For:		
12H	30	LF	Clean Existing Drainage System	For:		
12E-8	210	LF	8" Cast Iron Culvert Pipe	For:		
12P-4	127	LF	4 Inch Smooth Interior Corrugated Polyethylene Drainage Pipe	For:		
12P-6	35	LF	6 Inch Smooth Interior Corrugated Polyethylene Drainage Pipe	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
12P-10	450	LF	10 Inch Smooth Interior Corrugated Polyethylene Drainage Pipe	For:		
13BP-4	7	LF	Precast Manhole, 4'-0" Diameter	For:		
13C	12	EA	Area Drain	For:		
14	5	EA	Connections to Existing Drainage Facilities	For:		
15	3	EA	Rehabilitation of Catch Basins	For:		
20	30	CY	Broken Stone, Loose Measure	For:		
24	90	CY	Cement Concrete Pavement	For:		
26MOD	1025	LF	Concrete Curb - Edge Restraint Assembly	For:		
26	10	LF	Concrete Curb	For:		
27	12190	SF	Cement Concrete Sidewalk	For:		
30	250	sy	Metal Reinforcement for Concrete Pavement	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
58RPC	930	LF	Saw Cutting Existing Roadway Pavement and Concrete	For:		
81	100	LBS	Structural Steel	For:		
95	50	LF	Metal Protection Plates for Curbs			
102	1	LS	Work Zone Traffic Control	For:		
104XF	52	LF	Remove Existing Fence	For:		
106A	16	LF	Post Painting	For:		
106VBG	52	LF	Vehicle Barrier Gate	For:		
116C	780	SY	Profiling and Removal of Concrete Pavement	For:		
136	1	LS	Survey Stakeout	For:		
141B	21	EA	Silt Protection for Surface Inlet Drainage Structure	For:		
142D	1	LS	Structural Steel Painting, Paint System D	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
144MOD	2000	SY	Waterproofing Membrane	For:		
145MOD	460	GAL	Protective Coating	For:		
158A	1290	SF	Geotextile Cloth	For:		
162A-1	850	EA	Groundcovers & Ornamental Grass (1 Gallon Container)	For:		
162A-2	2	EA	Groundcovers & Ornamental Grass (2	For:		
162B	45	EA	Perennial Bulbs	For:		
179C	1025	LF	Aluminum Plant Bed Edge	For:		
180	30	LF	Trench Drain	For:		
199*	1	LS	Interim Payments	For:	\$140,000.00	
199S*	1	LS	Steel/Iron Price Adjustment	For:	\$5,000.00	
361B	1	EA	Planting Trees and Shrubs	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
361E	230	EA	Planting Trees and Shrubs	For:		
361F	7	EA	Planting Trees and Shrubs	For:		
365	8640	SF	Sodding	For:		
420R	1	EA	Regrade a Pullbox Frame and Cover	For:		
442W	10	LF	Epoxy ReflectORIZED Pavements Markings (White)	For:		
442Y	525	LF	Epoxy ReflectORIZED Pavements Markings (Yellow)	For:		
701	8	EA	Remove, Store and Reset Existing Bench	For:		
702	7490	SF	Remove, Dispose and Replace Brick Facing	For:		
703	750	LF	Remove, Store and Reinstall Existing Granite Cap	For:		
704	10090	SF	Maintenance and Repair of Cast-in-Place Concrete	For:		
705	100	LF	Slip Slab	For:		

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Nassau County DPW

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Item No.	Engineers Estimate	Unit	Item Description			
706	3750	SF	Remove, Store and Reuse Existing Granite Block Facing	For:		
707	1585	LF	Joint Sealants	For:		
708	940	SF	Grouting	For:		
709	8	EA	Remove, Store and Reset Existing Light Pole	For:		
710	38	LF	Remove and Replace Flashing	For:		
711	8400	SF	Clean and Repoint Granite Stones	For:		
712	1	EA	Remove, Store and Reset Landscape Appurtenances	For:		
713	50	CY	Hand and/or Pneumatic Excavation	For:		
714	354	LF	Align Aluminum Edging	For:		
715	700	SF	Round Stone	For:		
716	200	SY	Bark Chip Mulch	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
717	2315	LBS	Integral Color Pigment for Cement Concrete	For:		
718	14480	SF	Imprinting on Concrete Pavement or Sidewalk	For:		
719	1	LS	Low-Voltage Electrical Power Conductors and Cables	For:		
720	1	LS	Grounding and Bonding for Electrical Systems	For:		
721	1	LS	Raceways and Boxes for Electrical Systems	For:		
722	1	LS	Underground Ducts and Raceways for Electrical Systems	For:		
723	1	LS	Identification for Electrical Systems	For:		
724	8	EA	Foundation for Lights	For:		
725	1	LS	Hangers and Supports for Electrical Systems	For:		
726	1	LS	Sleeves and Sleeve Seals for Electrical Raceways and Cabling	For:		
727	1	LS	Lighting Control Devices	For:		

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Item No.	Engineers Estimate	Unit	Item Description			
728	1	LS	Enclosed Switches and Circuit Breakers	For:		
729	1	LS	LED Exterior Lighting	For:		
730	50	SF	Replace Granite Block Facing	For:		
731	760	LF	Painting of Fire Sprinkler Piping	For:		
732	60	LF	Remove, Store and Reset Existing Handrail	For:		
733	723	SY	Overlay Conrete, Class DP	For:		
744*	1	LS	Force Account Work	For:	\$50,000.00	

**NASSAU COUNTY**  
**SUPREME COURT LOADING DOCK REHABILITATION**  
**CONTRACT NO. H90059-01G**

**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, September 1, 2025 or latest edition.
- e) FHWA 2009 Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), or latest edition.

**1. Scope of Work:**

The scope of work involves the rehabilitation of the loading dock underpass, the adjoining ramps of the Supreme Court Building and the walkways along the North, East, West and South sides of the Supreme Court building. Infrastructure improvements are as follows:

- Rehabilitate the brick face and coping stones of the ramp walls
- Apply new waterproofing above the underpass structure
- Rehabilitate regions of deterioration concrete structural slab and concrete encased steel beams of the underpass
- Replace existing drainage inlets, and piping at the loading dock and above the underpass at the south plaza/walkway
- Upgrade/replace existing lighting elements/fixtures in loading dock and ramp walls.
- Mill existing concrete pavement of loading dock ramps and perform repairs and seal pavement of the entire loading dock region and ramps.
- Replace existing bluestone pavers walkways and concrete pavements lobby areas with new stamped/imprinted concrete pavement.
- Install landscaping at the south plaza/walkway
- Paint the existing fire sprinkler piping.

Unless otherwise approved, at least one of the loading dock ramps shall remain open during construction. Additionally, at least half of all the plaza areas shall remain open for access to the Supreme Court Building at all times. Approval shall only be given with consideration of needs to the Supreme Court building.

Unless approved by County, all work within the underpass and any demolition work above the loading dock (South Plaza Area) cannot be done during the Supreme Court normal business hours. Work along the underpass ramps, at the walkways, and only permanent restoration work at the South Plaza Area (above the loading dock) are allowed during Supreme Court normal business hours. Additionally, as directed by the County any construction activity of excessive noise concern will be performed outside of normal business hours.

All work shall be implemented and executed according to the plans and specifications.

2. **NOTE: Compliance with Law.**

**Prohibition of Gifts.** 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.

**Disclosure of Conflicts of Interest.** 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.

3. **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 for the contract, 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.

Unless approved by County, all work within the underpass and any demolition work above the loading dock (South Plaza Area) cannot be done during the Supreme Court normal business hours. Work along the underpass ramps, at the walkways, and only permanent restoration work at the South Plaza Area (above the loading dock) are allowed during Supreme Court normal business hours. Additionally, as directed by the County any construction activity of excessive noise concern will be performed outside of normal business hours.

4. 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.
5. 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.
6. 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.
7. 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.
8. Unless otherwise approved by NCDPW, at least one of the loading dock ramps shall remain open during construction for building access.
9. Lighted Barricades, Flashing Warning Lights and Signs:
  - Must be serviced a minimum of twice each week.
  - Must be checked and maintained by the Contractor each day, including weekends and holidays.
  - Must be secured or weighted in such a manner as to prevent them from blowing over under windy conditions.
  - Must be in accordance with the latest Manual of Uniform Traffic Control Devices.
10. 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.

11. 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, NCDPW and NYSDOT 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.**

12. 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 work hours as restricted under item 3. If the Contractor chooses to work beyond these 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.

13. 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.
14. 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.
15. All weather and temperature requirements specified by the Manufacturers for materials used must be adhered to.
16. 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).

**17. Pavement Restoration**

- Milling of concrete pavement shall be included under item 733, Hydrodemolition of Concrete Pavement.
- New concrete pavement surface shall be included under item 734, Ultra High Performance Concrete Overlay for Pavement.
- Repair to cracks in pavement surface shall be included under item 133.
- Protective coating of concrete pavement surface shall be included under item 145MOD.
- Removal of concrete pavement for utility trenching shall be included under item 4A.
- Concrete pavement reconstruction shall be included under item 24.

18. 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.

**19. Inspection of Steel**

- No separate payment shall be made for the contractor to retain a qualified engineer to inspect the exposed steel members and connections to ascertain and report in writing, any damage of steel due to corrosion. inspection will include but not be limited to the following:
  - a. Inspect flanges and webs of steel members.
  - b. Inspect all exposed beam-to-beam and beam-to-column connections for loose bolts, loose rivets, and excessive corrosion.
  - c. Inspect clip angle, connecting lintels to beams for loose bolts, loose rivets, and excessive corrosion.
  - d. Denote location and extent of areas of steel where significant corrosion damage has occurred.

**20. 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.

## **21. Maintenance of Traffic**

- 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.
- 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 requirements to safely maintain traffic.

## **22. Utilities**

- The Contractor is directed to notify all utilities well in advance of beginning work, to allow them to mark-out their facilities.
- The Contractor is directed to provide private utility mark out and notify all privately-owned utilities well in advance of beginning work, to allow them time to adjust their manholes and other castings, if applicable.
- 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.
- 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.
- 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.
- 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.
- 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.

- 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.
  - 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.
  - 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.
  - 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.
  - 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.
23. 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.
24. 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.
- 25. Clean-Up**
- 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.

- 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.
- 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.

**26. 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.

**27. 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.

**28. 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.

**29. 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.

**30. 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.

**31. Cold Patch**

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

**32. 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.

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

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

**34. Special OSHA Notes**

- 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.

- Sheeting shall conform strictly to the Requirements of the OSHA Regulations for Construction Subpart 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.

- 35. 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.
- 36. 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.
- 37. 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 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.

38. **Schedule:** The Contractor shall provide a detailed written schedule of operations for when work will be started and completed for work within the Contract one week after the Notice to Proceed is issued. Typical information to be provided includes, but is not limited to:
- Removals;
  - Drainage work;
  - Wall work:
  - Underpass structural concrete slab and encased steel beam repair work;
  - Curb, apron & sidewalk ramp work;
  - Electrical work;
  - Plaza/walkway imprinted concrete sidewalk work;
  - Concrete pavement;
  - Plantings;
  - Cleaning drainage system;
  - 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.

39. 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.
40. The contractor when submitting shop drawings for approval must specify the work order number and location that said shop drawings will be used.
41. 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.
42. When ordered, all concrete supplied for Items 26, and 27 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, and 27.
43. The contractor shall have a full time Supervisor, fluent in English on the project at all times.

44. No permanent asphalt top course will be allowed to be placed after December 1<sup>st</sup> (unless approved by the Commissioner and as long as other conditions are met per specification).
45. 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.
46. 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.
47. 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](mailto:jlindgren@nassaucountyny.gov), or [TrafficHelp@nassaucountyny.gov](mailto: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>

48. 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.
49. 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.
50. 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.
51. 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.
52. 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.
53. Nassau County Drainage Manholes  
All Nassau County drainage manhole frames and castings raised under Item 16SS, 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.

54. 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.

55. 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.

**56. Supplies**

- As per Item 1M/F – Mobilization with Field Office: All the provisions of the Item 1M/F 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.
- The contractor shall supply the following equipment at the start of the project, those items shall be shown below:

MINIMUM SPECIFICATION

N/A

# LIST OF SPECIAL SPECIFICATIONS

## *Nassau County Supreme Court Loading Dock Rehabilitation*

		<u>UNIT</u>
12P-4	Smooth Interior Corrugated Polyethylene Drainage Pipe – 4”	LF
12P-6	Smooth Interior Corrugated Polyethylene Drainage Pipe – 6”	LF
12P-10	Smooth Interior Corrugated Polyethylene Drainage Pipe – 10”	LF
26MOD	Concrete Curb - Edge Restraint Assembly	LF
144MOD	Waterproofing Membrane	SY
145MOD	Protective Coating	GAL
162A-1	Groundcover & Ornamental Grass (1 Gallon Container)	EA
162A-2	Groundcover & Ornamental Grass (2 Gallon Container)	EA
162B	Perennial Bulbs	EA
420R	Regrading Pullbox Frame and Cover	EA
701	Remove, Store and Reset Existing Bench	EA
702	Remove, Dispose and Replace Brick Facing	SF
703	Remove, Store and Reinstall Existing Granite Cap	LF
704	Maintenance and Repair of Cast-in-Place Concrete	SF
705	Slip Slab	LF
706	Remove, Store and Reuse Existing Granite Block Facing	SF
707	Joint Sealants	LF
708	Grouting	SF
709	Remove and Dispose Existing Light Pole	EA
710	Remove and Replace Flashing	LF
711	Clean and Repoint Granite Stones	SF
712	Remove, Store and Reset Landscape Appurtenances	EA
713	Hand and or Pneumatic Excavation	CY
714	Align Aluminum Edging	LF
715	Round Stone	SF
716	Bark Chip Mulch	SY
717	Integral Color Pigment for Cement Concrete	LBS
718	Imprinting on Concrete Pavement or Sidewalk	SF
719	Low Voltage Electrical Poser Conductors and Cables	LS
720	Grounding and Bonding for Electrical Systems	LS
721	Raceways and Boxes for Electrical Systems	LS
722	Underground Ducts and Raceways for Electrical Systems	LS
723	Identification for Electrical Systems	LS
724	Foundation for Lights	EA
725	Hangers and Supports for Electrical Systems	LS
726	Sleeves and Sleeve Seals for Electrical Raceways and Cabling	LS
727	Lighting Control Devices	LS
728	Enclosed Switches and Circuit Breakers	LS
729	LED Exterior Lighting	LS
730	Replace Granite Block Facing	SF
731	Painting of Fire Sprinkler	LF
732	Remove, Store and Reset Existing Handrail	LF
733	Concrete Overlay, Class DP	SY
744	Force Account Work	LS

## **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 NO. 12P-4 – SMOOTH INTERIOR CORRUGATED POLYETHYLENE  
DRAINAGE PIPE – 4”.**

---

The requirements for Item 12A-4 - Reinforced Concrete Pipe, shall apply with the following modifications:

**1. DESCRIPTION**

The Contractor may at his option substitute smooth interior corrugated polyethylene pipe. The Contractor shall furnish and place polyethylene pipe of the size specified, as supplied by ADS or approved equal, at the locations and to the lines and grades shown in plans, in the itemized proposal and/or as ordered by the Engineer. Smooth-lined corrugated polyethylene pipe shall be used when so ordered by the Engineer.

**2. MATERIALS**

The smooth lined corrugated polyethylene pipe shall conform to the requirements of AASHTO M294. The pipe also must exceed the minimum engineering property values as specified in section 18 of AASHTO Bridge Design Manual. These properties are listed below:

Section Properties  
PE Corrugated Pipes

I.D.	O.D.	A	C	I
(in.)	(in.)	(sq.in/ft.)	(in.)(max.)	(in.4/in.)
4	4.6	0.82	0.13	0.011

**3. CONSTRUCTION DETAILS**

a. Method

All Polyethylene pipe shall be handled and assembled in accordance with the manufacturer's instructions, except as modified herein on plans or by the Engineer in writing.

The pipe shall be placed and backfilled in accordance to the manufacturer's recommendations, unless special construction methods are called for on the plans or in the proposal.

b. Joints

Connections for making field joints for Polyethylene pipe sections shall consist of corrugated couplings, so constructed as to lap on equal portions of each of the pipe sections to be connected. All connections will be of a compatible type to provide a secure and firm connection of the sections of pipe which may readily be made in the field.

*END OF SECTION*

**ITEM NO. 12P-6 – SMOOTH INTERIOR CORRUGATED POLYETHYLENE  
DRAINAGE PIPE – 6”.**

---

The requirements for Item 12A-4 - Reinforced Concrete Pipe, shall apply with the following modifications:

**1. DESCRIPTION**

The Contractor may at his option substitute smooth interior corrugated polyethylene pipe. The Contractor shall furnish and place polyethylene pipe of the size specified, as supplied by ADS or approved equal, at the locations and to the lines and grades shown in plans, in the itemized proposal and/or as ordered by the Engineer. Smooth-lined corrugated polyethylene pipe shall be used when so ordered by the Engineer.

**2. MATERIALS**

The smooth lined corrugated polyethylene pipe shall conform to the requirements of AASHTO M294. The pipe also must exceed the minimum engineering property values as specified in section 18 of AASHTO Bridge Design Manual. These properties are listed below:

Section Properties  
PE Corrugated Pipes

I.D.	O.D.	A	C	I
(in.)	(in.)	(sq.in/ft.)	(in.)(max.)	(in.4/in.)
6	6.9	1.29	0.18	0.031

**3. CONSTRUCTION DETAILS**

a. Method

All Polyethylene pipe shall be handled and assembled in accordance with the manufacturer's instructions, except as modified herein on plans or by the Engineer in writing.

The pipe shall be placed and backfilled in accordance to the manufacturer's recommendations, unless special construction methods are called for on the plans or in the proposal.

b. Joints

Connections for making field joints for Polyethylene pipe sections shall consist of corrugated couplings, so constructed as to lap on equal portions of each of the pipe sections to be connected. All connections will be of a compatible type to provide a secure and firm connection of the sections of pipe which may readily be made in the field.

*END OF SECTION*

**ITEM NO. 12P-10 – SMOOTH INTERIOR CORRUGATED POLYETHYLENE  
DRAINAGE PIPE – 10”.**

---

The requirements for Item 12A-4 - Reinforced Concrete Pipe, shall apply with the following modifications:

**1. DESCRIPTION**

The Contractor may at his option substitute smooth interior corrugated polyethylene pipe. The Contractor shall furnish and place polyethylene pipe of the size specified, as supplied by ADS or approved equal, at the locations and to the lines and grades shown in plans, in the itemized proposal and/or as ordered by the Engineer. Smooth-lined corrugated polyethylene pipe shall be used when so ordered by the Engineer.

**2. MATERIALS**

The smooth lined corrugated polyethylene pipe shall conform to the requirements of AASHTO M294. The pipe also must exceed the minimum engineering property values as specified in section 18 of AASHTO Bridge Design Manual. These properties are listed below:

Section Properties  
PE Corrugated Pipes

I.D.	O.D.	A	C	I
(in.)	(in.)	(sq.in/ft.)	(in.)(max.)	(in.4/in.)
10	11.4	2.16	0.33	0.017

**3. CONSTRUCTION DETAILS**

a. Method

All Polyethylene pipe shall be handled and assembled in accordance with the manufacturer's instructions, except as modified herein on plans or by the Engineer in writing.

The pipe shall be placed and backfilled in accordance to the manufacturer's recommendations, unless special construction methods are called for on the plans or in the proposal.

b. Joints

Connections for making field joints for Polyethylene pipe sections shall consist of corrugated couplings, so constructed as to lap on equal portions of each of the pipe sections to be connected. All connections will be of a compatible type to provide a secure and firm connection of the sections of pipe which may readily be made in the field.

*END OF SECTION*

**ITEM NO. 26MOD – CONCRETE CURB – EDGE RESTRAINT ASSEMBLY**

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All of the requirements of Item 26 - Concrete Curb, shall apply with the following modifications:

**1. DESCRIPTION**

Under this item the Contractor shall place concrete curb used for the installation of Edge Restraint Assembly, Item 179C, where shown on the Plans.

**2. CONSTRUCTION DETAILS**

The construction details for this item shall be as shown in the Plans.

*END OF SECTION*

**ITEM NO. 144MOD – WATERPROOFING MEMBRANE**

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All of the requirements of Item 144 – Bridge Deck Waterproofing Membrane, shall apply with the following modifications:

**1. DESCRIPTION**

Under this item the Contractor shall remove existing waterproofing membranes, clean the existing concrete surfaces and furnish and place a waterproofing membrane at the designated locations shown on the plan or as directed by the engineer.

**2. MATERIALS**

Vertical Applications:

SikaTop 144, as manufactured by Sika Corporation or approved equal.

Polymer-modified portland cement coating:

Component “A” shall be a liquid polymer emulsion of an acrylic co-polymer base and additives.

Component “B” shall be a blend of selected portlandcements, specially graded aggregates, and admixtures to control setting time and workability.

The ratio of Component A: Component B shall be:

Mortar 1:1.647 by weight

The material shall be non-combustible, either before or after cure.

Horizontal Applications:

Sika Fully Bonded – SikaProof A+12, as manufactured by Sika Corporation

*END OF SECTION*

**ITEM NO. 145MOD – PROTECTIVE COATING**

---

**1. DESCRIPTION**

Under this item the Contractor shall clean, furnish and place a polyurethane protective traffic coating system on the exposed concrete pavement surfaces of the underpass and ramps where indicated on the plans or where ordered by the engineer.

**2. MATERIAL**

The protective coating for use under this item shall be Sikalastic 720-One Shot, vehicular polyurethane traffic coating system, as manufactured by Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071, or an approved equal.

Primer Selection - Primer is required for all applications of Sikalastic®-720 One Shot. For applications over concrete, the primer used will depend on the moisture level of the concrete. Measure the moisture content of concrete substrate with a Tramex CME or CMExpert type concrete moisture meter. Refer to manufacturer product data sheets for additional information on primer selection/options.

**3. METHOD**

- a. Substrates shall be clean, dry, sound and free of surface contaminants, with an open texture. Remove all traces of laitance, grease, oils, curing compounds, form release agents and foreign particles by mechanical means, such as shot blast, milling, grinding or scarifying as acceptable to the Engineer. Blow surface free of all dust. If using compressed air ensure compressor is equipped with an oil and moisture trap. All projections, depressions and rough spots should be removed or dressed off to achieve a level surface prior to the application.
- b. Concrete shall be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by shot blast or equivalent mechanical means (CSP 3-4 per ICRI guidelines).
- c. Mixing: After opening Part A place lid face up on ground, remove aggregate insert and place insert on pail lid. Premix Part A component using a low speed (400–600 rpm) mechanical mixer and Jiffy Paddle (5-50 gal. model) at slow speed to obtain uniform color. Slowly add aggregate from tray into Part A and continue to mix, making sure to scrape the bottom and sides of the pail, ensure aggregate is fully mixed within the Part A . Slowly pour Part B into Part A while mixing so that the Part B gets pulled into the vortex of the mixing paddle. Scrape the sides of the container, Mix the combined material thoroughly for 3 minutes until a homogenous mixture and uniform color is obtained. Use care not to prevent whipping air into the material while mixing - use a slow and methodical mixing approach.
- d. Application - Material furnished under this item shall be applied in air temperatures above 40 degrees F, maximum if 95 degrees F. Sikalastic or an approved equal must be applied to a dry surface. Do not apply to frosted, wet or damp surface.
- e. Apply a single coat of the mixed Sikalastic 720-One Shot with a 3/8" notched squeegee or trowel at the recommended coverage rate of 33 sf/gal and backroll using a phenolic

**COUNTY OF NASSAU  
DEPARTEMENT OF PUBLIC WORKS**

**ITEM NO.**

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*(Continued)*

resin core roller. Extend single coat over entire area including previously detailed cracks and control joints. Coverage rate of 33 sf/gal should provide a wet film thickness yield of 48 mils, 45 mils dry. Allow coating to cure a minimum of 36 hours before opening to vehicular traffic. Consult Sika for other weather related recommendations.

**4. METHOD OF MEASUREMENT**

The quantity to be paid for under this item will be the actual number of gallons of coating material properly mixed and incorporated in the completed work.

**5. BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing all labor, materials, tools, equipment and primer necessary to prepare the surfaces and apply the surface coating in accordance with the plans or as directed by the engineer.

*END OF SECTION*

**COUNTY OF NASSAU  
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**ITEM NO. 162A-1 – GROUNDCOVERS & ORNAMENTAL GRASS (1 GALLON CONTAINER)  
ITEM NO. 162A-2 - GROUNDCOVERS & ORNAMENTAL GRASS (2 GALLON CONTAINER)  
ITEM NO. 162B – PERENNIAL BULBS**

---

The planting specifications under Item 361 Section IX, shall apply with the following:

**1. DESCRIPTION**

1.1 Under these items the contractor shall furnish, plant, dig, transplant, transport, maintain and replace all plant materials specified in the following plant schedule in accordance with the specifications or as directed by the Landscape Architect. All plant material shall conform to A.A.N. standards. All plants are to be nursery grown and free of insect and disease injury. The contractor shall be liable for any damages caused by planting and/or transplanting operations and all areas and construction disturbed shall be restored to their original condition to the satisfaction of the Landscape Architect.

**2. MATERIALS**

2.1 Groundcovers & ornamental grass shall be Calamagrostis x Acutiflora ‘Karl Foerster’ (Feather Reed Grass), Hakonechloa Macra ‘Aureola’ (Golden Japanese Forest Grass), and Liriope Spicata Green (Creeping Lirope).

2.2 Perennial bulbs shall be Narcissus ‘Dutch Master’ (Trumpet Daffodil).

**3. METHOD OF CONSTRUCTION**

3.1 The contractor shall follow the planting instructions as stated herein. The area to be planted shall be prepared by thoroughly raking the section of any debris, trash, weeds, bottles or any other discarded material that may be onsite. This discarded material shall be taken off-site and disposed of by the contractor. Each hole dug for a plant or shrub shall be equal in depth to the associated soil within each plant plug, quart, pot or container. The width of each hole shall be twice the diameter of each plant plug, quart, pot, container, or bulb. Osmocote slow release fertilizer (or equivalent), and in pellet form, shall be incorporated into the bottom of each hole. The plants and shrubs shall be placed in each hole, upright and centered, then backfilled to the top of the soil surrounding each plant plug, quart, pot or container. The area then shall be raked again to a finished condition.

**4. METHOD OF MEASUREMENT**

4.1 The quantity of groundcovers & ornamental grass plantings, and bulbs to be paid for under these items shall be the number of each furnished, planted, transplanted and maintained in accordance with the Plans, Specifications and directions of the Landscape Architect.

**5. BASIS OF PAYMENT**

5.1 The price bid shall be a unit price per groundcovers & ornamental grass plantings, and bulbs as specified in the PLANT SCHEDULE and shall include the cost of excavating plant pits, including removal, disposal of excess subsoil, removal and resetting stone block, furnishing plants, transplanting plants, digging and transporting plants from nurseries, furnishing and placing mulch for planting beds, inspecting, planting, watering, restoration,

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**ITEM NO. 162A-1 – GROUNDCOVERS & ORNAMENTAL GRASS (1 GALLON CONTAINER)**  
**ITEM NO. 162A-2 - GROUNDCOVERS & ORNAMENTAL GRASS (2 GALLON CONTAINER)**  
**ITEM NO. 162B – PERENNIAL BULBS**

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*(Continued)*

replacing and maintaining all groundcovers & ornamental grass plantings, incorporating superphosphate with the topsoil, distributing fertilizer over plant pits and all other work, incidental thereto in accordance with the Specifications to the satisfaction of the Landscape Architect.

*END OF SECTION*

**NASSAU COUNTY  
TRAFFIC SIGNAL SPECIFICATION  
FOR  
REGRADE PULLBOX FRAME AND COVER**

**Item 420R    Regrade a 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

**ITEM NO. 701 – REMOVE, STORE AND RESET EXISTING BENCH**

---

**1. DESCRIPTION**

1.1 This work shall include the removal, storage, and resetting of all existing benches designated on the plans or as specified by the Engineer. The bench components shall consist of the bench assembly (including seat, back, and frame), upright mounting posts, and any associated hardware.

**2. MATERIALS**

2.1 None specified.

**3. METHOD OF CONSTRUCTION**

3.1 Existing benches shall be removed and stockpiled above ground in a neat and workmanlike manner by the Contractor to the satisfaction of the Engineer, at the site or sites within the R.O.W. limits as designated by the Engineer. Care shall be exercised in removing the benches to prevent damage to any part of the bench assembly, upright mounting posts, or hardware. Any damage resulting from the Contractor's operations shall be repaired, or the damaged part replaced, to the satisfaction of the Engineer at the Contractor's expense.

3.2 Should a bench become damaged as a result of the Contractor's operations, to the extent that it cannot be repaired in a manner suitable to the Engineer, the bench shall be replaced with a matching bench satisfactory to the Engineer at the Contractor's expense. If the Contractor is unable to furnish a matching bench satisfactory to the Engineer, all benches designated on the plans shall be replaced with benches of comparable size, appearance, and capacity to the existing benches to the satisfaction of the Engineer, at the Contractor's expense. Existing benches which have heretofore been described as requiring replacement shall become the property of the Contractor and shall be removed from the work site in a neat and workmanlike manner.

3.3 The Contractor shall reset the existing benches at the locations shown on the plans or specified by the Engineer. Benches shall be securely reset in an upright position to the satisfaction of the Engineer.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured as the number of benches reset.

**5. BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of all materials, equipment, and labor necessary to satisfactorily complete the work

*END OF SECTION*

**ITEM NO. 702 – REMOVE, DISPOSE AND REPLACE BRICK FACING**

---

**1. DESCRIPTION**

1.1 This work shall consist of removing and disposing existing glazed brick facing and furnishing and installing new unglazed brick facing in accordance with the contract documents and as directed by the Engineer.

**2. MATERIALS**

2.1 The materials used for this specification shall be of the following standards:

Concrete Brick	*M37
Stainless Steel Dovetail Anchors	ASTM A240
Caulking Compound for Structures	*M31
Masonry Mortar	ASTM C270-10

\*Refers to the Nassau County Department of Public Works Standard Specifications

2.2. Source Limitations for brick Units: Obtain exposed brick units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required. Color to be approved by County prior to purchase.

2.3 Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

**3. CONSTRUCTION DETAILS**

3.1 Remove and legally dispose of the existing glazed brick facing, including all mortar bedding and backing material as indicated on the plans or as ordered by the Engineer, in a manner so as not to damage dovetail slots or brick facing to remain. Repair or replace all damaged areas resulting from removal operations at no additional cost, to the satisfaction of the Engineer.

3.2 Extend the dovetail slots from the existing wall into the new section of the wall as shown on the plans or as approved by the Engineer. Clean the surfaces of dovetail slots, in-place bricks and concrete surfaces, which might interfere with bonding. Follow the cleaning with compressed air jetting or vacuum cleaning to ensure the removal and disposal of all loose particles subject to approval of the Engineer.

3.3 Immerse the bricks in water for 3 hours and use when they are surface dry. Install each brick in mortar so as to form a full bed, with end and side joints in one operation in a neat, true line and grade manner. Secure the brick facing to the wall with anchors as shown on the plans or as approved by the Engineer. Follow the pattern that matches the adjacent brick facing. Finish the joints with a pointing tool to match the adjacent joints.

COUNTY OF NASSAU  
DEPARTEMENT OF PUBLIC WORKS

ITEM NO.

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*(Continued)*

3.4 Protect and keep the completed brick masonry from drying and keep damp for a period of at least 3 days.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured the number of square feet, including joints, of brick facing satisfactorily removed and replaced.

**5. BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

*END OF SECTION*

**ITEM NO. 703 – REMOVE, STORE AND REINSTALL EXISTING GRANITE CAP**

---

**1. DESCRIPTION**

- 1.1 The work shall consist of removing the existing granite cap stone at locations indicated on the plans and as directed by the Engineer.
- 1.2 The cap stone that is designated for reuse in this item shall be approved by the Engineer and reset as shown in the plans.

**2. MATERIALS**

- 2.1 Non-metallic, non-shrink grout for setting dowels shall meet requirements as specified in custom specification Item 710.
- 2.2 Masonry mortar shall meet requirements of ASTM C270-10. Submit samples of mortar in color selected by the Engineer from the mortar manufacturer's standard color chart.
- 2.3 Stainless steel dowels shall meet the requirements and the requirements of ASTM A276, AISI Type 302/304.

**3. CONSTRUCTION DETAILS**

- 3.1 The Contractor shall remove the existing granite cap stone from its original position, clean off the existing mortar, and store the caps stone at locations approved by the Engineer.
- 3.2 The cap stone that is to be reset shall be placed in accordance with the requirements of Contract Drawings and as directed by the Engineer.
- 3.3 Cap stone that is to be reset and is damaged as a result of the Contractor's operations shall be repaired or replaced by the Contractor at no additional cost to the client.

**4. METHOD OF MEASUREMENT**

- 4.1 This work will be measured as the number of feet of existing cap stone that is removed and reset. Measurement shall be taken along the centerline of the top surface of the cap stone and shall include the joints between the reset stones.

**5. BASIS OF PAYMENT**

- 5.1 The unit price bid per foot shall cover all costs for the installation of the cap stones complete, including all labor, materials, equipment, storage, drilling and grouting dowels, fresh mortar bedding, and any incidentals necessary to complete the work.

*END OF SECTION*

**COUNTY OF NASSAU  
DEPARTEMENT OF PUBLIC WORKS**

**ITEM NO. 704- MAINTENANCE AND REPAIR OF CAST-IN-PLACE CONCRETE**

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**1. DESCRIPTION**

**1.1 SUMMARY**

A. This Section includes the following:

1. Removal of deteriorated concrete and reinforcement and subsequent replacement and patching.
2. Floor joint repair.
3. Epoxy crack injection.
4. Corrosion-inhibiting treatment.
5. Polymer overlays.
6. Polymer sealers.
7. Steel structural reinforcement.
8. Composite structural reinforcement.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.
- B. Formwork and Shoring Drawings: Prepared by or under the supervision of a qualified professional engineer detailing formwork and temporary shoring and supports. Include schedule and sequence for erection and removal relative to removal of deteriorated concrete and reinforcement and subsequent repair and reinforcement.
- C. Samples: Cured Samples of overlay and patching materials.
- D. Qualification Data: For installers, professional engineer, manufacturers and testing agency.
1. For products required to be installed by workers approved by product manufacturers, include letters of acceptance by product manufacturers certifying that installers are approved to apply their products.
- E. Material Certificates: For each type of product indicated, signed by manufacturers.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for bonding agents, patching mortars, epoxy adhesives, and, composite structural reinforcement.
- G. Rehabilitation Program: For each phase of rehabilitation process, including protection of surrounding materials and Project site during operations. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

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1. If alternative materials and methods to those indicated are proposed for any phase of rehabilitation work, submit substitution request complying with Division 01 Section "Product Requirements" and provide a written description of proposed materials and methods, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.

**1.3 QUALITY ASSURANCE**

- A. **Installer Qualifications:** Installer that employs workers trained and approved by manufacturer to apply corrosion-inhibiting treatments, concrete patching and rebuilding materials, epoxy crack injection materials, polymer overlays, polymer sealers, and composite structural reinforcement.
- B. **Manufacturer Qualifications:** Manufacturer that employs factory-trained representatives who are available for consultation and Project-site inspection.
- C. **Source Limitations:** Obtain concrete patching and rebuilding materials, epoxy crack injection materials, and composite structural reinforcement materials, each, through one source from a single manufacturer.
- D. **Mockups:** Build mockups for concrete removal and patching, floor joint repair, epoxy crack injection, polymer overlays, polymer sealers, and composite structural reinforcement, to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.
- B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- C. Store cementitious materials off the ground, under cover, and in a dry location.
- D. Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.

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1.5 PROJECT CONDITIONS

- A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.
1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 deg F (5 deg C) within 8 hours.
  2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 deg F (16 deg C) within 8 hours.
  3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 deg F (16 deg C) for 8 hours.
- B. Cold-Weather Requirements for Cementitious Materials: Do not apply unless air temperature is above 40 deg F (5 deg C) and will remain so for at least 48 hours after completion of Work.
- C. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:
1. When air temperature is below 40 deg F (5 deg C), heat patching material ingredients and existing concrete to produce temperatures between 40 and 90 deg F (5 and 32 deg C).
  2. When mean daily air temperature is between 25 and 40 deg F (minus 4 and plus 5 deg C), cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after repair.
  3. When mean daily air temperature is below 25 deg F (minus 4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after repair.
- D. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F (32 deg C) and above.
- E. Environmental Limitations for High-Molecular-Weight Methacrylate Sealers: Do not apply when concrete surface temperature is below 55 deg F (13 deg C) or above 90 deg F (32 deg C). Apply only to dry substrates.

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**2. MATERIALS**

**2.1 BONDING AGENTS**

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Euclid Chemical Company (The); Corr-Bond.
  - b. Kaufman Products, Inc; Surepoxy HM EPL.
  - c. Sika Corporation; Armatec 110 EpoCem.
  - d. Sonneborn, Div. of ChemRex; Sonoprep.
  - e. Sto Corp., Concrete Restoration Division; Sto Bonding and Anti-Corrosion Agent.
  - f. Tamms Industries, Inc.; Duralprep A.C.

B. Epoxy Bonding Agent: ASTM C 881/C 881M, Type V.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Anti-Hydro International, Inc.; Poly-Epoxy Bonding #100.
  - b. ChemCo Systems; CCS Bonder Liquid, [LWL] [or] [SWL].
  - c. Dayton Superior Corporation: Resi-Bond (J-58), Sure-Anchor Epoxy (J-50), or Sure-Inject (J-56).
  - d. Euclid Chemical Company (The); Euco #352 Epoxy System, Euco #452 Epoxy System, or Euco #620 Epoxy System.
  - e. Kaufman Products, Inc.; SurePoxy HM EPL.
  - f. MBT Protection and Repair, Div. of ChemRex; Concrecive Liquid LPL.
  - g. Meadows, W. R., Inc.; Sealtight Rezi-Weld 1000, Sealtight Rezi-Weld Gel Paste, Sealtight Rezi-Weld Gel Paste State, or Sealtight Rezi-Weld LV.
  - h. Sika Corporation; Sikadur 31, Hi-Mod Gel, Sikadur 32, Hi-Mod Sikadur 32, Hi-Mod LPL, Sikadur 35, Hi-Mod LV, or Sikadur 35, Hi-Mod LV LPL.
  - i. Sonneborn, Div. of ChemRex; Epogel or Epogrip.
  - j. Tamms Industries, Inc.; Duralbond.
  - k. ThoRoc, Div. of ChemRex; Epoxy Adhesive 24LPL.
  - l. Unitex; Pro-Poxy 204 or Slow Set Bonding Agent.
  - m. US MIX Products Company; US Spec Maxi - Bond 2500 or US Spec Slow Bond 6500.
2. Thin Film Open Time: Not less than six hours.

C. Latex Bonding Agent: ASTM C 1059, Type II.

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1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Latex Bonding Agent, Type II:

- 1) Dayton Superior Corporation; Day-Chem Ad Bond (J-40).
- 2) Euclid Chemical Company (The); Flex-Con.
- 3) Kaufman Products, Inc.; Surebond.
- 4) Meadows, W. R. Inc.; Sealtight Acry-Lok.
- 5) Sonneborn, Div. of ChemRex; Acrylic Additive.
- 6) US MIX Products Company; US Spec Acrylcoat.

D. Mortar Scrub-Coat: 1 part portland cement complying with ASTM C 150, Type I, II, or III and 1 part fine aggregate complying with ASTM C 144, except 100 percent passing a No. 16 (1.18-mm) sieve.

## 2.2 PATCHING MORTAR

A. Patching Mortar, General:

1. Unless otherwise indicated, use any of the products specified in this Article.
2. Overhead Patching Mortar: For overhead repairs, use patching mortar recommended by manufacturer for overhead use and as specified in this Article.
3. Coarse Aggregate for Adding to Patching Mortar: Washed aggregate complying with ASTM C 33, Size No. 8, Class 5S. Add only as permitted by patching mortar manufacturer.

B. Job-Mixed Patching Mortar: 1 part portland cement complying with ASTM C 150, Type I, II, or III and 2-1/2 parts fine aggregate complying with ASTM C 144, except 100 percent passing a No. 16 (1.18-mm) sieve.

C. Cementitious Patching Mortar: Packaged, dry mix complying with ASTM C 928.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cementitious Patching Mortar:

- 1) Kaufman Products, Inc.; Hicap.
- 2) MBT Protection and Repair, Div. of ChemRex; Emaco S66 CI, Emaco S77 CI, or Emaco S88 CI.
- 3) Sika Corporation; Sikarepair 223, or Sikarepair SHB.
- 4) Sonneborn, Div. of ChemRex; Deep Pour Mortar.
- 5) Sto Corp., Concrete Restoration Division; Sto Full-Depth Repair Mortar.
- 6) ThoRoc, Div. of ChemRex; LA Repair Mortar.

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- b. Cementitious Patching Mortar, Rapid Setting:
  - 1) CGM, Incorporated; Pro Patching Cement.
  - 2) Dayton Superior Corporation; Day-Chem Perma-Patch, Re-Crete 5 Minute, or Re-Crete 20 Minute.
  - 3) Euclid Chemical Company (The); Euco-Speed.
  - 4) Fox Industries, Inc.; FX-928 Rapid Hardening Mortar.
  - 5) Kaufman Products, Inc.; Duracrete.
  - 6) Meadows, W. R. Inc.; Sealtight Meadow-Patch 5, Sealtight Meadow-Patch 20, or Sealtight Futura-15.
  - 7) Sika Corporation; Sikaset Roadway Patch.
  - 8) Sonneborn, Div. of ChemRex; Road Patch.
  - 9) Sto Corp., Concrete Restoration Division; Sto Rapid Repair Mortar.
  - 10) Tamms Industries, Inc.; Speed Crete 2028.
  - 11) ThoRoc, Div. of ChemRex; 10-60 Rapid Mortar or 10-61 Rapid Mortar.
  - 12) Unitex; Patch Set 928.
  - 13) US MIX Products Company; US Spec Transpatch.
  - 14) Watson Bowman Acme Corp., Degussa AG; Wabo Renew 100.
  
- D. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix complying with ASTM C 928, that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. AQUAFIN, Inc.; MORTAR-40.
    - b. CGM, Incorporated; Pro Trowel Mortar., Pro Gel Mortar., Pro Flowable Mortar., Pro N.B.P.
    - c. Dayton Superior Corporation; HD-50 or Thin Resurfacer.
    - d. Euclid Chemical Company (The); Concrete Coat, Thin Coat or Verticoat.
    - e. Fox Industries, Inc.; FX-243 or FX-273 Trowel Grade Polymer Repair Mortar.
    - f. Kaufman Products, Inc.; Patchwell, Patchwell Kit, Patchwell Kit D, or Patchwell Kit HB.
    - g. MBT Protection and Repair, Div. of ChemRex; Emaco R320 CI, or Emaco R350 CI.
    - h. Meadows, W. R., Inc.; Sealtight Meadow-Patch T1, or Sealtight Meadow-Crete FNP.
    - i. Sika Corporation; SikaTop 121 Plus, SikaTop 122 Plus, SikaTop 123 Plus, or SikaTop 126 Plus.
    - j. Sonneborn, Div. of ChemRex; Screed, Sonopatch 100, Sonopatch 200, Sonopatch 300.
    - k. Sto Corp., Concrete Restoration Division; Sto Flowable Mortar, Sto Overhead Mortar, Sto Thin-Coat Mortar or Sto Trowel-Grade Mortar.
    - l. Tamms Industries, Inc.; Duraltop Fast Set or Speed Crete PM.
    - m. ThorRoc, Div. of ChemRex, Inc.; HB2 Repair Mortar or Polyset.

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- n. US MIX Products Company; US Spec Polypatch FR or US Spec Thinpatch.
- E. Polymer-Modified, Silica-Fume-Enhanced, Cementitious Patching Mortar: Packaged, dry mix complying with ASTM C 928, that contains silica fume complying with ASTM C 1240 and a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Euclid Chemical Company (The); Verticoat Supreme.
    - b. Fox Industries, Inc.; FX-261 Polymer Repair Mortar or FX-286.
    - c. MBT Protection and Repair, Div. of ChemRex; Emaco S88 CI.
    - d. Meadows, W. R., Inc.; Sealtight Meadow-Crete H2 or Sealtight Meadow-Crete-GPS.
    - e. Sika Corporation; Sika Monotop 615.
    - f. Sonneborn, Div. of ChemRex; Gel Patch, Sonopatch 200, or Sonopatch 300.
    - g. US Mix Products Company; US Spec V/O Patch.

**2.3 CONCRETE**

- A. Concrete Materials and Admixtures: Comply with Volume 1, Part Three Section A and Section B of the Nassau County Department of Public Works Standard Specifications.
- B. Steel and Fiber Reinforcement and Reinforcement Accessories: Comply with Volume 1, Part Two Section B of the Nassau County Department of Public Works Standard Specifications.
- C. Preplaced Aggregate: Washed aggregate complying with ASTM C 33, Class 5S, with 95 to 100 percent passing a 1-1/2-inch (37.5-mm) sieve, 40 to 80 percent passing a 1-inch (25-mm) sieve, 20 to 45 percent passing a 3/4-inch (19-mm) sieve, 0 to 10 percent passing a 1/2-inch (12.5-mm) sieve, and 0 to 2 percent passing a 3/8-inch ((9.5-mm)) sieve.
- D. Fine Aggregate for Grout Used with Preplaced Aggregate: Fine aggregate complying with ASTM C 33, but with 100 percent passing a No. 8 (2.36-mm) sieve, 95 to 100 percent passing a No. 16 (1.18-mm) sieve, 55 to 80 percent passing a No. 30 (0.6-mm) sieve, 30 to 55 percent passing a No. 50 (0.3-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, 0 to 10 percent passing a No. 200 (0.075-mm) sieve, and having a fineness modulus of 1.30 to 2.10.
- E. Grout Fluidifier for Grout Used with Preplaced Aggregate: ASTM C 937.
- F. Portland Cement for Grout Used with Preplaced Aggregate: ASTM C 150.

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G. Pozzolans for Grout Used with Preplaced Aggregate: ASTM C 618.

2.4 MISCELLANEOUS MATERIALS

A. Epoxy Joint Filler: 2-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of at least 80 per ASTM D 2240.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Anti-Hydro International, Inc.; Groove & Crack Filler #250.
- b. ChemCo Systems; CCS Grout, Control Joint or Control Joint - HB.
- c. Euclid Chemical Company (The); Euco 700 or 800.
- d. Kaufman Products, Inc.; Surepoxy Flexijoint.
- e. MBT Protection and Repair, Div. of ChemRex; Masterfill 300i.
- f. Meadows, W. R., Inc.; Sealtight Rezi-Weld Flex.
- g. Metzger/McGuire; MM-80 or Edge-Pro XL.
- h. Sika Corporation; Sikadur 51 NS or Sikadur 51 SL.
- i. Unitex; Pro-Flex or Pro-Flex Gel.
- j. US Mix Products Company; US Spec SR 50 - EJF.

B. Polyurea Joint Filler: 2-component, semirigid, 100 percent solids, polyurea resin with a Type A Shore durometer hardness of at least 80 per ASTM D 2240.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. ASTC Polymers; Penetron 3003.
- b. ChemCo Systems; CCS Grout, Polyurea Control Joint or SWL.
- c. Dayton Superior Corporation; Joint Saver II.
- d. Euclid Chemical Company (The); Euco Qwikjoint 200.
- e. MBT Protection and Repair, Div. of ChemRex; Masterfill 400 CT.
- f. Metzger/McGuire; Spal-Pro RS 88 or Spal-Pro 2000.
- g. Sonneborn, Div. of ChemRex; Sonolastic TF-100.

C. Epoxy Crack Injection Adhesive: ASTM C 881/C 881M, Type IV.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. ChemCo Systems; CCS Grout, [Standard] [Standard - High Ambient Temperature] [or] [Low Viscosity].
- b. Dayton Superior Corporation; [Resi-Bond (J-58)] [Sure-Anchor Epoxy (J-50)] [or] [Sure-Inject (J-56)].
- c. Euclid Chemical Company (The); [Euco #352 Epoxy System] [Euco #452 Epoxy System] [Euco #620 Epoxy System] [Euco #452 LV] [Euco #620 LV] [or] [Eucopoly Injection Resin].

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- d. Kaufman Products, Inc.; [Surepoxy HMLV] [Surepoxy HMLV-Class B] [or] [Surepoxy HM-SLV].
  - e. MBT Protection and Repair, Div. of ChemRex; [Concresive Standard LVI] [or] [SCB Concresive 1380].
  - f. Meadows, W. R., Inc.; Sealtight Rezi-Weld LV.
  - g. Sika Corporation; [Sikadur 35, Hi-Mod LV] [Sikadur 35, Hi-Mod LV LPL] [Sikadur 52] [or] [Sikadur Injection Gel].
  - h. Sonneborn, Div. of ChemRex; [Epofil] [or] [Epofil SLV].
  - i. Tamms Industries, Inc.; Duralcrete LV.
  - j. Thermal-Chem; Crack Injection, Product [2] [205] [or] [212].
  - k. ThorRoc, Div. of ChemRex, Inc.; [LV300 Injection Resin] [or] [ULV140 Injection Resin].
  - l. Unitex; [Pro-Poxy 50 SuperLV] [Pro-Poxy 100 LV] [or] [Slow Set Injection Resin].
  - m. US MIX Products Company; US Spec Maxi - Bond 500LV.
  - n. AQUASEAL GEL or LV
- D. Capping Adhesive: Product manufactured for use with crack injection adhesive by same manufacturer.
- E. Corrosion-Inhibiting Treatment Materials: Water-based solution of alkaline corrosion-inhibiting chemicals that penetrates concrete by diffusion and forms a protective film on steel reinforcement.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cortec Corporation; MCI 2005 or MCI 2020.
    - b. Degussa Corporation; Protectosil CIT.
    - c. Fox industries, Inc.; FX-361 Migratory Corrosion Inhibitor.
    - d. Sika Corporation; Sika Ferrogard 903.
    - e. Sonneborn, Div. of ChemRex; Corrosion Inhibitor.
- F. Polymer Overlay: Epoxy adhesive complying with ASTM C 881/C 881M, Type III.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Kaufman Products, Inc.; Surepoxy VLM or Surepoxy VLM-Class B.
    - b. Meadows, W. R., Inc.; Sealtight Rezi-Weld Type III DOT.
    - c. Thermal-Chem; Flexgard T, Product 309.
    - d. Unitex; Pro-Poxy Type III D.O.T.
    - e. US MIX Products Company; US SPEC Type III Epoxy Binder.
- G. Aggregate for Use with Polymer Overlay: Oven-dried, washed silica sand complying with ACI 503.3.

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- H. Polymer Sealer: Low-viscosity epoxy penetrating sealer recommended by manufacturer for application to exterior concrete traffic surfaces.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Epoxy Sealers:
      - 1) ChemCo Systems; CCS Coating, Epoxy Healer Sealer.
      - 2) Euclid Chemical Company (The); Euco #512 Epoxy Sealer.
      - 3) Fox Industries, Inc.; FX-452 Epoxy Penetrating Sealer.
      - 4) Kaufman Products, Inc.; SurePoxy Penetrating Sealer.
      - 5) MBT Protection and Repair, Div. of ChemRex; Masterseal GP.
      - 6) Thermal-Chem; Hairline Crack Sealer, Product 207.
      - 7) Unitex; Pro-Seal HS.
      - 8) US MIX Products Company; US Spec Eposeal LVS.
    - b. High-Molecular-Weight Methacrylate Sealers:
      - 1) Meadows, W. R. Inc.; Sealtight Vocomp-25.
      - 2) Sika Corporation; Sikapronto 19.
      - 3) Transpo Industries, Inc.; Sealate T70.

2.5 MIXES

- A. Mix products, in clean containers, according to manufacturer's written instructions.
1. Add clean silica sand and coarse aggregates to products only as recommended by manufacturer.
  2. Do not add water, thinners, or additives unless recommended by manufacturer.
  3. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
  4. Do not mix more materials than can be used within recommended open time. Discard materials that have begun to set.
- B. Mortar Scrub-Coat: Mix with enough water to provide consistency of thick cream.
- C. Dry-Pack Mortar: Mix with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.
- D. Concrete: Comply with Volume 1, Part Three Section A and B of the Nassau County Department of Public Works Standard Specifications.

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- E. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C 938. Add grout fluidifier to mixing water followed by cementitious materials and then fine aggregate.

**3. CONSTRUCTION DETAILS**

**3.1 EXAMINATION**

- A. Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.
- B. Locate areas of deteriorated or delaminated concrete using hammer or chain drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries as directed by the Engineer. At columns and walls make boundaries level and plumb, unless otherwise indicated.
- C. Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer, using depth of cover measurements, and verify depth of cover in removal areas using pachometer.

**3.2 PREPARATION**

- A. Protect people, motor vehicles, equipment, surrounding construction, Project site, plants, and surrounding buildings from injury resulting from concrete rehabilitation work.
  - 1. Erect and maintain temporary protective covers over pedestrian walkways and at points of entrance and exit for people and vehicles, unless such areas are made inaccessible during the course of concrete rehabilitation work. Construct covers of tightly fitted, 3/4-inch (19-mm) exterior-grade plywood supported at 16 inches (405 mm) o.c. and covered with asphalt roll roofing.
  - 2. Protect adjacent equipment and surfaces by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
  - 3. Neutralize and collect alkaline and acid wastes according to requirements of authorities having jurisdiction and dispose of by legal means off Owner's property.
  - 4. Dispose of runoff from wet operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
  - 5. Collect runoff from wet operations and dispose of by legal means off Owner's property.
- B. Shoring: Install temporary supports before beginning concrete removal.

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C. Concrete Removal:

1. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch (13 mm). Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
2. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
3. Remove additional concrete, if necessary, to provide a depth of removal of at least 1/2 inch (13 mm) over entire removal area.
4. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least a 3/4-inch (19-mm) clearance around bar.
5. Test areas where concrete has been removed by tapping with hammer and remove additional concrete until unsound and disbonded concrete is completely removed.
6. Provide fractured aggregate surfaces with a profile of at least 1/8 inch (3 mm) that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level, unless otherwise directed.
7. Thoroughly clean removal areas of loose concrete, dust, and debris.

D. Reinforcing Bar Preparation: Remove loose and flaking rust from reinforcing bars by high-pressure water cleaning, abrasive blast cleaning, needle scaling, or wire brushing until only tightly bonded light rust remains.

1. Where section loss of reinforcing bar is more than 25 percent, or 20 percent in 2 or more adjacent bars, cut bars and remove and replace as directed by Engineer. Remove additional concrete as necessary to provide at least 3/4-inch (19-mm) clearance at existing and replacement bars. Splice replacement bars to existing bars according to ACI 318 (ACI 318M), by lapping, welding, or using mechanical couplings.

E. Preparation of Floor Joints for Repair: Saw-cut joints full width to edges and depth of spalls, but not less than 3/4 inch (19 mm) deep. Clean out debris and loose concrete; vacuum or blow clear with compressed air.

F. Surface Preparation for Corrosion-Inhibiting Treatment: Clean concrete by low-pressure water cleaning, detergent scrubbing or sand blasting to remove dirt, oils, films, and other materials detrimental to treatment application. Allow surface to dry before applying corrosion-inhibiting treatment.

G. Surface Preparation for Overlays: Remove delaminated material and deteriorated concrete surface material. Roughen surface of concrete by sand blasting, shot blasting, scarifying, needle scaling, high-pressure water jetting, scabbling, flame blasting, or milling to produce a surface profile matching CSP [3] [4] [5] [6] [7] [8] [9] per ICRI 03732. Sweep and vacuum roughened surface to remove debris followed by low-pressure water cleaning.

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*(Continued)*

- H. Surface Preparation for Sealers: Clean concrete by shot blasting, low-pressure water cleaning, or detergent scrubbing to remove dirt, oils, films, and other materials detrimental to sealer application.
  
- I. Surface Preparation for Sealers: Acid etch surface of concrete to produce a surface profile matching CSP 1 per ICRI 03732. Prepare surface for acid etching by detergent scrubbing to remove oils and films that may prevent acid penetration.
  - 1. Remove excess acid solution, reaction products, and debris by squeegeeing or vacuuming.
  - 2. Scrub surface with an alkaline detergent, rinse, and squeegee or vacuum.
  - 3. Check acidity of surface with pH test paper and continue rinsing until pH is acceptable.
  - 4. When pH is acceptable and surface is clean, vacuum dry.
  
- J. Surface Preparation for Composite Structural Reinforcement: Remove delaminated material and deteriorated concrete surface material. Clean concrete where reinforcement and epoxy patching mortar is to be applied by low-pressure water cleaning or detergent scrubbing to remove dirt, oils, films, and other materials detrimental to epoxy application. Roughen surface of concrete by sand blasting.

**3.3 APPLICATION**

- A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.
  
- B. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars and concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.
  
- C. Epoxy Bonding Agent: Apply to reinforcing bars and concrete by brush, roller, or spray according to manufacturer's written instructions, leaving no pinholes or other uncoated areas. Apply to reinforcing bars in at least two coats, allowing first coat to dry before applying second coat. Apply patching mortar or concrete while epoxy is still tacky. If epoxy dries, recoat before placing patching mortar or concrete.
  
- D. Latex Bonding Agent, Type II: Mix with portland cement and scrub into concrete surface according to manufacturer's written instructions. Apply patching mortar or concrete while bonding agent is still wet. If bonding agent dries, recoat before placing patching mortar or concrete.
  
- E. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.

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*(Continued)*

- F. Mortar Scrub-Coat: Dampen repair area and surrounding concrete **6 inches (150 mm)** beyond repair area. Remove standing water and apply scrub-coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub-coat dries, recoat before applying patching mortar or concrete.
- G. Patching Mortar: Unless otherwise recommended by manufacturer, apply as follows:
1. Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar mixed with latex bonding agent into substrate, filling pores and voids.
  2. Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
  3. For vertical patching, place material in lifts of not more than 1 inch (25 mm). Do not feather edge.
  4. For overhead patching, place material in lifts of not more than 1 inch (25 mm) nor less than 1/4 inch (6 mm). Do not feather edge.
  5. After each lift is placed, consolidate material and screed surface.
  6. Where multiple lifts are used, score surface of lifts to provide a rough surface for application of subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
  7. Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface.
  8. Wet-cure cementitious patching materials, including polymer-modified, cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.
- H. Dry-Pack Mortar: Use for deep cavities. Unless otherwise recommended by manufacturer, apply as follows:
1. Provide forms where necessary to confine patch to required shape.
  2. Wet substrate and forms thoroughly and then remove standing water.
  3. Place dry-pack mortar into cavity by hand, and compact into place with a hardwood drive stick and mallet or hammer. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.
  4. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete. A thin coat of patching mortar may be troweled into the surface of patch to help obtain required finish.
  5. Wet-cure patch for not less than seven days by water-fog spray or water-saturated absorptive cover.
- I. Concrete: Place and as follows:
1. Apply epoxy-modified, cementitious bonding and anticorrosion agent to reinforcement and concrete substrate.

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*(Continued)*

2. Apply latex bonding agent to concrete substrate.
  3. Use vibrators to consolidate concrete as it is placed.
  4. At unformed surfaces, screed concrete to produce a surface that when finished with patching mortar will match required profile and surrounding concrete.
  5. Where indicated place concrete by form and pump method.
    - a. Design and construct forms to resist pumping pressure in addition to weight of wet concrete. Seal joints and seams in forms and junctions of forms with existing concrete.
    - b. Pump concrete into place, releasing air from forms as concrete is introduced. When formed space is full, close air vents and pressurize to 14 psi (96 kPa).
  6. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.
  7. Fill placement cavities with dry-pack mortar and repair voids with patching mortar. Finish to match surrounding concrete.
- J. Grouted Preplaced Aggregate Concrete: Use for column and wall. Place as follows:
1. Design and construct forms to resist pumping pressure in addition to weight of wet grout. Seal joints and seams in forms and junctions of forms with existing concrete.
  2. Apply epoxy-modified, cementitious bonding and anticorrosion agent to reinforcement and concrete substrate.
  3. Place aggregate in forms, consolidating aggregate as it is placed. Pack aggregate into upper areas of forms to achieve intimate contact with concrete surfaces.
  4. Fill forms with water to thoroughly dampen aggregate and substrates. Drain water from forms before placing grout.
  5. Pump grout into place at bottom of preplaced aggregate, forcing grout upward. Release air from forms at top as grout is introduced. When formed space is full and grout flows from air vents, close vents and pressurize to 14 psi (96 kPa).
  6. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.
  7. Repair voids with patching mortar and finish to match surrounding concrete.
- K. Joint Filler: Install in nonmoving floor joints where indicated.
1. Install filler to a depth of at least 3/4 inch (19 mm). Use fine silica sand no more than 1/4 inch (6 mm) deep to close base of joint. Do not use sealant backer rods or compressible fillers below joint filler.
  2. Install filler so that when cured, it is flush at top surface of adjacent concrete. If necessary, overfill joint and remove excess when filler has cured.

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*(Continued)*

- L. Epoxy Crack Injection: Comply with manufacturer's written instructions and the following:
  - 1. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond, and clean cracks with oil-free compressed air or low-pressure water to remove loose particles.
  - 2. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.
  - 3. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch (6 mm) thick by 1 inch (25 mm) wider than crack.
  - 4. Inject cracks wider than 0.003 inch (0.075 mm) to a depth of 8 inches (200 mm) or to a width of less than 0.003 inch (0.075 mm), whichever is less.
  - 5. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.
  - 6. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.
  
- M. Corrosion-Inhibiting Treatment: Apply by brush, roller, or airless spray in two coats at manufacturer's recommended application rate. Remove film of excess treatment by high-pressure washing before patching treated concrete or applying a sealer or overlay.
  
- N. Polymer Overlay: Apply according to ACI 503.3.
  - 1. Apply to traffic-bearing surfaces, including parking areas and walks.
  
- O. Polymer Sealer: Apply by brush, roller, or airless spray at manufacturer's recommended application rate.
  - 1. Apply to traffic-bearing surfaces, including parking areas and walks.
  
- P. Methylmethacrylate Sealer/Brighteners: Apply by brush, roller, or airless spray at manufacturer's recommended application rate.
  - 1. Apply to exterior concrete surfaces that are exposed to view, excluding traffic-bearing surfaces.

**3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to sample materials and perform tests as follows:
  - 1. Patching Mortar, Packaged Mixes: Randomly select samples to test according to ASTM C 928.

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2. Patching Mortar, Field Mixed: Randomly select samples to test for compressive strength according to ASTM C 109/C 109M.
3. Concrete: As specified in Volume 1, Part Three, Section A and B of the Nassau County Department of Public Works Standard Specifications.
4. Grouted Preplaced Aggregate: Tested for compressive strength of grout according to ASTM C 942.
  - a. Testing Frequency: One sample for each 25 cu. yd. (19 cu. m) of grout or fraction thereof, but not less than one sample for each day's work.
5. Joint Filler: Core drilled samples to verify proper installation.
  - a. Testing Frequency: One sample for each 100 feet (30 m) of joint filled.
  - b. Where samples are taken, fill holes with joint filler.
6. Epoxy Crack Injection: Core drilled samples to verify proper installation.
  - a. Testing Frequency: 1 sample for each 100 feet (30 m) of crack injected.
  - b. Where samples are taken, fill holes with epoxy mortar.

**4. METHOD OF MEASUREMENT**

- A. This item shall be paid on the number of square feet of concrete to be repaired. All repair types shall be included under this method of measurement, and the expected proportion of repair work to be done will be incorporated in the unit price for this item.

**5. BASIS OF PAYMENT**

- A. Unit prices include the cost of preparing existing construction to receive the work indicated, and furnishing all labor, equipment and materials necessary to complete the work. Additionally, the cost shall include the costs of field quality-control testing required by the Work for which the unit price applies.

*END OF SECTION*

**ITEM NO. 705 – SLIP SLAB**

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**1. DESCRIPTION**

1.1 This work shall consist of installing slip slab/membrane for use as a separating membrane in sliding joints between concrete surfaces, such as slab joints, at locations shown on the contract plans and as directed by the Engineer. Slip membrane permits free movement between slab joints.

**2. MATERIALS**

2.1 The materials used for this specification shall be of the following standards:

**Form:** Extruded high density polyethylene strips  
**Nominal Thickness:** 2mm  
**Width:** 6in, 8in, 12in  
**Maximum Working Load:** 0.25N / mm<sup>2</sup>  
**Coefficient of Static Friction:** 0.15 - 0.20

**3. CONSTRUCTION DETAILS**

- 3.1 Surface to receive the Slip Membrane must be smooth, regular and clean from contaminants.
- 3.2 Slip Membrane is used as two layers to provide a low friction sliding interface. The strips should be cut if necessary to the required width and placed one on top of the other, binding the edges together with an adhesive tape before fixing on the longitudinal edges. The tape is to prevent the ingress of concrete and other damaging materials getting between the slip membrane layers. Joints between the upper and lower lengths of the strip should be staggered. Using a proprietary contact adhesive apply a thin coat to the concrete surface and to one side of the slip membrane envelope. When the adhesive is touch dry (normally 10 to 20 minutes) place the slip membrane envelope, adhesive side down onto the concrete surface in the desired position and roll well to ensure full contact.
- 3.4 Slip Membrane should be stored in original unopened packaging, in cool dry conditions, away from sunlight.
- 3.5. Avoid damage to the slip membrane during construction. If damage occurs, repair or replace the damaged section of slip membrane prior to placement of concrete. Ensure the integrity of the slip membrane is fully restored.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured the number of linear feet of slip slab/membrane installed in accordance with the plans, specifications and directions of the Engineer.

**5. BASIS OF PAYMENT**

5.1 The price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment and incidental expenses necessary to satisfactorily complete the work.

*END OF SECTION*

**ITEM NO. 706 – REMOVE, STORE AND REUSE EXISTING GRANITE BLOCK  
FACING**

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**1. DESCRIPTION**

1.1 This work shall consist of removing and storing existing granite block facing and reinstalling the granite block facing after repairs have been done in accordance with the contract documents and as directed by the Engineer. Any granite block facing that is damaged beyond repair (as determined by the Contractor and confirmed by the Engineer) is to be replaced in-kind per Item No. 730.

**2. MATERIALS**

2.1 The materials used for this specification shall be of the following standards:

Stainless Steel Crimp Anchors	ASTM A240
Caulking Compound for Structures	*M31
Masonry Mortar	ASTM C270-10

\*Refer to the Nassau County Department of Public Works Standard Specifications.

**3. CONSTRUCTION DETAILS**

3.1 Remove the existing granite block facing, including all mortar bedding and backing material as indicated on the plans or as ordered by the Engineer, in a manner so as not to damage dovetail slots or existing concrete. Repair or replace all damaged areas resulting from removal operations at no additional cost, to the satisfaction of the Engineer. Store the existing granite block facing in a staging area away from public access and approved by the Engineer.

3.2 Extend the dovetail slots from the existing wall into the new section of the wall as shown on the plans or as approved by the Engineer. Clean the surfaces of dovetail slots, in-place bricks and concrete surfaces, which might interfere with bonding. Follow the cleaning with compressed air jetting or vacuum cleaning to ensure the removal and disposal of all loose particles subject to approval of the Engineer.

3.3 Clean the granite block facing. Secure the granite block facing to the wall with anchors as shown on the plans or as approved by the Engineer. The Contractor shall ensure that the granite block facing is not out of place and there is no gap between the facing and the concrete. Follow the pattern that matches the adjacent granite block facing. Finish the joints with a pointing tool to match the adjacent joints, as specified and paid for in Item No. 711.

3.4 Protect and keep the completed granite block facing from drying and keep damp for a period of at least 3 days.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured the number of square feet, including joints, of granite block

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**ITEM NO. 706 – REMOVE, STORE AND REUSE EXISTING GRANITE BLOCK  
FACING**

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facing satisfactorily removed, stored and reset/replaced.

**5. BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

*END OF SECTION*

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**ITEM NO. 707 – JOINT SELANTS**

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**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.

1.2 INFORMATIONAL SUBMITTALS

A. Product Data: For each joint-sealant product.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.4 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

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**ITEM NO. 707 – JOINT SELANTS**

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*(Continued)*

**2. MATERIALS**

**2.1 JOINT SEALANTS, GENERAL**

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Color of new joint sealant to match in-kind color of existing joint sealant as closely as reasonably practicable.
- C. Joint sealants can be either silicone based or urethane based, as long as they conform with the material specifications listed below. The Contractor is to determine which sealant is appropriate per location, and the Engineer is to confirm that the selected product is acceptable.

**2.2 SILICONE JOINT SEALANTS**

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
- C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.
- D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- E. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- F. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
- G. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

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- H. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
- I. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.
- J. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
- K. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade P, Class 100/50, Uses T and NT.

**2.3 URETHANE JOINT SEALANTS**

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
- C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
- D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 35, Uses T and NT.
- E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
- F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
- G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.

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*(Continued)*

- H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.
- I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.
- J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
- K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

**2.4 MISCELLANEOUS MATERIALS**

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

**3. CONSTRUCTION DETAILS**

**3.1 EXAMINATION**

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

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1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- 3.3 INSTALLATION OF JOINT SEALANTS
- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
  - B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
  - C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

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1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
  4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
  5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

**3.4 FIELD QUALITY CONTROL**

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

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*(Continued)*

- a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.5 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.6 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

**COUNTY OF NASSAU  
DEPARTEMENT OF PUBLIC WORKS**

**ITEM NO. 707 – JOINT SELANTS**

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*(Continued)*

**3.7 JOINT-SEALANT SCHEDULE**

**A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.**

**1. Joint Locations:**

- a. Control and expansion joints in brick pavers.
- b. Isolation and contraction joints in cast-in-place concrete slabs.
- c. Joints between plant-precast architectural concrete paving units.
- d. Joints in stone paving units
- e. Tile control and expansion joints.
- f. Joints between different materials listed above.
- g. Other joints as indicated on Drawings.

**2. Joint Sealant: Urethane, M, P, 50, T, NT**

**3. Joint-Sealant Color: As indicated by manufacturer's designations**

**B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.**

**1. Joint Locations:**

- a. Joints in pedestrian plazas.
- b. Joints in swimming pool decks.
- c. Other joints as indicated on Drawings.

**2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I**

**3. Joint-Sealant Color: As indicated by manufacturer's designations**

**C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.**

**1. Joint Locations:**

- a. Construction joints in cast-in-place concrete.
- b. Joints between plant-precast architectural concrete units.
- c. Control and expansion joints in unit masonry.
- d. Joints in dimension stone cladding.
- e. Joints in glass unit masonry assemblies.
- f. Joints in exterior insulation and finish systems.
- g. Joints between metal panels.
- h. Joints between different materials listed above.
- i. Perimeter joints between materials listed above and frames of doors, windows and louvers.
- j. Control and expansion joints in ceilings and other overhead surfaces
- k. Other joints as indicated on Drawings.

**2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT**

**3. Joint-Sealant Color: As indicated by manufacturer's designations**

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**ITEM NO. 707 – JOINT SELANTS**

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*(Continued)*

- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in stone flooring.
    - c. Control and expansion joints in brick flooring.
    - d. Control and expansion joints in tile flooring.
    - e. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, P, 25, T, NT
  3. Joint-Sealant Color: As indicated by manufacturer's designations
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of unit masonry concrete walls and partitions.
    - d. Joints on underside of plant-precast structural concrete beams and planks.
    - e. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, NS, 25, NT
  3. Joint-Sealant Color: As indicated by manufacturer's designations
- F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As indicated by manufacturer's designations
- G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated on Drawings.

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**ITEM NO. 707 – JOINT SELANTS**

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*(Continued)*

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As indicated by manufacturer's designations

H. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:
  - a. Aluminum thresholds.
  - b. Sill plates.
  - c. Other joints as indicated on Drawings.
2. Joint Sealant: Butyl-rubber based
3. Joint-Sealant Color: As indicated by manufacturer's designations

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured as the number of linear feet of joints satisfactorily sealed.

**5. BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

**ITEM NO. 708 - GROUTING**

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**1. DESCRIPTION**

1.1 This work shall consist of furnishing and placing grout in amounts sufficient to fill any voids at the locations indicated on the plans or where directed by the Engineer. The Contractor shall furnish equipment capable of placement of the grout under pressure. Prior to the delivery of the equipment at the site, the Contractor shall furnish the Engineer for approval, the Specifications for the equipment including pumping pressure, delivery rates and data on the anticipated pressure drops for piping schemes adequate to deliver the grout to the point of installation.

**2. MATERIALS**

2.1 Materials for the grout shall comply with the following Subsections of Volume 1, Part Three, Section A and Section B, of the Nassau County Department of Public Works Standard Specifications for Concrete Class A.

2.2 The grout shall be approximately proportioned as follows, with the approval of the Engineer, to produce the desired consistency for pumping.

2 - Bags of Portland Cement  
0.04 - yd<sup>3</sup> of Mineral Filler  
0.18 -yd<sup>3</sup> of Sand by Weight

2.3 Grouting Agent - In accordance with manufactures recommendations. Water content as required for a workable mix, suitable for pumping.

2.4 Grout Pipe - In accordance with manufacturer's recommendations.

2.5 Equipment for grouting - The equipment shall be adequate to furnish a continuous supply of grout at a pressure of 40 lb/sq.in at the delivery nozzle. The equipment shall also have a gauge that registers pressure at delivery nozzles. The delivery nozzle shall be capable of passing through the grout pipe or of utilizing the grout pipe for delivery of grout.

**3. METHOD OF CONSTRUCTION**

3.1 The Contractor shall furnish and install, by suitable methods, grout pipe at locations shown on the plans or where directed by the Engineer. The method of installation shall be approved by the Engineer, but pre-boring or pre-drilling of holes larger than the outside diameter of the grout pipe shall not be permitted. The grout pipe shall be of a diameter compatible with the installation of the grout as recommended by the Manufacturer of the equipment used for placing the grout mixtures and approved by the Engineer. After or concurrent with the withdrawal of the grout pipe, the holes shall be filled with grout.

3.2 Actual weight and loose volumes shall be determined by the Contractor based on the sources of materials submitted. The amount of water added to the mix may be varied with the approval of the Engineer in order to make a more workable mix. If the sand is damp, a correction must be made for the moisture content of the sand. Grout shall be

**ITEM NO. 708 - GROUTING**

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*(Continued)*

placed by a grout pumping system. Grouting pressure shall be as approved by the Engineer. The Engineer may also direct that the consistency of the grout be changed by reducing or increasing the amount of water. The Contractor shall be responsible for supplying an acceptable water source.

3.3 Once the action of placing grout is commenced, it must be carried through to the other end without interruption. All grouting shall be done slowly and at a uniform rate to permit the grout to fill all voids. Under no condition shall the rate of pumping be increased suddenly.

3.4 In no case shall grout be used after such time as appreciable stiffening, as determined by the Engineer, has occurred. Grout that cannot be placed, for any reason, within a 1½ hour period after mixing, shall be wasted.

3.5 Equipment which in actual operation prove inadequate, in the judgment of the Engineer, to satisfactorily complete the work shall be immediately removed from the job site and replaced at no additional cost to the State. All connections involved shall be tight and shall not leak at the necessary working pressure.

**4. METHOD OF MEASUREMENT**

4.1 The quantity of the grout filling shall be paid for by the number of square feet of grout needed to complete the scope of the work.

**5. BASIS OF PAYMENT**

5.1 Payment will be made for the number of square feet needed to complete the scope of the work. Mechanical breakdowns of equipment shall be the Contractor's responsibility and the cost of material required to refill the discharge system shall be borne by the Contractor. The price bid per square foot shall include the cost of furnishing all labor, equipment and materials necessary to complete the work, including furnishing a water source and installing grout pipe.

*END OF SECTION*

**ITEM NO. 709 – REMOVE, STORE AND RESET EXISTING LIGHT POLE**

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**1. DESCRIPTION**

1.1 Under this item, the Contractor shall remove, store on site, and reinstall the existing light pole, as designated on the plans or as directed by the Engineer after all necessary work has been completed.

**2. MATERIALS**

2.1 Not specified.

**3. METHOD OF CONSTRUCTION**

3.1 The Contractor shall carefully disconnect and remove the existing light pole. The Contractor shall take care not to damage any luminaires and lamps and shall leave the area vacated by the light pole ready for subsequent work. The light pole shall be stored in a staging area, on-site, at a location that is inaccessible to the public.

After all necessary work has been completed, the light pole shall be reinstalled in-kind at the location specified on the contract drawings.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured by the number of existing light poles completely removed, stored and reset in accordance with the plans, specifications and direction of the Engineer.

**5. BASIS OF PAYMENT**

5.1 The unit price bid (without distinction) for each existing light pole and sign luminaire completely removed and stored shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work. Any damage caused due to the Contractor's lack of care shall be repaired at no additional expense to the client.

*END OF SECTION*

**COUNTY OF NASSAU  
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**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

---

**1. DESCRIPTION**

1.1 This work shall consist of removing existing flashing and furnishing and installing sheet metal flashing and trim as indicated in the contract documents and as directed by the Engineer.

**2. MATERIALS**

2.1 The Contractor shall replace the flashing in-kind.

2.2 The following ASTM specifications shall apply:

Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate	B209
Standard Specification for Elastomeric Joint Sealants	C920
Standard Specification for Solvent Release Sealants	C1311
Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing	D226
Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal	D1187
Standard Specification for Asphalt Roof Cement, Asbestos-Free	D4586

2.3 The following other specifications shall apply:

Voluntary Specification for Anodized Architectural Aluminum	AAMA 611
Voluntary Specification Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels	AAMA 2605
Wind Test Design Standard for Edge Systems Used with Low Slope Roofing Systems	ANSI/SPRI/FM 4435/ES-1
FM Global Property Loss Prevention Data Sheet – Perimeter Flashing	FM 1-49
The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing	NCRA
Architectural Sheet Metal Manual	SMACNA

2.4 Sheet metal flashing and trim assemblies shall include cleats, anchors, and fasteners. Sheet metal flashing shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.

2.5 Sheet metal standard for flashing and trim shall comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

COUNTY OF NASSAU  
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**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

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*(Continued)*

2.6 Manufacture shall install roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES- 1 and be capable of resisting the design pressure as indicated in the contract documents.

2.7 Contractor shall allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Calculations shall be based on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.8 Mechanical and other finishes on exposed surfaces shall be protected from damage by applying strippable, temporary protective film before shipping.

2.9 **Aluminum sheet** shall be/have:

- compliant with ASTM B209.
- temper as required to suit forming operations and performance required with smooth, flat surface.
- as-milled finish that is standard two-side bright.
- an Alclad finish that is metallurgically bonded surfacing alloy on both sides, forming aluminum sheet with reflective luster.
- a clear anodic finish, coil coated compliant with AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- a color anodic finish, coil coated compliant with AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  - color as indicated in the contract documents.
  - color range have noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.10 **Exposed Coil-Coated Finish:** Two-Coat Fluoropolymer shall:

- comply with AAMA 2605,
- contain not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.
- be applied by preparing, pretreating, and applying coating to exposed metal surfaces in compliance with coating and resin manufacturers' written instructions.
- be a natural aluminum color or as indicated in the contract documents.

2.11 **Concealed finish** shall be pretreated with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

**COUNTY OF NASSAU  
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**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

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*(Continued)*

2.12 **Felt** shall comply with ASTM D226, Type II (No.30), asphalt-saturated organic felt, nonperforated.

2.13 Contractor shall provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

2.14 **Fasteners** shall be:

- wood screws,
- annular threaded nails,
- self-tapping screws,
- self-locking rivets,
- bolts,
- other suitable fasteners,
- designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
- blind fasteners or self-drilling screws, gasketed, with hex-washer head.
  - blind fasteners shall be high-strength aluminum or stainless-steel rivets suitable for metal being fastened.
- exposed fasteners with heads matching the color of sheet metal using plastic caps or factory-applied coating.
- metal-backed EPDM or PVC sealing washers provided under heads of exposed fasteners bearing on weather side of metal.
- spikes and ferrules that are the same material as gutter, with spike with ferrule matching internal gutter width.
- aluminum or Series 300 stainless steel for aluminum sheet,
- series 300 stainless steel for stainless steel sheet.

2.15 **Sealant Tape** shall be/have:

- pressure-sensitive,
- 100 percent solids,
- polyisobutylene compound,
- release-paper backing,
- permanently elastic,
- non-sag,
- nontoxic,
- non-staining,
- 1/2 inch wide and 1/8 inch thick.

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

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2.16 **Elastomeric sealant** shall be:

- compliant with ASTM C920,
- elastomeric silicone polymer sealant;
- of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.17 **Butyl sealant** shall be:

- ASTM C1311,
- single-component,
- solvent-release butyl rubber sealant;
- polyisobutylene plasticized;
- heavy bodied for hooked-type expansion joints with limited movement.

2.18 **Epoxy seam sealer** shall be:

- two-part, noncorrosive, aluminum seam-cementing compound,
- recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.19 **Bituminous coating** shall be cold-applied asphalt emulsion in accordance with ASTM D1187.

2.20 **Asphalt roofing cement** shall comply with ASTM D4586, asbestos free, of consistency required for application.

2.21 The **sheet metal flashing and trim** shall be/have:

- custom fabricated to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
- fabricated in shop to greatest extent possible.
- fabricated in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- verified by the Contractor for all shapes and dimensions of surfaces to be covered and field measured for accurate fit before shop fabrication.
- formed to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
- concealed fasteners and expansion provisions where possible.
- no exposed fasteners on faces exposed to view.

2.22 **Fabrication Tolerances:** Sheet metal flashing and trim shall be fabricated to meet the following tolerances:

- capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on the contract documents,
- within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

2.23 **Expansion Provisions:** Metal shall be formed for thermal expansion of exposed flashing and trim.

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

*(Continued)*

2.24 Expansion joints: Intermeshing hooked flanges shall be formed not less than 1 inch deep

2.25 **Cleats and attachment devices** shall be:

- fabricated from same material as accessory being anchored or from compatible, noncorrosive metal.
- fabricated of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

2.26 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- apron, step, cricket, and backer flashing shall be fabricated from aluminum 0.032 inch thick.
- drip edges shall be fabricated from aluminum 0.032 inch thick.
- eave and rake flashing shall be fabricated from aluminum 0.032 inch thick.
- counterflashing shall be fabricated from aluminum 0.032 inch thick.

2.27 WALL SHEET METAL FABRICATIONS

*2.27.1 Opening Flashings in Frame Construction:*

- head, sill, jamb, and similar flashings shall be fabricated to extend 4 inches beyond wall openings. Head and sill flashing shall be formed with 2 inch high, end dams.
- flashing shall be fabricated from aluminum 0.032 inch thick.

2.28 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

*2.28.1 Roof edge flashing (gravel stop) and fascia cap shall:*

- be fabricated from aluminum 0.050 inch thick in minimum 96-inch long - but not exceeding 12 foot long - sections.
- have shop fabricated interior and exterior corners.
- include 6-inch wide, joint cover plates.
- include a butted joint style with expansion space and 6-inch-wide exposed cover plate.

2.29 Base flashing shall be fabricated from aluminum 0.040 inch thick and have shop fabricated interior and exterior corners.

2.30 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

*2.30.1 Roof edge flashing (gravel stop) and fascia cap shall be:*

- fabricated from 0.050-inch-thick aluminum in minimum 96 inch long - but not exceeding 12 foot long - sections.
- include 6-inch wide, joint cover plates.
- include shop fabricated interior and exterior corners.
- include butted joint style with expansion space and 6-inch-wide exposed cover plate.

2.31 Base flashing interior and exterior corners shall be shop fabricated from 0.040-inch-thick aluminum.

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

(Continued)

**3. METHOD OF CONSTRUCTION**

3.1 The existing flashing shall be removed with care to not damage any property. Any property damaged during removal shall be repaired at the expense of the Contractor.

3.2 The removed flashing shall be disposed of by any legal method that the Contractor prefers.

3.3 The following ASTM specifications shall apply:

Standard Practice for Calculation of Color Tolerances and Color

D22

44

Differences from Instrumentally Measured Color Coordinates  
Standard Test Methods for Evaluation the Degree of Chalking of

D42

14

Exterior Paint Films

3.4 The following other specifications shall apply:

Wind Test Design Standard for Edge Systems Used with Low

ANSI/SPRI/F

M

Slope Roofing Systems  
Architectural Sheet Metal Manual

4435/ES-1  
SMACNA

**3.5 SUBMITTALS**

3.5.1 Product data shall be submitted for underlayment materials, elastomeric sealant, butyl sealant, and epoxy seam sealer.

3.5.2 Samples shall be submitted for:

- each exposed product and for each color and texture specified, 12 inches long by actual width.
- initial selection for each type of sheet metal and accessory indicated with factory-applied finishes.
- for verification for each type of exposed finish.
- sheet metal flashing shall be 12 inches long by actual width of unit, including finished seam and in required profile. Fasteners, cleats, clips, closures, and other attachments shall be included.
- trim, metal closures, expansion joints, joint intersections, and miscellaneous fabrications shall be 12 inches long and in required profile. Fasteners and other exposed accessories shall be included.
- unit-type accessories and miscellaneous materials shall be full-size samples. Anodized aluminum samples shall show full range to be expected for each color required.

3.5.3 Qualification data shall be submitted for fabricator.

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

*(Continued)*

- 3.5.4 Product certificates shall be submitted for each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.
- 3.5.5 Product test reports shall be submitted for each product by a qualified testing agency.
- 3.5.6 Evaluation reports shall be submitted for copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.
- 3.5.7 Special warranty shall be submitted.
- 3.5.8 Maintenance data shall be submitted for sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

**3.6 WARRANTY**

3.6.1 Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

3.6.2 Exposed Panel Finish: Deterioration includes, but is not limited to, the following: Color fading more than 5 Delta E units when tested in accordance with ASTM D2244. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

3.6.3 Finish Warranty Period: 20 years from date of substantial completion.

3.6.4 Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

**3.7 QUALITY ASSURANCE**

3.7.1 Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this project and whose products have a record of successful in-service performance. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

**3.8 DELIVERY, STORAGE, AND HANDLING**

3.8.1 Sheet metal flashing and trim materials shall:

- not be stored in contact with other materials that might cause staining, denting, or other surface damage.
- be stored away from uncured concrete and masonry. Stored sheet metal flashing and trim shall be:
  - protected from contact with water.
- be protected from exposure to sunlight and high humidity using a strippable protective covering on sheet metal flashing and trim, except to extent necessary for

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

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*(Continued)*

period of sheet metal flashing and trim installation.

**3.9 EXAMINATION**

**3.9.1 Contractor shall:**

- examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the work,
- verify compliance with requirements for installation tolerances of substrates,
- verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored,
- verify that air or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration,
- proceed with installation only after unsatisfactory conditions have been corrected.

**3.10 INSTALLATION, COORDINATION**

- 3.10.1 Sheet metal flashing and trim layout and seams shall be coordinated with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials. Sheet metal flashing and trim installation shall be coordinated with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

**3.11 INSTALLATION GENERAL**

3.11.1 Metal Protection: Where dissimilar metals contact each other, or where metal contacts

pressure- treated wood or other corrosive substrates Contractor shall protect against

galvanic action or corrosion by painting contact surfaces with bituminous coating or by

other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

- 3.11.2 Concealed side of uncoated-aluminum sheet metal flashing and trim shall be coated with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction. Where installing sheet metal flashing and trim directly on cementitious or wood substrates, the Contractor shall install underlayment and cover with slip sheet.

3.11.3 Expansion Provisions: Contractor shall:

- provide for thermal expansion of exposed flashing and trim.
- conceal expansion provisions where possible in exposed work.
- space movement joints a maximum of 10 feet with no joints within 24 inches of corner or intersection.
- seal joints as required for watertight construction.
- use sealant-filled joints unless otherwise indicated.
- embed hooked flanges of joint members not less than 1 inch into sealant.
- form joints to completely conceal sealant.
- set joint members for 50 percent movement each way when ambient temperature at

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

*(Continued)*

time of installation is between 40° and 70°F.

- adjust setting proportionately for installation at higher ambient temperatures.
- not install sealant-type joints at temperatures below 40°F.

3.11.4 Sheet metal flashing and trim shall be shimmed and aligned within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on the plans and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

**3.12 INSTALLATION OF UNDERLAYMENT**

3.12.1 **Felt underlayment** shall be installed wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Contractor shall install in shingle fashion to shed water. Joints shall be lapped not less than 2 inches.

**3.13 INSTALLATION OF ROOF FLASHINGS**

3.13.1 Contractor shall install **sheet metal flashing and trim work** with laps, joints, and seams that are permanently watertight and weather resistant.

3.13.2 Installation of roof-penetration flashing shall be coordinated with installation of roofing and other items penetrating roof. Flashing shall be sealed with butyl sealant and clamped to pipes that penetrate roof.

3.13.3 **Sheet metal flashing and trim** shall be:

- installed to comply with:
  - performance requirements,
  - sheet metal manufacturer's written installation instructions,
  - recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to required installation characteristics,
  - details indicated and cited sheet metal standard, unless otherwise indicated in the contract documents.
- installed true to line, levels, and slopes,
- anchored securely in place, with provisions for thermal and structural movement,
- installed to fit substrates and to result in watertight performance,
- have uniform and neat seams with minimum exposure of sealant.
- not field cut by torch.
- not marked on metal surfaces with graphite pencils.

3.13.4 **Exposed sheet metal flashing and trim** shall be installed with limited oil-canning and free of buckling and tool marks.

3.13.5 **Continuous cleats** shall be installed with fasteners spaced not more than 12 inches on center. Individual cleats shall be placed not more than 12 inches apart. Each cleat shall be attached with at least two fasteners.

3.13.6 Temporary protective coverings and strippable films shall be removed as sheet metal

**ITEM NO. 710 – REMOVE AND REPLACE FLASHING**

*(Continued)*

flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation Contractor shall remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

3.14.7 Sheet metal flashing and trim shall be maintained in clean condition during construction. Contractor shall replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**3.15 INSTALLATION OF WALL FLASHINGS**

3.15.1 Installation of **wall flashing** shall be coordinated with installation of wall-opening components such as windows, doors, and louvers.

3.15.2 **Opening Flashings in Frame Construction:** Contractor shall install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

**3.16 INSTALLATION OF FASTENERS**

3.16.1 **Fasteners:** Contractor shall:

- install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
- use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- provide concealed fasteners where possible in exposed work.
- locate fasteners and expansion provisions to minimize possibility of leakage.
- cover and seal fasteners and anchors as required for a tight installation.
- bend tabs over fasteners.

3.16.2 **Rivets:** Joints shall be riveted in uncoated aluminum where necessary for strength.

**3.17 CLEANING**

3.17.1 Exposed metal surfaces shall be cleaned of substances that interfere with uniform oxidation and weathering. Excess sealants shall be cleaned off.

**4. METHOD OF MEASUREMENT**

This work will be measured as the number of linear feet of sheet metal flashing and trim removed and replaced.

**5. BASIS OF PAYMENT**

The unit price bid per lump sum of sheet metal flashing and trim furnished and installed shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

*END OF SECTION*

**COUNTY OF NASSAU  
DEPARTEMENT OF PUBLIC WORKS**

**ITEM NO. 711 – CLEAN AND REPOINT GRANITE STONES**

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**1. DESCRIPTION**

- 1.1 The work shall consist of removing existing mortar from joints and exposed surfaces of stones, and repointing joints in rubble masonry, where indicated on the contract plans or as ordered by the Engineer.
- 1.2 Replacement of missing or damaged stones and grouting of voids is also included under the Clean and Repoint Rubble Stone Masonry item.
- 1.3 Grouting of voids is included under the Clean and Repoint Ashlar Stone Masonry item.

**2 MATERIALS**

- 2.1 Portland cement shall be Type 6 (white) cement meeting the material requirements of AASHTO M 85-Type I cement, and the cement color shall be white, except that the maximum permissible alkali content shall be 0.60 percent. All portland cement used for this item shall be supplied by the same manufacturer.
- 2.2 Hydrated lime shall meet the requirements of ASTM C 207, Type SA. All hydrated lime used for this item shall be supplied by the same manufacturer.
- 2.3 Masonry sand shall be obtained from a natural local source, and graded per ASTM C 144. The sand shall be free of impurities such as salts, organic impurities, and other deleterious materials in accordance with ASTM C 144. The Contractor shall provide a sample of the masonry sand to the Engineer for approval prior to commencing work.
- 2.4 Water used for mixing and curing mortar shall meet the requirements of PART TWO, Materials of Construction, Section B, M40 Water.
- 2.5 New stones shall match or replicate the existing masonry and native stone as closely as possible in kind, sizes, quality, color, texture, and finish. All stones shall be clean and free from structural defects. Samples of the new stone shall be submitted to the Engineer for approval.
- 2.6 Abrasive for blast cleaning shall conform to PART THREE, General Specifications, Section C, Article 3, Materials and Equipment, subsection a, Materials - Abrasive. Medium or fine grit material shall be used.

**3 METHOD OF CONSTRUCTION**

- 3.1 Cleaning and repointing work shall be performed by skilled masons with a minimum of five years' experience restoring historic masonry structures. The Contractor shall provide the Engineer with specific documentation of each mason's experience.
- 3.2 The Contractor shall prepare a masonry cleaning and repointing sample, at a representative location selected by the Engineer. The sample area shall measure 1.0 square yard for the
- 3.3 Clean and Repoint Rubble Stone Masonry item, and 2.0 square yards for the Clean and Repoint Ashlar Stone Masonry item. The sample cleaning and repointing shall be

**COUNTY OF NASSAU  
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**ITEM NO. 711 – CLEAN AND REPOINT GRANITE STONES**

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*(Continued)*

completed in accordance with the plans and this specification. The completed sample shall be subject to approval by the Engineer in writing, prior to commencing cleaning and repointing work throughout the structure. The approved sample will be the standard by which completed stone patching work will be accepted. The approved sample repair shall remain as part of the finished work. In the event that the cleaning and repointing sample is not approved, a new sample shall be prepared at a new location selected by the Engineer. The rejected sample areas shall be cleaned and repointed as directed by the Engineer.

- 3.4 For the Clean and Repoint Rubble Stone Masonry item, all existing pointing mortar shall be removed to a minimum uniform depth of 2 inches or 2.5 times the joint width, whichever is greater. For the Clean and Repoint Ashlar Stone Masonry item, all existing pointing mortar shall be removed to a minimum uniform depth of 0.8 inches or 2.5 times the joint width, whichever is greater. Any loose or disintegrated mortar beyond this minimum depth shall also be removed as ordered by the Engineer. Removal of mortar from joints shall be accomplished using hand tools and small pneumatically-powered chisels, such as Chicago Pneumatic Model CP 0456 or equivalent, and small electric grinders. If electric grinders are utilized for cleaning vertical joints, special care shall be used at ends of the joints to prevent damage to adjacent stones. For the Clean and Repoint Rubble Stone Masonry item, small electric grinders will be permitted for removal of mortar from narrow portions of horizontal joints only. All tools shall be subject to approval by the Engineer prior to commencing work. If, in the opinion of the Engineer, the Contractor's methods of mortar removal are found to be damaging to the masonry, work shall be stopped until acceptable corrective action is taken.
- 3.5 The face of the stones shall be cleaned to remove existing mortar smears and plastered over areas, exposing the natural stone faces. The mortar removal shall be accomplished using hand tools and small pneumatically-powered chisels. Once the bulk of the mortar has been removed to the satisfaction of the Engineer, a light abrasive blast cleaning shall be utilized to remove chisel marks and any remaining cement film.
- 3.6 After cleaning and removal work is complete, the joints shall be rinsed with water and brushed out to remove any loose particles and dust. The rinsing action should not scour additional bedding mortar material out of the joint.
- 3.7 For the Clean and Repoint Rubble Stone Masonry item, missing or damaged stones shall be replaced with new stones as directed by the Engineer. New stones shall be placed such that the natural stratification is parallel to the bedding plane. Loose stones shall be carefully removed, cleaned, and reset in their original position. Bedding mortar for setting stones shall be proportioned and mixed as specified for pointing mortar. Stones shall be set in accordance with the contract plans and Specifications.
- 3.8 For the Clean and Repoint Rubble Stone Masonry item, if loose stones are encountered, or if stones become loose during the work, wedges shall be carefully installed in the transverse joints, as approved by the Engineer. Installed wedges shall be slightly recessed from the surface of the joint.

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**ITEM NO. 711 – CLEAN AND REPOINT GRANITE STONES**

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*(Continued)*

- 3.9 After mortar removal and cleaning work is complete, but prior to pointing, grout injection ports shall be installed in joints at void locations identified by the Engineer. Where a void is evident or suspected, but there is not an adequate opening for grout injection, the Contractor shall drill through the bedding mortar as directed by the Engineer to create a sufficient opening for grout injection. Grout injection ports shall be of a size and type approved by the Engineer. The joints around the injection ports shall be sealed using pointing mortar or as approved by the Engineer. After pointing is complete and the mortar has cured for a minimum of 72 hours, grout shall be placed through the previously installed injection ports. Immediately prior to and during grout injection, the surface of the wall shall be kept wet to deter adhesion of spilled grout. A water hose and brush shall be kept on hand during injection for cleaning any grout spills from the masonry surface. Where injection ports are located in groups, injection shall begin at the lowest injection port and work upwards. Grout shall be injected at a consistent and uninterrupted pressure to uniformly force grout into voids. The maximum injection pressure shall be 4.35 psi, unless otherwise approved by the Engineer. Grout placement shall continue until the flow of grout completely stops at the maximum injection pressure, or until grout exits from an adjacent port. If grout exits from an adjacent port, the adjacent port shall be temporarily plugged and injection continued to achieve maximum penetration. Injection ports shall be sealed immediately after feed line is removed to prevent leakage of grout. If grout exits from an adjacent port, the injection operations shall resume at that port prior to setting of the grout. Grout placement equipment and procedures shall be approved by the Engineer prior to commencing grouting work. Once the grout has cured, the injection ports shall be carefully removed and the holes filled with pointing mortar.
- 3.10 Pointing mortar shall consist of 1 part portland cement, 2 parts lime, and 8 parts sand. Dry ingredients shall be measured by volume and thoroughly mixed prior to the addition of any water. Add sufficient water to the dry ingredients to produce a mortar that retains its form when hand-squeezed and released. Mix for approximately 5 minutes. Allow this mortar to stand covered for not less than 1 hour or more than 1 ½ hours for prehydration. Add additional water in small portions until a stiff, but workable consistency is reached. The use of pigments or other mortar additives will not be permitted. Mortar shall be used within 30 minutes of final mixing. Retempering of mortar will not be permitted.
- 3.11 Pointing shall not be done when the ambient temperature is 40° F or below, nor when the stone contains frost. At the time of pointing, the joints shall be damp, but with no standing water present. All pointing mortar shall be placed by hand. Where the existing mortar has been removed to a depth greater than 2 inches, these deeper areas shall be filled first, compacting mortar to fill all voids. Once a uniform joint depth is attained, the joint shall be filled by applying several layers of mortar, packing it well into the back corners. The thickness of the individual layers shall not exceed ½" and each successive layer of mortar shall be permitted to reach thumb-print hardness before application of the next layer. The final layer of mortar shall be recessed slightly behind the face of the stones, and finished with an approved flat pointing tool. Feathered edges should be

**ITEM NO. 711 – CLEAN AND REPOINT GRANITE STONES**

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*(Continued)*

avoided. After the mortar has dried but before it is initially set (1 to 2 hours), excess mortar shall be removed from the edge of the joint by brushing with a natural bristle or nylon brush.

3.12 Repointed surfaces shall be kept moist by water-misting at least three times a day, or as directed by the Engineer, and protected from extreme heat, freezing, high winds, and direct sunlight for a seventy-two hour period after finishing. Repointed areas shall be protected from rain for at least 12 hours after finishing.

3.13 At the completion of the project, masonry surfaces shall be cleaned using plain water and natural bristle or nylon brushes as directed by the Engineer. Use of chemical detergents will not be permitted for cleaning masonry.

**4 METHOD OF MEASUREMENT**

4.1 This work will be measured by the number of square feet (including joints within the stone masonry) measured along the plane of the exposed surfaces of the stone masonry. Exposed horizontal surfaces at the top of walls will not be considered in computing the payment area for this item.

4.2 No measurement will be made for areas of rejected cleaning and repointing samples.

**5 BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work. No separate payment will be made for placement of grout material into voids.

*END OF SECTION*

**COUNTY OF NASSAU  
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**ITEM NO. 712 – REMOVE, STORE AND RESET LANDSCAPE APPURTENANCES**

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**1. DESCRIPTION**

1.1 This work shall consist of removing, storing and resetting landscape appurtenances in accordance with the contract documents and as directed by the Engineer.

**2. MATERIALS**

2.1 The following sections of the standard specification shall apply:

2.2 Portland Cement Concrete – General 501-2

2.3 for all concrete foundations required, except that the requirements for inspection facilities, automated batching control and recordation do not apply. The concrete shall be Class A concrete for structures, unless otherwise specified. 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 a mix at least equivalent to the specified Class A concrete.

2.4 Incidental installation material may also include hardware, grout, silicone sealant or others. Refer to the contract documents and any manufacturer's installation instructions for incidental material(s) required to complete the re-setting of each landscape appurtenance.

**3. METHOD OF CONSTRUCTION**

**Prior to removal:**

3.1 The Contractor, as necessary and appropriate to the intent of resetting, shall sufficiently document the current location and orientation(s) of the existing appurtenance(s). The documentation shall ensure that the required reassembly (including footings) in the existing or new location is accurate and consistent with the original assembly, unless otherwise noted in the contract documents.

**Removal:**

3.2 Existing landscape appurtenance(s) shall be removed from the location(s) indicated, and according to specific instructions provided, in the contract documents.

3.3 Removal shall be completed in a manner that prevents damage to the material, material assembly, mounting infrastructure and/or hardware, as appropriate. If removing the existing structural concrete is called for in the contract documents, the existing structural concrete or other materials for footings shall be broken up and removed, and the affected portions of the appurtenances carefully cleaned.

3.4 Any damage to the landscape appurtenance that may result from the Contractor's removal and storage operations shall be repaired or the damaged components shall be replaced at no additional cost to the State. Should the resultant damage be deemed irreparable, the Contractor must replace the landscape appurtenance with one of comparable size, appearance and capacity to the existing, as appropriate. Damaged landscape appurtenances requiring replacement, unless otherwise specified, shall become the property of the Contractor and shall be removed from the work site at no additional cost to the State.

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**ITEM NO. 712 – REMOVE, STORE AND RESET LANDSCAPE APPURTENANCES**

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*(Continued)*

**Storage:**

3.5 Landscape appurtenance(s) shall be stockpiled at an approved location, and/or as indicated in the contract documents, with adequate provision for damage protection.

**Resetting:**

3.6 The landscape appurtenance(s) shall be reset at the location(s) and orientation(s) indicated in the contract documents.

3.7 All material, including footings, shall be reset according to the manufacturer's installation instructions and/or the contract documents and/or documentation by the Contractor prior to removal, as appropriate. The landscape appurtenance shall be satisfactorily reset in a secure and upright position.

**4      METHOD OF MEASUREMENT**

4.1 This work will be measured as the number of each landscape appurtenance satisfactorily removed, stored and reset.

**5      BASIS OF PAYMENT**

5.1 The unit price bid per each landscape appurtenance removed, stored and reset shall include the cost of furnishing all labor, materials, and equipment, including concrete footings, necessary to satisfactorily complete the work.

*END OF SECTION*

**ITEM NO. 713 – HAND AND/OR PNEUMATIC EXCAVATION**

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**1. DESCRIPTION**

1.1 Under this item, the Contractor shall perform hand and/or pneumatic excavation in accordance with the plans, specifications, and directions of the Engineer. The intent of the item is to either hand excavate or excavate with a pneumatic air device in areas where trenching or other excavation is required within the critical root zones of existing trees and/or excavation around gas lines and other sensitive areas. These are areas, where in the opinion of the Engineer, use of a backhoe or tractor would not be appropriate.

**2. MATERIALS**

2.1 Trenching/Excavation shall be accomplished either by hand or with a pneumatic device such as an Air-Spafe CGP System, as manufactured by Concept Engineering Group, Inc. Verona, PA, or approved equal.

2.2 The Contractor shall provide a compressor unit for operating the pneumatic excavator rated at one hundred fifty standard cubic feet per minutes (150 scfm) at ninety pounds per square foot gauge (90 psfg).

**3. METHOD OF CONSTRUCTION**

3.1 Prior to beginning work, the area to be trenched/excavated shall be thoroughly wetted, 24 hours in advance, to minimize dust to the greatest extent possible.

3.2 All pneumatic excavation shall be as minimal as possible in width and depth, thereby minimizing the impact on tree roots and other areas where the Engineer determines that conventional machine excavation may be detrimental.

3.3 Different nozzles may be used on the air spade to expedite the work or minimize the amount of airborne material.

3.4 Depth shall be as indicated on Contract Drawings or as directed by the Engineer. Depths greater than 18" shall require removal of soil by hand shovel, or other appropriate means.

3.5 Where a pneumatic device is used, care shall be taken to avoid rocks being scattered and inadvertently damaging public or private property. In addition, operators must be equipped with adequate protective clothing and gear, in accordance with manufacturer's recommendations.

3.6 All tree roots exposed by the pneumatic or hand excavation operation must be kept constantly moist with burlap covered with white plastic and checked a minimum of two (2) times a day, once in the morning and once in the afternoon, for a maximum of forty-eight (48) hours, until backfill is complete as directed by the Engineer. If directed, soaker hoses shall be installed to facilitate properly moist conditions.

3.7 Necessary inspections of piping shall be scheduled in advance, especially those involving inspections performed by Outside Agencies.

**ITEM NO. 713 – HAND AND/OR PNEUMATIC EXCAVATION**

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*(Continued)*

3.8 In cases where roots must be cut, the Contractor must receive written approval from the Engineer prior to cutting any roots. Roots must be cut cleanly with pruning shear, loppers or pruning saws. All root cuts must be approved by the Engineer prior to backfilling.

**4. METHOD OF MEASUREMENT**

4.1 The quantity of hand and/or pneumatic excavation to be paid under this Item shall be the number of cubic yards of material excavated and backfilled, as measured in its original position, in accordance with the plans, specifications, and directions of the Engineer.

**5. BASIS OF PAYMENT**

5.1 The price bid shall be a unit price per cubic yard of hand and/or pneumatic excavation and shall include the cost of all labor, materials, and equipment necessary, including compressor and backfilling, in accordance with the plans and specifications, to the satisfaction of the Engineer.

5.2 Where required, disposal of materials designated as contaminated (hazardous and non-hazardous) shall be paid for separately.

*END OF SECTION*

**ITEM NO. 714 – ALIGN ALUMINUM EDGING**

---

**1. DESCRIPTION**

1.1 This work shall consist of aligning existing aluminum edging in accordance with the contract documents and as directed by the Engineer. If the edging (or a portion of the edging) is deemed, by the Engineer, to need to be replaced, the payment and specification for that work shall be included under this Item.

**2. MATERIALS**

2.1 Any new aluminum metal edging shall be from one of the following manufacturers:

as manufactured by  
Permaloc Corporation (Basis of Design) Curv-Rite  
13505 Barry Street 3603 10th Street C  
Holland, Michigan 49424 Wayland, Michigan 49348  
616-399-9600 800-366-2878  
www.permaloc.com www.curv-rite.com

Sure-Loc  
494 E. 64th Street  
Holland, Michigan 49423  
616-392-3209  
www.surelocedging.com

or equal as approved by the Engineer

**3. METHOD OF CONSTRUCTION**

3.1 The existing aluminum edging shall be aligned with the existing column to the satisfaction of the Engineer at the locations specified in the Contract Drawings. The Contractor shall take care not to damage any property during the course of the work. Any damage done during the course of the work shall be repaired by the Contractor at no cost to the client.

3.2 If the Engineer determines that new edging is needed at certain locations, the Contractor shall use one of the manufacturers listed above and replace in-kind. The Contractor shall ensure that all bends and curves are smooth and uniform. Where the radii of bends or curves are such that field bending is not practical, they may be formed in the shop.

**4. METHOD OF MEASUREMENT**

4.1 This work will be measured for payment as the number of linear feet of metal edging aligned/replaced.

**5. BASIS OF PAYMENT**

5.1 The unit price bid per linear foot of metal edging furnished and installed shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the

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**ITEM NO. 714 – ALIGN ALUMINUM EDGING**

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*(Continued)*

aligning and/or replacement work, with the understanding that the majority of the aluminum edging will not need to be replaced.

*END OF SECTION*

**COUNTY OF NASSAU  
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**ITEM NO. 715 – ROUND STONE**

---

**1. DESCRIPTION**

1.1 Under this item, the Contractor shall furnish and place round stones in the locations where shown on the plans or as directed by the Engineer.

**2. MATERIALS**

2.1 The stones are to be of a white color, varying between 4"-12".

2.2 The stones are to be roughly round, with no sharp edges or blemishes.

2.3 The stone material having a gradation in accordance with:

<b>Gradation</b>	
<b>Stone Weight</b>	<b>Gradation Spread</b>
Heavier than 100 lbs.	50-100 percent of total by weight
< 100 lbs	Remainder of stones

**3. CONSTRUCTION DETAILS**

3.1 After installation of all geotextile filters, waterproofing, and broken stone, the round stones are to be placed at the locations shown in the plans or as directed by the Engineer so that the round stones are approximately at the finished grade.

**4. METHOD OF MEASUREMENT**

4.1 The quantity of round stone to be paid for under this item shall be the number of square feet of round stone furnished and placed in accordance with the plans, specifications, and directions of the Engineer.

**5. BASIS OF PAYMENT**

5.1 The price bid shall be a unit price per square foot and shall include the cost of all labor, materials, equipment and incidental expenses necessary to complete the work in accordance with the plans and specifications, to the satisfaction of the Engineer.

5.2 Excavation, geotextile, and broken stone – loose measure shall be paid for separately under Item No. 2, 158A and 20, respectively.

*END OF SECTION*

**ITEM NO. 716 - BARK CHIP MULCH**

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**1. DESCRIPTION**

1.1 Under this item, the Contractor shall furnish and place bark chip mulch, in accordance with the plans, specifications, and directions of the Engineer.

**2. MATERIALS**

2.1 Bark chip mulch shall be a natural forest product composed of bark or wood not exceeding three inches (3") in length and one inch (1") in width. Mulch shall be derived from tree material, not from wood waste or by-products like sawdust, shredded palettes, or other debris. Mulch shall be natural in color and not dyed. It shall be of a uniform grade with no additives or any other treatment. Mulch with leaves, twigs, and/or debris shall not be acceptable.

2.2 Commercial Fertilizer Low Phosphorus (Slow Release): shall have the following composition by weight: Nitrogen (N) shall be min. 7% - max. 10%, of which min. of 50% is slow release; available Phosphorus (P) shall be min. 1% - max. 2%; and soluble Potash (K) shall be min. 4% - max. 12%.

2.3 Fertilizer shall be a pesticide free (no weed-and-feed) product such as "Healthy Turf (8-19)" as manufactured by Plant Health Care, Inc, Pittsburg, PA; or Safer Ringer Lawn Restore (10-2-6) as manufactured by Woodstream Corp., Lifitz, PA; or Nutrients Plus (7-2-12) as manufactured by Nutrients Plus, Virginia Beach VA, or approved equal.

2.4 All commercial Fertilizer Low Phosphorus (Slow Release) shall be delivered in standard size bags of the manufacturer, showing weight, analysis, and name of manufacturer. It shall be stored as directed by the Engineer in such a manner that it's effectiveness will not be impaired.

**3. METHOD OF CONSTRUCTION**

3.1 Upon completion of planting and prior to application of shredded bark, Commercial Fertilizer Low Phosphorus (Slow Release) shall be incorporated into soil to a depth of three inches (3") at the rate of twenty pounds per thousand square feet (20 lbs./1,000 s.f.).

3.2 Bark chip mulch shall be applied to the surface of the beds and tree pit areas, as shown on the plans, or Standard Details and as directed by the Engineer. Mulch shall be applied to a uniform depth of three to four inches (3"-4") over the tree pit and shrub bed areas and two to three inches (2"-3") over groundcover beds and shall be distributed as to create a smooth level cover over the exposed soil. Plants shall not be covered.

**4. METHOD OF MEASUREMENT**

4.1 The quantity of bark chip mulch to be paid for under this item shall be the number of square yards of mulch measured in final position, furnished and installed in accordance with the plans, specifications, and directions of the Engineer.

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**ITEM NO. 716 - BARK CHIP MULCH**

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*(Continued)*

**5. BASIS OF PAYMENT**

5.1 The price bid shall be a unit price per square yard and shall include the cost of all labor, materials, and equipment necessary or required to complete the work including furnishing and applying the Commercial Fertilizer Low Phosphorus (Slow Release), mulch, and watering, all in accordance with the plans and specifications, to the satisfaction of the Engineer.

*END OF SECTION*

**ITEM NO. 717 – INTEGRAL COLOR PIGMENT FOR CEMENT CONCRETE**

---

**1. DESCRIPTION**

1.1 Under this item, the Contractor shall furnish and mix color pigment into cement concrete at locations shown on the plans, or as directed by the Engineer.

**2. MATERIALS**

2.1 The pigment shall conform to “Sika Color® – 100P” (\*Formerly Chromix® P Admixtures) integral colors as supplied by “Sika Corporation” or approved equal. The color to be used shall be indicated on the plans or as directed by the Engineer.

2.2 Integral Color Concrete Admixture. The color shall be as indicated in the contract documents. For each color used, the pigment shall be from the same batch or lot unless otherwise approved. Color admixtures for integrally colored concrete shall be:

- certified by the manufacturer as meeting the requirements of ASTM C979. The Contractor shall provide the manufacturer’s certification verifying that the colored concrete admixture meets ASTM C979.
- added to the concrete mix per manufacturer’s recommendations at a dosage rate to achieve the color specified in the contract documents; the manufacturer’s recommended maximum dosage rate shall not be exceeded.
- packaged so that each dose is the proper dose for 1 cubic yard of concrete.

**3. METHOD OF CONSTRUCTION**

3.1 Test Panels: The Contractor shall have sufficient skill and experience to properly perform colored and imprinted concrete work. The Contractor shall construct a job site test panel for each individual color and pattern or combination of color and pattern specified in the contract documents. The test panel(s) shall be 5 feet x 5 feet, minimum, constructed at a selected location. As many test panels will be constructed as are necessary to produce approved sample panels. The permanent work shall be consistent with the appearance of the approved test panel(s). The test panel(s) shall not be incorporated into the work and will be removed when ordered.

3.2 Color Concrete Admixture: Add the integral color admixture at the manufacturer’s recommended dosage rate, or as directed by the Engineer. The pigment shall be added to, and thoroughly mixed into, the cement concrete prior to placement, to insure a consistent color throughout the concrete.

This rate is to remain constant for all batches of concrete produced. Prior to placing concrete, the Contractor shall protect adjacent surfaces and structures from spatters. Once a portion of the batch has been placed, no additional water shall be added to the remaining batch. To integrally color the concrete, introduce the color additive into the mixer drum in a manner recommended by the manufacturer. The quantity of concrete being delivered shall be no less than one-third the capacity of the mixer drum. Batch the concrete in full cubic yard increments. After the concrete is placed, apply a color matching hardener evenly to the plastic surface by the “dry shake” method as recommended by the manufacturer.

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ITEM NO. 717 – INTEGRAL COLOR PIGMENT FOR CEMENT CONCRETE  
(Continued)

4. **METHOD OF MEASUREMENT**

4.1 The quantity to be paid under this item will be the number of pounds of pigment added to the cement concrete mix.

5. **BASIS OF PAYMENT**

5.1 The unit price bid shall include the cost of all labor, materials, and equipment to complete the work, including cleaning residue of color pigment from the concrete truck. Imprinting and cement concrete will be paid under their respective items.

*END OF SECTION*

**ITEM NO. 718 – IMPRINTING ON CONCRETE PAVEMENT OR SIDEWALK**

---

**1. DESCRIPTION**

1.1 Under this item, the Contractor shall modify the surface of newly placed cement concrete pavement or sidewalk to create a pattern as specified in the plans and/or directed by the Engineer.

**2. MATERIALS**

2.1 Possible technology to complete this work is available from, but not limited to:

- a. Bomanite Corporation, P.O. Box 599, Madera, California 93639
- b. Quick Imprint Systems, P.O. Box 7, Goodman, Mo., 64850
- c. Stampcrete International Ltd., Centereach, N.Y., 11720

**3. METHOD OF CONSTRUCTION**

3.1 Cement concrete pavement or sidewalk shall be placed at locations and dimensions shown on the plans and/or as directed by the Engineer, in accordance with Items No. 24, 27, 30, 32A, 32X and 7 as described in the Standard Specifications. At the appropriate time in the concrete curing process (as detailed in the specified treatment directions), the concrete surface shall be imprinted, stamped or rolled such that the specified patten is obtained. The Contractor shall submit the recommended method of operation, containing dimensions of forms and/or rollers, timing of installation, and any other pertinent information to the Engineer for approval. Immediately after the surface finishing has been completed, the Impervious Membrane Method of curing shall be implemented, as detailed in the latest edition of the New York State Department of Transportation Standard Specifications.

The top surface shall be finished where vertical discontinuities shall be ¼” or less for stamped “joints” to meet ADA requirements.

**4. METHOD OF MEASUREMENT**

4.1 The quantity to be paid under this item shall be the number of square feet of imprinting on cement concrete pavement or sidewalk, in accordance with the plans and specifications, or as directed by the Engineer.

**5. BASIS OF PAYMENT**

5.1 The unit price bid per square foot for this item shall include the cost of furnishing all labor, materials, equipment, and incidentals to complete the imprint work to the satisfaction of the Engineer. Cement concrete pavement or sidewalk will be paid under their respective items.

*END OF SECTION*

**COUNTY OF NASSAU  
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**ITEM NO. 719 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND  
CABLES**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

**2. MATERIALS**

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. Belden Inc.
  2. Cerro Wire LLC.
  3. General Cable; Prysmian Group North America.
  4. Southwire Company.
  5. WESCO.
- C. Standards:
  1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

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- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type THHN and Type THWN-2: Comply with UL 83.
  - 2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

**2.2 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. 3M Electrical Products.
  - 2. Hubbell Incorporated, Power Systems.
  - 3. Ideal Industries, Inc.
  - 4. ILSCO.
  - 5. O-Z/Gedney; Emerson Electric Co., Automation Solutions, Appleton Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One hole with standard barrels.
  - 3. Termination: Compression.

**3. METHOD OF CONSTRUCTION**

**3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

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3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Item 723 "Identification for Electrical Systems."

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- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 **FIELD QUALITY CONTROL**

- A. Perform tests and inspections.

- 1. Perform each of the following visual and electrical tests:

- a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
- b. Test bolted connections for high resistance using one of the following:
  - 1) A low-resistance ohmmeter.
  - 2) Calibrated torque wrench.
  - 3) Thermographic survey.
- c. Inspect compression-applied connectors for correct cable match and indentation.
- d. Inspect for correct identification.
- e. Inspect cable jacket and condition.
- f. Continuity test on each conductor and cable.
- g. Uniform resistance of parallel conductors.

- B. Cables will be considered defective if they do not pass tests and inspections.

- C. Prepare test and inspection reports to record the following:

- 1. Procedures used.
- 2. Results that comply with requirements.
- 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**4. METHOD OF MEASUREMENT**

The quantity of electrical power conductors and cables to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

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Payments shall be made monthly after Architect or Engineers approval.

*END OF SECTION*

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**ITEM NO. 720 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**1. DESCRIPTION**

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

**2. MATERIALS**

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burndy; Hubbell Incorporated, Construction and Energy.
  - 2. ILSCO.
  - 3. O-Z/Gedney; Emerson Electric Co., Automation Solutions, Appleton Group.
  - 4. Siemens Industry, Inc., Energy Management Division.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:

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1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Conduit Hubs: Mechanical type, terminal with threaded hub.

**3. METHOD OF CONSTRUCTION**

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
- C. Conductor Terminations and Connections:
  1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  1. Feeders and branch circuits.
  2. Receptacle circuits.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

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- B. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.

3.4 **FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 25 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**4. METHOD OF MEASUREMENT**

The quantity of grounding and bonding components to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications. Payments shall be made monthly after Architect or Engineers approval.

*END OF SECTION*

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**ITEM NO. 721 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Handholes and boxes for exterior underground cabling.

1.2 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.

1.3 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures.

**2. MATERIALS**

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Allied Tube & Conduit; Atkore International.
  - b. O-Z/Gedney; Emerson Electric Co., Automation Solutions, Appleton Group.
  - c. Western Tube; Zekelman Industries.
  - d. Wheatland Tube; Zekelman Industries.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; Atkore International.
    - b. Electri-Flex Company.
    - c. O-Z/Gedney; Emerson Electric Co., Automation Solutions, Appleton Group.
    - d. Wheatland Tube; Zekelman Industries.
  2. Comply with NEMA FB 1 and UL 514B.
  3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  4. Fittings, General: Listed and labeled for type of conduit, location, and use.
  5. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: compression.
  6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

**2.2 NONMETALLIC CONDUITS AND FITTINGS**

**A. Nonmetallic Conduit:**

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Cantex Inc.
  - b. CertainTeed Corporation; Saint-Gobain North America.
  - c. Raco Taymac Bell; Hubbell Incorporated, Commercial and Industrial.
2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fiberglass:
  - a. Comply with NEMA TC 14.
  - b. Comply with UL 2515 for aboveground raceways.
  - c. Comply with UL 2420 for belowground raceways.

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4. RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

**B. Nonmetallic Fittings:**

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Cantex Inc.
  - b. CertainTeed Corporation; Saint-Gobain North America.
  - c. Raco Taymac Bell; Hubbell Incorporated, Commercial and Industrial.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Solvents and Adhesives: As recommended by conduit manufacturer.

**2.3 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**

**A. General Requirements for Handholes and Boxes:**

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.**

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Armorcast Products Company.
  - b. Oldcastle Infrastructure Inc.; CRH Americas.
  - c. Quazite; Hubbell Incorporated, Power Systems.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."

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7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

**2.4 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES**

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  1. Tests of materials shall be performed by an independent testing agency.
  2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

**3. METHOD OF CONSTRUCTION**

**3.1 RACEWAY APPLICATION**

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  1. Exposed Conduit: GRC.
  2. Concealed Conduit, Aboveground: GRC.
  3. Underground Conduit: RNC, Type EPC-80-PVC,.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

**3.2 INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.
- B. Complete raceway installation before starting conductor installation.

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- C. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- E. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- I. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- J. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- K. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- L. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

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1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Conduit extending from interior to exterior of building.
  4. Where otherwise required by NFPA 70.
- P. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- Q. Expansion-Joint Fittings:
1. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- R. Liquid-tight Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
- S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- T. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- U. Locate boxes so that cover or plate will not span different building finishes.
- V. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

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- W. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

**3.3 INSTALLATION OF UNDERGROUND CONDUIT**

**A. Direct-Buried Conduit:**

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as detailed.
2. Install backfill and compact.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
  - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Item 723 "Identification for Electrical Systems."

**3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES**

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, below grade.

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- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

**4. METHOD OF MEASUREMENT**

The quantity of raceways and boxes to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

*END OF SECTION*

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**ITEM NO. 722 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL  
SYSTEMS**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
2. Rigid nonmetallic duct.
3. Duct accessories.
4. Precast concrete handholes.
5. Polymer concrete handholes and boxes with polymer concrete cover.
6. Fiberglass handholes and boxes with polymer concrete cover.
7. Fiberglass handholes and boxes.

1.2 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. GRC: Galvanized rigid (steel) conduit.
- D. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including spacers and miscellaneous components.
2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for handholes and boxes.
4. Include underground-line warning tape.

B. Shop Drawings:

1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
  - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
  - b. Include duct entry provisions, including locations and duct sizes.
  - c. Include cover design.

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- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: For duct and duct bank. Show duct profiles and coordination with other utilities and underground structures.
  - 1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
  - 2. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
- C. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C858.
- D. Source quality-control reports.
- E. Field quality-control reports.

**1.5 MAINTENANCE MATERIALS SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

**1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

**1.7 FIELD CONDITIONS**

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than 7 days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

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**2. MATERIALS**

**2.1 METAL CONDUIT AND FITTINGS**

- A. GRC: Comply with ANSI C80.1 and UL 6.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

**2.2 RIGID NONMETALLIC DUCT**

- A. Underground Plastic Utilities Duct: Type EPC-80-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

**2.3 FLEXIBLE NONMETALLIC DUCTS**

- A. HDPE Duct: Type EPEC-80 HDPE, complying with NEMA TC 7 and UL 651A.
  - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

**2.4 DUCT ACCESSORIES**

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Item 723 "Identification for Electrical Systems."

**2.5 PRECAST CONCRETE HANDHOLES AND BOXES**

- A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Comply with ASTM C858 for design and manufacturing processes.

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- C. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
  - D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - E. Cover Legend: Molded lettering, "ELECTRIC."
  - F. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
  - G. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
  - H. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
    - 1. Center window location.
    - 2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    - 3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
    - 4. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
    - 5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.
  - I. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
    - 1. Type and size shall match fittings to duct to be terminated.
    - 2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
  - J. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- 2.6 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER
- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

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- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
  - C. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
  - D. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - F. Cover Legend: Molded lettering, "ELECTRIC."
  - G. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
  - H. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
  - I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.
- 2.7 FIBERGLASS HANDHOLES AND BOXES WITH POLYMER CONCRETE FRAME AND COVER
- A. Description: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
  - B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
  - C. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
  - D. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - F. Cover Legend: Molded lettering, "ELECTRIC."
  - G. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.

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- H. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

**2.8 FIBERGLASS HANDHOLES AND BOXES**

- A. Description: Molded of fiberglass-reinforced polyester resin, with covers made of cast iron.
- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- C. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- D. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- F. Cover Legend: Molded lettering, "ELECTRIC."
- G. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- H. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

**2.9 SOURCE QUALITY CONTROL**

- A. Test and inspect precast concrete utility structures according to ASTM C1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  - 1. Tests of materials shall be performed by an independent testing agency.

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2. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

**3. METHOD OF CONSTRUCTION**

**3.1 PREPARATION**

- A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to handholes, and as approved by Architect.

**3.2 UNDERGROUND DUCT APPLICATION**

- A. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC RNC, direct-buried unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: Type EPC-80-PVC RNC, direct-buried unless otherwise indicated.
- C. Stub-ups: Concrete-encased GRC.

**3.3 UNDERGROUND ENCLOSURE APPLICATION**

- A. Handholes and Boxes for 600 V and Less:
  1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-20 structural load rating.
  2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20, Fiberglass enclosures with polymer concrete frame and cover, SCTE 77, Tier 15 structural load rating.
  3. Cover design load shall not exceed the design load of the handhole or box.

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**3.4 EARTHWORK**

- A. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.
- B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures.

**3.5 DUCT AND DUCT-BANK INSTALLATION**

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- E. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- F. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.
- G. Direct-Buried Duct and Duct Bank:
  - 1. Excavate trench bottom to provide firm and uniform support for duct.
  - 2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
  - 3. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
  - 4. Depth: Install top of duct at least 24 inches (900 mm) below finished grade unless otherwise indicated.
  - 5. Set elevation of bottom of duct bank below frost line.

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6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
  7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
  8. Install duct with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and communications duct.
  9. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  10. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
    - a. Couple RNC duct to GRC with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    - b. Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.
    - c. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
    - d. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.
- H. Underground-Line Warning Tape: Bury nonconducting underground line specified in Item 723 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.
- 3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE
- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
  - B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

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- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- E. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
  - 1. Concrete: 3000 psi (20 kPa), 28-day strength with a troweled finish.

**3.7 GROUNDING**

- A. Ground underground ducts and utility structures according to Item 720 "Grounding and Bonding for Electrical Systems."

**3.8 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct.
  - 2. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Item 720 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

**3.9 CLEANING**

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

**4. METHOD OF MEASUREMENT**

The quantity of underground ducts and raceways to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the

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plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

*END OF SECTION*

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**ITEM NO. 723 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Tags.
4. Signs.
5. Cable ties.
6. Paint for identification.
7. Fasteners for labels and signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

**2. MATERIALS**

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

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2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
  
- B. Color-Coding for Phase- Identification, 600 V or Less: Use colors listed below for ungrounded branch-circuit conductors.
  - 1. Color shall be factory applied.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  - 4. Color for Neutral: White.
  - 5. Color for Equipment Grounds: Green.
  
- C. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
  - 2. .
  
- D. Equipment Identification Labels:
  - 1. Black letters on a white field.
  - 2.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Panduit Corp.
    - c. Seton Identification Products; a Brady Corporation company.

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- B. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Ideal Industries, Inc.
    - c. Panduit Corp.
  2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 TAPES AND STENCILS

- A. Underground-Line Warning Tape:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Ideal Industries, Inc.
    - c. Seton Identification Products; a Brady Corporation company.
  2. Tape:
    - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical lines.
    - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  3. Color and Printing:
    - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".

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- c. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, compounded for direct-burial service.
  - d. Width: 3 inches.
  - e. Overall Thickness: 5 mils.
  - f. Foil Core Thickness: 0.35 mil.
  - g. Weight: 28 lb/1000 sq. ft..
  - h. Tensile according to ASTM D882: 70 lbf and 4600 psi.
- B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

**2.5 TAGS**

**A. Write-on Tags:**

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Carlton Industries, LP.
  - b. LEM Products Inc.
  - c. Seton Identification Products; a Brady Corporation company.
- 2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
- 3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- 4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

**2.6 SIGNS**

**A. Laminated Acrylic or Melamine Plastic Signs:**

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Brady Corporation.
  - b. Carlton Industries, LP.
  - c. emedco.
- 2. Engraved legend.
- 3. Thickness:

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- a. For signs up to 20 sq. in., minimum 1/16 inch thick.
- b. For signs larger than 20 sq. in., 1/8 inch thick.
- c. Engraved legend with black letters on white face.
- d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

**2.7 CABLE TIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. HellermannTyton.
  2. Ideal Industries, Inc.
  3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black.

**2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

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**3. METHOD OF CONSTRUCTION**

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- I. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. "POWER."
  - 2. "LIGHTING"
- J. Vinyl Wraparound Labels:
  - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

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2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- K. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- L. Self-Adhesive Labels:
1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- M. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- N. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- O. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- P. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- Q. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- R. Underground Line Warning Tape:
1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
  2. Limit use of underground-line warning tape to direct-buried cables.
  3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- S. Write-on Tags:
1. Place in a location with high visibility and accessibility.
  2. Secure using general-purpose cable ties.
- T. Laminated Acrylic or Melamine Plastic Signs:

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*(Continued)*

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

U. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.

**3.3 IDENTIFICATION SCHEDULE**

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
  1. "LIGHTING"
  2. "POWER."
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, and manholes, use self-adhesive wraparound labels to identify the phase.
  1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- G. Conductors to Be Extended in the Future: Attach write-on tags to conductors.
- H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

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*(Continued)*

- J. Operating Instruction Signs: Self-adhesive labels.
- K. Equipment Identification Labels:
  - 1. Indoor Equipment: Self-adhesive label.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.

**4. METHOD OF MEASUREMENT**

The quantity of electrical system identification labels to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

*END OF SECTION*

**ITEM NO. 724 – FOUNDATION FOR LIGHTS**

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**1. DESCRIPTION**

This work shall consist of installing a Cast-In-Place concrete foundation for light standards.

**2. MATERIALS**

2.1 The Cast-In-Place foundation for light standards shall conform to the dimensions and details shown on the plans.

2.2 All cast-in-place concrete base, and foundations shall conform to the requirements of the General Specifications, Section A, Portland Cement Concrete. The concrete shall be Class A concrete for structures unless otherwise specified. The batching, mixing and curing methods, and the inspection facilities shall meet the approval of the County or its representative.

**3. METHOD OF CONSTRUCTION**

Locations of concrete foundations for light standards shown on the plans are approximate only and the exact location will be determined in the field. When cast-in-place concrete foundations can be constructed in undisturbed soil, as determined by the Engineer, the concrete shall be poured in direct contact with the earth. Holes shall contain no free water, nor any loose material at the time of placement of Class A concrete. The bottom of the shaft excavation shall be cleaned of loose material to the satisfaction of the Engineer immediately prior to concreting. Forms shall not be used unless the excavation is oversize or where neat limits must be maintained. The top 12 to 20 inches shall be formed as specified on the plans or as directed by the Engineer. Care shall be taken to construct the tops of all foundations so they are level and true to line and grade. Anchor bolts shall be set by template, as ordered by the Engineer.

When cast-in-place concrete foundations are to be constructed in soil that will not support a vertical cut, the foundations shall be formed. When forms are used, the foundations shall be backfilled and compacted allowing sufficient room for the compaction equipment selected. For drilled shaft foundations under no circumstances shall temporary casing be left in place. All temporary casing shall be removed as the concrete is placed.

**4. METHOD OF MEASUREMENT**

Lighting standard foundations will be measured as the number of complete units installed in accordance with the plans, specifications, or as directed by the Engineer.

**5. BASIS OF PAYMENT**

The unit price for each Cast-In-Place lighting standard foundation shall include the cost of all labor and materials necessary to complete the work, including conduit elbows, grounding system, anchor bolts, steel reinforcement, all appurtenances, excavation, special fill, and any protective system(s) required to ensure the safety of the workers and the public. The unit price shall include the cost for removal and disposal of existing concrete foundations.

*END OF SECTION*

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**ITEM NO. 725 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - a. Slotted support systems, hardware, and accessories.
  - b. Clamps.
  - c. Hangers.
  - d. Sockets.
  - e. Eye nuts.
  - f. Fasteners.
  - g. Anchors.
  - h. Saddles.
  - i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Delegated Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

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**2. MATERIALS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D635.

**2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch (10 mm) diameter holes at a maximum of 8 inch (200 mm) on center in at least one surface.
  - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
  - 3. Channel Width: Selected for applicable load criteria.
  - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
6. Toggle Bolts: All steel springhead type.
7. Hanger Rods: Threaded steel.

**3. METHOD OF CONSTRUCTION**

**3.1 SELECTION**

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA NEIS 101
- B. Comply with requirements for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Item 721 "Raceway and Boxes for Electrical Systems."
- D. Provide vibration and seismic controls with hangers and supports.
- E. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch (6 mm) in diameter.
- F. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 50 percent in future without exceeding specified design load limits.
  1. Secure raceways and cables to these supports with two-bolt conduit clamps.

**3.2 INSTALLATION OF SUPPORTS**

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.

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- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch (100 mm) thick.
  - 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
  - 9. .
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

**3.3 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inch (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000 psi (20.7 MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements shall conform to the requirements of the General Specifications, Section A, Portland Cement Concrete.
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.4 PAINTING**

**A. Touchup:**

1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

- B. Galvanized Surfaces:** Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

**4. METHOD OF MEASUREMENT**

The quantity of hangers and supports for electrical systems to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

END OF SECTION

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**ITEM NO. 726 – SLEEVES AND SEALS FOR ELECTRICAL RACEWAYS AND  
CABLING**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Pourable sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

**2. MATERIALS**

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

1. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

2.2 RECTANGULAR SLEEVES

A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:

1. General Characteristics:
  - a. Material: Galvanized sheet steel.
  - b. Minimum Metal Thickness:
    - 1) For sleeve cross-section rectangle perimeter less than 50 inch (1270 mm) and with no side larger than 16 inch (400 mm), thickness must be 0.052 inch (1.3 mm).
    - 2) For sleeve cross-section rectangle perimeter not less than 50 inch (1270 mm) or with one or more sides larger than 16 inch (400 mm), thickness must be 0.138 inch (3.5 mm).

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**2.3 SLEEVE-SEAL SYSTEMS**

- A. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

**2.4 SLEEVE-SEAL FITTINGS**

- A. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

**2.5 GROUT**

- A. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi (34.5 MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

**2.6 POURABLE SEALANTS**

- A. Performance Criteria:

1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.
  - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

**3. METHOD OF CONSTRUCTION**

**3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS**

- A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

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- a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Item 707 "Joint Sealants."
2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  3. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  4. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch (50 mm) above finished floor level. Install sleeves during erection of floors.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch (25 mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- E. Underground, Exterior-Wall and Floor Penetrations:
1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch (25 mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.
- 3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS
- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
  - B. Install conduits and cable with no crossings within the sleeve.
  - C. Fill opening around conduits and cables with expanding foam without leaving voids.
  - D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

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**3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

**4. METHOD OF MEASUREMENT**

The quantity of sleeves and seals for electrical raceways and cabling to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

END OF SECTION

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**ITEM NO. 727 – LIGHTING CONTROL DEVICES**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Electronic time switches.
2. Indoor occupancy and vacancy sensors.
3. Lighting contactors.
4. Emergency shunt relay.
5. Conductors and cables.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
  - a. Occupancy sensors.
  - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:

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- a. Faulty operation of lighting control software.
  - b. Faulty operation of lighting control devices.
2. Extended Warranty Period: Two year(s) from date of Substantial Completion.

**2. MATERIALS**

**2.1 ELECTRONIC TIME SWITCHES**

- A. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
- 1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Contact Configuration: SPST.
  - 3. Contact Rating: 20 A ballast load, 120/240 V(ac).
  - 4. Programs:
    - a. Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays].
  - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
  - 6. Astronomic Time: All channels.
  - 7. Automatic daylight savings time changeover.
  - 8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

**2.2 INDOOR OCCUPANCY AND VACANCY SENSORS**

- A. General Requirements for Sensors:
- 1. Wall and Ceiling-mounted, solid-state indoor occupancy and vacancy] sensors.
  - 2. Passive infrared, Ultrasonic, Dua] technology.
  - 3. Separate] power pack.
  - 4. Hardwired connection to switch.
  - 5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 6. Operation:
    - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

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- b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
- 7. Sensor Output: Sensor is powered from the power pack.
  - 8. Power: Line voltage.
  - 9. Power Pack: Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
  - 10. Mounting:
    - a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
    - b. Relay: Externally mounted through a 1/2 inch (13 mm) knockout in a standard electrical enclosure.
    - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  - 11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
  - 12. Bypass Switch: Override the "on" function in case of sensor failure.
- B. PIR Type: Wall and Ceiling mounted; detect occupants in coverage area by their heat and movement.
- 1. Detector Sensitivity: Detect occurrences of 6 inch (150 mm) minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch (23 200 sq. mm).
  - 2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96 inch (2440 mm) high ceiling.
  - 3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 ft. (27.4 m) when mounted on a 10 ft. (3 m) high ceiling.
  - 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. (110 sq. m) when mounted 48 inch (1200 mm) above finished floor.
- C. Ultrasonic Type: Wall and Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
- 1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inch (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inch/s (305 mm/s).

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2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96 inch (2440 mm) high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96 inch (2440 mm) high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96 inch (2440 mm) high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 ft. (27.4 m) when mounted on a 10 ft. (3 m) high ceiling in a corridor not wider than 14 ft. (4.3 m).
6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. (110 sq. m) when mounted 84 inch (2100 mm) above finished floor.

D. Dual-Technology Type: Wall and Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6 inch (150 mm) minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch (23 200 sq. mm), and detect a person of average size and weight moving not less than 12 inch (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inch/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96 inch (2440 mm) high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. (110 sq. m) when mounted 48 inch (1200 mm) above finished floor.

### 2.3 LIGHTING CONTACTORS

A. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

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**2.4 EMERGENCY SHUNT RELAY**

- A. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
  - 1. Coil Rating: 120 V.

**2.5 CONDUCTORS AND CABLES**

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Item 719 "Low-Voltage Electrical Power Conductors and Cables."
- B. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG.

**3. METHOD OF CONSTRUCTION**

**3.1 EXAMINATION**

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION OF SENSORS**

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

**3.3 INSTALLATION OF CONTACTORS**

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

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**3.4 INSTALLATION OF WIRING**

- A. Wiring Method: Comply with Item 719 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

**3.5 IDENTIFICATION**

- A. Identify components and power and control wiring in accordance with Item 723 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

**3.6 FIELD QUALITY CONTROL**

- A. Field tests must be witnessed by Tenant.
- B. Tests and Inspections:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Nonconforming Work:
  - 1. Lighting control devices will be considered defective if they do not pass tests and inspections.
  - 2. Remove and replace defective units and retest.
- D. Prepare test and inspection reports.
- E. Manufacturer Services:

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1. Engage factory-authorized service representative to supervise field tests and inspections.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
  1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
  2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
  3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

**4. METHOD OF MEASUREMENT**

The quantity of lighting control devices to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

END OF SECTION

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**ITEM NO. 728 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**1. DESCRIPTION**

1.1 SUMMARY

A. Section Includes:

1. Molded-case circuit breakers (MCCBs).
2. Enclosures.

1.2 DEFINITIONS

Retain definition(s) remaining after this Section has been edited.

- A. GFEP: Ground-fault circuit-interrupter for equipment protection.
- B. GFLS: Ground-fault circuit-interrupter for life safety.
- C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
7. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

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- C. Field Quality-Control Submittals:
  - 1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts: Furnish to Owner spare parts, for repairing enclosed switches and circuit breakers, that are packaged with protective covering for storage on-site and identified with labels describing contents.

1.7 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
  - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
  - 1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

**2. MATERIALS**

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain products from single manufacturer.

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- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

**2.2 MOLDED-CASE CIRCUIT BREAKERS**

- A. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.
- B. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.

If series rated breakers are not allowed, delete the references to series rated in first paragraph below.

- C. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated or series rated as indicated on Drawings.
- D. MCCBs must be equipped with device for locking in isolated position.
- E. Lugs must be suitable 90 deg C rated wire, sized in accordance with 75 deg C temperature rating in NFPA 70.
- F. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.
- G. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- H. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:

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1. Instantaneous trip.
  2. Long- and short-time pickup levels.
  3. Long- and short-time time adjustments.
- J. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- K. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
  2. Application Listing: Appropriate for application.
  3. Lugs: Compression type, suitable for number, size, trip ratings, and conductor material.

**2.3 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1) and gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (UL 50E Types 3R, 12).
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be directly operable through front cover of enclosure (UL 50E Type 1) and directly operable through dead front trim of enclosure (UL 50E Type 3R).

**3. METHOD OF CONSTRUCTION**

**3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

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**3.2 SELECTION OF ENCLOSURES**

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.
- C. Other Wet or Damp, Indoor Locations: UL 50E, Type 3R.

**3.3 INSTALLATION**

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
  - 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
  - 2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
  - 3. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
  - 4. Install fuses in fusible devices.

**3.4 IDENTIFICATION**

- A. Comply with requirements in Item 723 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

**3.5 FIELD QUALITY CONTROL**

- A. Field tests and inspections must be witnessed by Tenant.
- B. Tests and Inspections for Switches:
  - 1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.

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- f. Verify that each fuse has adequate mechanical support and contact integrity.
- g. Inspect bolted electrical connections for high resistance using one of the following methods:
  - 1) Use low-resistance ohmmeter.
    - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
  - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
    - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
- h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
- i. Verify correct phase barrier installation.
- j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

C. Tests and Inspections for Molded-Case Circuit Breakers:

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1. Visual and Mechanical Inspection:
  - a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and clearances.
  - d. Verify that unit is clean.
  - e. Operate circuit breaker to ensure smooth operation.
  - f. Inspect bolted electrical connections for high resistance using one of the following methods:
    - 1) Use low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
  - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - h. Perform adjustments for final protective device settings in accordance with coordination study.
2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

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- d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 M  $\Omega$ .
- e. Determine the following by primary current injection:
  - 1) Long-time pickup and delay. Pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 2) Short-time pickup and delay. Short-time pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 3) Ground-fault pickup and time delay. Ground-fault pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 4) Instantaneous pickup. Instantaneous pickup values must be as specified and within manufacturer's published tolerances.

3. Test and adjust controls, remote monitoring, and safeties.

D. Nonconforming Work:

- 1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- 2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

- 1. Test procedures used.
- 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
- 3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified.

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**3.7 PROTECTION**

- A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

**3.8 MAINTENANCE**

- A. Infrared Scanning of Enclosed Switches and Breakers: Two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.
  - 1. Instruments and Equipment: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 2. Follow-up Infrared Scanning: Perform two follow-up infrared scans of enclosed switches and breakers, one at four months and another at 11 months after Substantial Completion.
  - 3. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
  - 4. Report: Prepare certified report that identifies units checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

**4. METHOD OF MEASUREMENT**

The quantity of switches and circuit breakers to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

END OF SECTION

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**ITEM NO. 729 – LED EXTERIOR LIGHTING**

**1. DESCRIPTION**

1.1 SUMMARY

- A. Section Includes:
  - 1. Luminaire types.
  - 2. Materials.
  - 3. Finishes.
  - 4. Luminaire support components.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaire.
  - 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type.
    - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
    - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
  - 6. Wiring diagrams for power, control, and signal wiring.

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7. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
  2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires/lights and lamps. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports and seismic restraints.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
  2. Structural members to which equipment and luminaires will be attached.
  3. Underground utilities and structures.
  4. Existing underground utilities and structures.
  5. Above-grade utilities and structures.
  6. Existing above-grade utilities and structures.
  7. Building features.
  8. Vertical and horizontal information.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Certificates: For each type of the following:
1. Luminaire.

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- E. Source quality-control reports.
- F. Sample warranty.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

**1.6 QUALITY ASSURANCE**

- A. Luminaire Photometric Data Testing Laboratory Qualifications:
  - 1. Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
  - 2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

**1.8 FIELD CONDITIONS**

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
- B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

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1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including luminaire support components.
    - b. Faulty operation of luminaires and accessories.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: 3 year(s) from date of Substantial Completion.

**2. MATERIALS**

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance:
  - 1. Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 2. Luminaires and lamps shall be labeled vibration and shock resistant.
  - 3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 LUMINAIRE TYPES

- A. Refer to Electrical drawings for the luminaire/lighting schedules for more information.

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

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**2.5 FINISHES**

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- D. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
  - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
    - a. Color:
      - 1) As selected from manufacturer's standard catalog of colors.

**2.6 LUMINAIRE SUPPORT COMPONENTS**

- A. Comply with requirements in Item 725 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

**3. METHOD OF CONSTRUCTION**

**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls, roofs, and canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 GENERAL INSTALLATION REQUIREMENTS**

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Support luminaires without causing deflection of finished surface.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming.

**3.3 CORROSION PREVENTION**

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

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**3.4 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Item 723 "Identification for Electrical Systems."

**3.5 FIELD QUALITY CONTROL**

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- C. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.
  - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

**3.6 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

**3.7 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
  - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
  - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 3. Adjust the aim of luminaires in the presence of the Architect.

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**4. METHOD OF MEASUREMENT**

The quantity of LED exterior lighting to be paid for under this item shall be included in a lump sum which have been placed and maintained in accordance with the plans, specifications, and directions of the Engineer. The plans specify the extents necessary to meet the needs of the electrical system installation.

**5. BASIS OF PAYMENT**

The lump sum price shall include all labor, materials, equipment and the performance of all operations and work necessary to complete the electrical system installation in conformity with the plans and specifications.

Payments shall be made monthly after Architect or Engineers approval.

END OF SECTION

**ITEM NO. 730 – REPLACE GRANITE BLOCK FACING**

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**1. DESCRIPTION**

1.1 This work shall consist of furnishing and installing granite block facing to replace existing missing/damaged granite block facing in accordance with the contract documents and as directed by the Engineer.

**2. MATERIALS**

2.1 The materials used for this specification shall be of the following standards:

Granite: Granite shall be of type finish and color to match existing surfaces and approved by the Engineer. Each stone type shall be obtained from a single quarry with resources to provide materials of consistent appearance and physical properties, and the capacity to cut, finish and supply granite without delaying the work. Granite shall be of uniform color and tone. Sizes shall be as specified or as measured on site to match existing surfaces.

Stainless Steel Crimp Anchors	ASTM A240
Caulking Compound for Structures	*M31
Masonry Mortar	ASTM C270-10

\*Refer to the Nassau County Department of Public Works Standard Specifications.

**3. CONSTRUCTION DETAILS**

3.1 Stone Fabrication: Contractor shall arrange a visit to the quarry to inspect the stone to be used for this job prior to the commencement of any quarrying or fabrication. The cost of this visit shall be borne by the Contractor and shall be included in the bid price for this item.

3.2 Remove any damaged existing granite block facing, including all mortar bedding and backing material as indicated on the plans or as ordered by the Engineer, in a manner so as not to damage dovetail slots or existing concrete. Repair or replace all damaged areas resulting from removal operations at no additional cost, to the satisfaction of the Engineer.

3.3 Beds and Joints: Pieces shall be bedded and jointed as shown in the approved shop drawings, and bed and joint surfaces shall be cut as follows: Bed and joint surfaces shall be sawn through the full thickness of the granite piece. Bed and joint surfaces shall be within +/- 3% of the 90degrees to the face of the piece.

3.4 Radial Profiles: Shall be constant throughout their length, in strict conformity with details shown on approved shop drawings.

Where called for, granite shall be drilled to receive stainless steel pins anchored with Anchoring Materials - Chemically Curing installed according to the manufacturers printed installation instructions and paid for under this item.

**ITEM NO. 730 – REPLACE GRANITE BLOCK FACING**

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*(Continued)*

- 3.5 Shipping and Handling: Granite material must be delivered to the site in an undamaged condition. All granite and related materials must be stored to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping or other causes. Granite shall be stored on wood skids or pallets at least 4inches off the ground, and covered with a non-staining waterproof membrane. Skids and granite must be placed and stacked to distribute weight evenly and to prevent breakage or cracking of granite and allow air circulation around stones. Contractor shall place polyethylene or other suitable plastic film as approved by the Engineer between any wood and finished surfaces and use polyethylene as an overall protective covering. Lifting holes must be plugged to prevent the accumulation of water. Salt shall not be used for melting ice formed in holes or on pieces, or for any purpose that could lead to contact with stone elements.
- 3.6 Installation: The Contractor is responsible for ensuring that all sub grades, bases and surfaces to receive granite masonry are clean, level and adequately prepared. The Contractor shall verify finished elevations and field dimensions taken at the job site affecting the work. Where called for, sub base material and granite component shall be core drilled to receive steel pins. Field dimensions, which are at variance with the drawings or specifications, shall be brought to the attention of the Engineer.

Surfaces of granite that have become dirty or stained are to be cleaned, removing all soil, stains and foreign materials, prior to setting. Granite is to be cleaned by thoroughly scrubbing stones with fiber brushes followed by a thorough drenching with clean water. Ferrous or other metallic brushes shall not be used. Only mild cleaning compounds that contain no caustic materials or abrasives are to be used.

Patched, chipped, cracked, broken or otherwise defective pieces shall not be set, and the Engineer shall be notified of any damaged stone. Contractor shall install mortar and attach granite components as shown on the plans or as directed by the Engineer. Stainless steel pins are to be used to secure granite components where indicated on the plan.

- 3.7 Construction Tolerances: The contractor will ensure that the Adjacent Stones will be flush
- 3.8 Pointing Joints: No pointing shall take place until all stone has been set and approved by the Engineer. All pointing shall be done with the approved pointing mortar mix. To reduce suction of moisture and control rate of stiffening, stone and bedding mortar shall be dampened before beginning to fill the joint. Free water or excessive dampness in the joint shall be avoided. Mortar must be forced into joints with sufficient pressure to insure joint is well packed, and a tool narrower than the joint width shall be used to pack mortar solidly into the back of joint. When the joint is more than 19mm (3/4") in depth, new mortar shall be placed in several layers. Each preceding layer shall be thumbprint hard before allowing another layer to be placed. Excess mortar must be struck off and mortar droppings must be removed from adjacent surfaces. When the final layer of mortar is thumbprint hard, the joint shall be tooled to a concave finish, to the satisfaction of the Engineer.

**ITEM NO. 730 – REPLACE GRANITE BLOCK FACING**

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*(Continued)*

- 3.9 Extend the dovetail slots from the existing wall into the new section of the wall as shown on the plans or as approved by the Engineer. Clean the surfaces of dovetail slots, in-place bricks and concrete surfaces, which might interfere with bonding. Follow the cleaning with compressed air jetting or vacuum cleaning to ensure the removal and disposal of all loose particles subject to approval of the Engineer.
- 3.10 Secure the granite block facing to the wall with anchors as shown on the plans or as approved by the Engineer. The Contractor shall ensure that the granite block facing is not out of place and there is no gap between the facing and the concrete. Follow the pattern that matches the adjacent granite block facing. Finish the joints with a pointing tool to match the adjacent joints, as specified and paid for in Item No. 711.
- 3.11 Protection: The top of the granite masonry must be covered with non-staining waterproof sheeting at end of day's work. Partially completed portions shall also be covered when work is not in progress. Contractor must prevent staining of stone from mortar, or other sources.
- 3.12 Final Cleaning: The granite shall be thoroughly cleaned after completion of the setting and other work. The granite shall be gone over and any mortar splashes or smears and any other encrusted matter carefully removed from the surface. The cleaning shall be done with non-ionic detergent and clean water applied vigorously with natural fiber bristle brushes. After cleaning, stone must be drenched with fresh water to remove all residue materials

**4. METHOD OF MEASUREMENT**

- 4.1 This work will be measured the number of square feet, including joints, of granite block facing satisfactorily replaced.

**5. BASIS OF PAYMENT**

- 5.1 The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

*END OF SECTION*

**ITEM NO. 731 – PAINTING OF FIRE SPRINKLER PIPING**

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**1) DESCRIPTION**

Under this item the Contractor shall clean, pretreat, prime and paint all fire sprinkler systems including valves, piping, hangers, supports, miscellaneous metalwork and accessories exposed to view, where indicated on the plans or where ordered by the engineer. Painting of the fire sprinkler system shall include the proper preparation of the surfaces, the application, protection and drying of the paint coatings, the protection of all surfaces adjacent to the paint surface against splatters and splashes of paint, and the supplying of all tools, drop cloths, scaffolding, labor and materials necessary to complete the work.

**2) MATERIAL**

Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.

Prime Coat: "Amercoat 68HS Epoxy Zinc-Rich Primer" by PPG; "Series 94-H<sub>2</sub>O Hydro-Zinc" by Tnemec; "Organic Zinc Rich Primer V 170" by Benjamin Moore Corotech or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.

Second Coat: "Pitt Guard Rapid Coat Epoxy 95-245" by PPG; "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Macropoxy 646 Fast Cure Epoxy B58-600" by Sherwin Williams.

Third Coat: "Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1070V (gloss) Fluoronar" or "Series 1071V (semi-gloss) Fluoronar" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510 (Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

- a. Pipe-Label Colors:
  - i. Background Color: Safety Red, exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
  - ii. Identification/Letter Color: White, exterior, acrylic enamel. Paint may be in pressurized spray-can form.

Refer to manufacturer product data sheets for additional information.

**3) METHOD**

- a. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified. Surfaces shall be assessed and treated indicated in the manufacturer's products catalogues.
- b. Clean piping surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of new paint coating.
- c. Comply with applicable federal, state and local laws enacted to ensure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.
- d. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.
- e. Unless otherwise specified or recommended by the paint manufacturer, paint may be

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applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

- f. Only apply paints, except water-thinned types, to surfaces that are completely free of moisture as determined by sight or touch.
- g. Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
- h. Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.
- i. Touch up damaged coatings as required to produce proper finish for painted surfaces, before applying subsequent coats.
- j. Apply paint to fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads.
- k. Piping in Unfinished Areas: Provide primed surfaces with one coat of red latex gloss enamel applied to a minimum dry film thickness of 0.025 mm 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.
- l. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red latex gloss enamel applied to a minimum dry film thickness of 0.025 mm 1.0 mil.
- m. Provide labeling, where piping is exposed, on the surfaces of all feed and cross mains to include identification of pipe function (such as "Sprinkler System", "Fire Department Connection", "Standpipe"), pipe size, and an arrow indicating flow direction. For pipe sizes 4-inch and larger provide white painted stenciled letters and arrows, a minimum of 2 in in height and visible from at least two sides when viewed from the floor. For pipe sizes less than 4-inch, provide white painted stenciled letters and arrows, a minimum of 0.75 in in height and visible from the floor. Pipe-Label Locations:
  - i. Near each valve and control device.
  - ii. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
  - iii. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
  - iv. At access doors, manholes, and similar access points that permit a view of concealed piping.
  - v. Near major equipment items and other points of origination and termination.
  - vi. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
- n. All fire suppression system valves must be marked with permanent tags indicating normally open or normally closed.
- o. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

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- p. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.
- q. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- r. Thermosetting Paints: Apply topcoats over thermosetting paints (epoxies and urethanes) within the overcoat window recommended by the manufacturer.
- s. Apply paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

**4) METHOD OF MEASUREMENT**

The quantity to be paid for under this item will be the actual number of linear feet of piping, that paint is applied to, necessary to complete the work.

**5) BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing all labor, materials, tools, equipment and primer necessary to prepare the surfaces and apply the surface paint coating in accordance with the plans or as directed by the engineer.

*END OF SECTION*

**ITEM NO. 732 – REMOVE, STORE AND RESET EXISTING HANDRAIL**

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**1. DESCRIPTION**

1.1 This work shall include the removal, storage, and resetting of all existing handrail designated on the plans or as specified by the Engineer.

**2. MATERIALS**

2.1 None specified.

**3. METHOD OF CONSTRUCTION**

3.1 Existing handrail shall be removed and stockpiled above ground in a neat and workmanlike manner by the Contractor to the satisfaction of the Engineer, at the site as designated by the Engineer. Care shall be exercised in removing the handrail to prevent damage to any part of the handrail assembly, mounting posts, or hardware. Any damage resulting from the Contractor's operations shall be repaired, or the damaged part replaced, to the satisfaction of the Engineer at the Contractor's expense.

3.2 Posts shall be set in anchoring epoxy/grout into pipe sleeves, which shall be embedded in the concrete pavement. Members shall be centered in sleeve to provide uniform thickness of epoxy/grout around post. The material at the top of the sleeve shall be pitched to shed water.

3.3 Should a handrail become damaged as a result of the Contractor's operations, to the extent that it cannot be repaired in a manner suitable to the Engineer, the handrail shall be replaced with a matching handrail satisfactory to the Engineer at the Contractor's expense. If the Contractor is unable to furnish a matching handrail satisfactory to the Engineer, all handrail designated on the plans shall be replaced with handrail of comparable size, and appearance, to the existing handrails to the satisfaction of the Engineer, at the Contractor's expense. Existing handrail which have heretofore been described as requiring replacement shall become the property of the Contractor and shall be removed from the work site in a neat and workmanlike manner.

3.4 The Contractor shall reset the existing handrail at the locations shown on the plans or specified by the Engineer. Handrail shall be securely reset in an upright position to the satisfaction of the Engineer.

3.5 Touchup Painting: The Contractor shall apply touchup painting to the existing handrails as necessary to cover any damages, scratches, or blemishes. The color, gloss and sheen of the touchup paint should match the existing paint. The Contractor shall verify the existing paint and provide a submittal for the selected paint. Apply touchup paint according to manufacturer's instructions. Apply paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F and 95 degrees F unless otherwise permitted by the paint manufacturer's printed instructions.

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4. **METHOD OF MEASUREMENT**

4.1 This work will be measured as the number of linear feet of handrail reset.

5. **BASIS OF PAYMENT**

5.1 The bid unit price per linear foot shall include the cost of all labor, materials, equipment, and other incidentals necessary to satisfactorily complete the work

*END OF SECTION*

**ITEM NO. 733 – CONCRETE OVERLAY, CLASS DP**

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**1. DESCRIPTION**

Furnish and place Class DP concrete with internal curing as shown in the contract plans. Class DP concrete with Internal Curing (DPIC) is a modified Class DP concrete with lightweight fine aggregate substituted for a portion of the standard fine aggregate to aid the curing process internally.

**2. MATERIALS**

Use materials meeting for Class DP concrete. Manufacture the Class DPIC concrete, with lightweight fine aggregate and the following modifications:

- A. Produce a homogeneous mixture of cement, pozzolan (fly ash or GGBFS), Microsilica, fine aggregate, lightweight fine aggregate, coarse aggregate, air entraining agent, water-reducing and set-retarding admixture, and water.
- B. Substitute lightweight fine aggregate, meeting the requirements of AASHTO M 195, for 30% (by volume) of standard fine aggregate of a Class DP mixture.
- C. Construct lightweight fine aggregate stockpile(s) at the production facility to maintain uniform moisture throughout the pile. Using a sprinkler system approved by the Materials Engineer, continuously and uniformly spray the stockpile(s) with water for a minimum of 24 hours. If a steady rain of comparable intensity occurs, turn off the sprinkler system at the direction of the Materials Engineer, until the rain ceases. At the end of the wetting period, or after the rain ceases, allow stockpiles to drain for 12 to 15 hours immediately prior to use, unless otherwise directed by the Materials Engineer.
- D. Provide the Materials Engineer with a list of proposed ingredients, and batch proportions at least one week prior to production. After the materials have been accepted for this work, make appropriate adjustments to the specific gravity (Bulk SSD) and fineness modulus of the combined fine aggregates prior to production of the concrete mixture. The Materials Engineer, or his representative, will approve the batch weights prior to use. Periodically correct the batch weights to account for changes in the daily measured aggregate moisture contents.
- E. The lightweight fine aggregate, at the time of batching must be at least saturated surface dry (SSD)\*\*. Batch the lightweight fine aggregate first, then routinely batch the fine aggregate, coarse aggregate, admixtures, cement, pozzolan, Microsilica, and remaining mixing water and mix completely.

\*\* The moisture content of the lightweight fine aggregate must be determined immediately prior to batching, using Materials Procedure 703-19E. If the supplied mix design is based on "oven dry" weight of lightweight fine aggregate, a corresponding adjusted weight must be supplied to account for the actual absorbed moisture content, so that the mix design entered in to the automated batching system is based on SSD weight. After the adjusted mix design is entered into the batching system, additional adjustments must be made to the fine aggregate and water quantities to account for the "surface" moisture of the fine aggregates.

**ITEM NO. 733 – CONCRETE OVERLAY, CLASS DP**

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*(Continued)*

**3. METHOD OF CONSTRUCTION**

**3.01 Limitation of Operations**

- A. No structural concrete removal work is permitted in areas adjoining new concrete during the new concrete's specified curing period.
- B. No loads, other than construction loads which are less than 2 tons and approved by the Engineer, are permitted on areas of the concrete pavement where concrete has been removed.
- C. No loads are permitted on concrete until completion of the specified curing period.

**3.02 Blast Cleaning**

- A. Blast clean all surfaces to be in contact with new concrete. Remove all grease and dirt. Remove all rust and mortar which is not firmly bonded to the surface being cleaned. Rust and concrete deposits which are firmly bonded and cannot be removed by blast cleaning may remain. A light coating of orange rust, that forms on steel surfaces after blast cleaning, is not considered detrimental to bond and may remain. Remove all debris created by blast cleaning.
- B. Place reinforcing steel supports and positive-tie-downs at a maximum spacing of 4 feet.
- C. Repeat blast cleaning if more than 48 hours pass before concrete placement begins.

**3.03 Preplacement Wetting.**

After blast cleaning has been accepted, thoroughly wet the concrete pavement surface and all porous surfaces to be in contact with new concrete for at least 12 hours immediately prior to placement. Remove all standing water with oil-free compressed air, and protect the deck from drying, so the concrete remains in a saturated surface dry condition.

**3.04 Handling and Placing Concrete.**

- A. Place concrete only when the ambient air temperature and deck surface temperature (after wetting) will be below 85 F during the entire placement.
- B. Place overlay concrete only if preplacement wetting has been completed on an area large enough to require one working day for placement, at least one span length.
- C. When using concrete transporting devices on a prepared surface, protect exposed reinforcing steel from deformation and prevent contamination of the surface.
- D. If operations are delayed for more than 30 minutes, install a construction dam or bulkhead. If placement operations are delayed for more than 60 minutes or if the concrete attains initial set, discontinue placement for at least 48 hours. This restriction does not prohibit continuation of the placement provided a gap is left in the placement. This gap is to be sufficient in length to allow the finishing machine to clear the previously placed concrete. Prepare the gap area for concrete placement in accordance with this specification, after the previously placed concrete, on both sides of the gap, has cured for 48 hours.
- E. Cold-weather concreting provisions shall apply when the ambient air temperature below 45°F for 24 consecutive hours, or drops below 32°F at any time, during the curing or drying periods of the concrete.

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*(Continued)*

A Preplacement Meeting is required to be held at least one week prior to the start of any concrete placement. Meeting participants besides the Contractor and Engineer should include materials suppliers, subcontractors, County representative, and others as deemed appropriate. Participants will review all aspects of the proposed placement including, but not limited to, the following:

- A. Equipment proposed for use and for backup.
- B. Planned workforce, assigned tasks of each designated position, and experience and expertise.
- C. Proposed construction techniques and crew experience.
- D. Safety considerations.
- E. Concrete mix design.
- F. Admixtures and technical data; dosage rates will be approved by the Regional Materials Engineer.
- G. Proposed placement rate, curing and loading schedule
- H. Curing practices to be employed as well as the workforce designated to the curing process.
- I. Delivery/conveyance equipment, including deck finishing machine setup and operation.
- J. Traffic control.
- K. For placements proposed between October 1st and April 1st the Preplacement Meeting should additionally review cold weather concreting operations including, but not limited to, the following:
  - 1. Expected environmental conditions at time of placement and during curing
  - 2. Proposed curing methods to maintain acceptable curing temperature

No concrete shall be placed until all aspects of the proposed placement are approved by the Engineer. A written report of the preplacement meeting will be established by the Engineer. Modifications shall be submitted in writing to the Engineer for approval. Further, for placements between October 1<sup>st</sup> and April 1st, no concrete shall be placed until all aspects of the proposed placement are approved by the County.

No concrete shall be placed when the ambient air temperature is below 45°F unless the Engineer grants approval to a written proposal from the Contractor. No concrete shall be placed during rain.

When concrete is to be placed in contact with reinforcing steel, or previously placed concrete, the temperature of the steel and concrete shall be raised to a minimum of approximately 45°F. The use of enclosures and heating equipment, including but not limited to the use of forced hot air, hot water boilers, and hoses, or other methods suitable to the Engineer, may be required before concreting begins.

Placement Limitations are met, environmental conditions are deemed favorable, and satisfactory means to mitigate adverse environmental conditions exist. Favorable environmental conditions are defined as an expected weather forecast suitable for concrete placement during the entire placement duration, the evaporation rate not to exceed 0.25 lb/sf-hr, and acceptable curing temperatures expected for the duration of the curing period.

The Contractor shall provide any necessary means to mitigate adverse weather conditions

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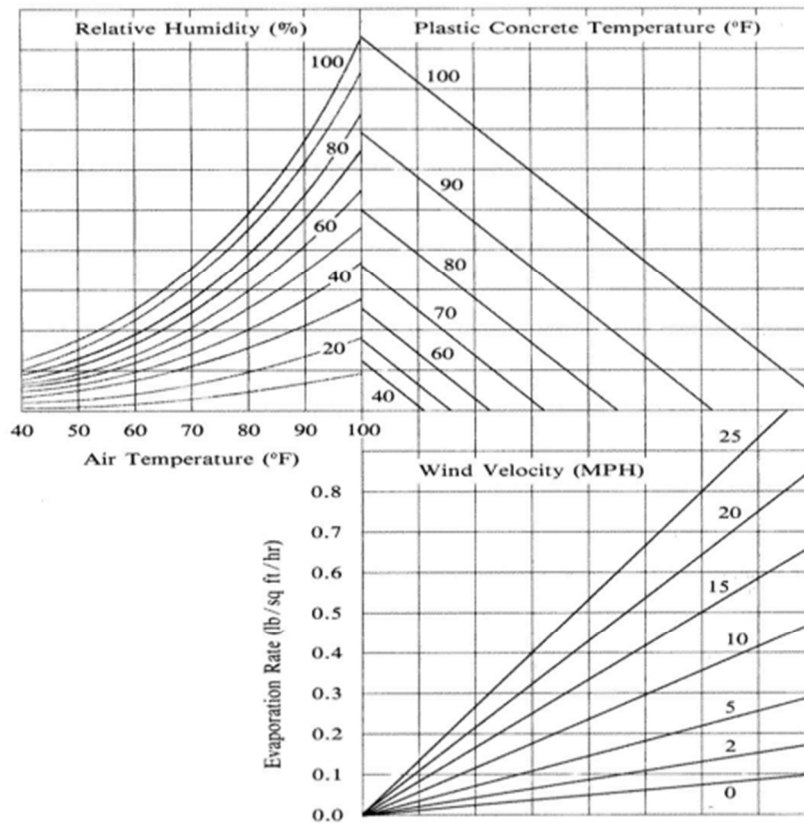
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and curing temperatures. Failure to maintain acceptable environmental conditions will result in the concrete placement being stopped and a bulkhead put in place.

The Contractor shall take the necessary measurements and calculate the theoretical evaporation rate. The measurements for air temperature, relative humidity, and wind speed shall be taken as near as possible to the final placement location of the concrete.

Concrete temperature will be taken from the same sample used for slump and air content tests. These measurements will be taken prior to commencement of concrete placement. If, in the Engineer's opinion, significant changes occur in atmospheric conditions, additional atmospheric measurements and calculations by the Contractor will be required. The Contractor shall supply all instruments necessary to make the required calculations. All instruments shall be approved by the Engineer, as being in good working order. The Contractor's measurements and calculations will be subject to the Engineer's approval. To determine the evaporation rate, apply the values taken for relative humidity, plastic concrete temperature, air temperature, and wind velocity to Figure - Structural Concrete Evaporation Rate.

**STRUCTURAL CONCRETE EVAPORATION RATE**



To use this chart:

1. Enter with air temperature, move up to relative humidity.
2. Move right to plastic concrete temperature.
3. Move down to wind velocity.
4. Move left to read approximate rate of evaporation.

**ITEM NO. 733 – CONCRETE OVERLAY, CLASS DP**

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*(Continued)*

**Vibration** - During and immediately after deposition, concrete shall be thoroughly consolidated by vibrating the concrete internally with mechanical vibrating equipment.

Vibration shall be supplemented by working or spading by hand in the corners and angles of forms and along form surfaces while the concrete is plastic. Vibrators shall not be used to push or distribute the concrete laterally

The number of vibrators required shall be one for every 40 cy of concrete placed per hour, with a minimum of two vibrators in use at all times, and equally spaced across the placement front. One additional vibrator shall be available for use as a backup.

**3.05 Finishing and Curing**

A. Overlay Concrete.

1. Finish overlay concrete to a minimum depth of 1 1/2 inches and a minimum total cover over top mat of bar reinforcement of 2 3/8 inches. Use a finishing machine meeting the requirements of this specification.
2. Machine finish the concrete within 10 minutes of its deposition onto the deck. If the machine cannot finish the concrete within the 10 minute time limit, stop all further placement, immediately cover the fresh concrete with plastic curing covers, and keep the unfinished concrete covered until it is machine finished. Once concrete being placed can be machine finished within the 10 minute time limit, resume placing concrete.
3. Apply curing within 10 minutes after machine finishing. Cure concrete with wet burlap, protected from displacement for seven days. Provide uniform continuous wetting for the duration of the curing period. The wet burlap and curing cover option is not allowed.

- B. Finishing Surfaces - Machine finishing shall be used throughout all concrete placement operations with the exception of areas which are inaccessible to finishing machines.

Machine finishing shall be accomplished with an approved power-driven, one-operation (strike-off and finishing) machine. The finishing machine shall have a strike-off auger set 1/4 to 1/2 inch above the finished surface, a power-driven roller or oscillating type screed, and a pan float.

Finishing machines shall be equipped with adjustable strike-off and finishing screeds, the bottom surfaces of which shall be adjusted to produce the required contour of the finished surface. Machines shall be kept in true adjustment. Machines out of adjustment shall not be used until proper adjustments have been made and the adjustments have been approved by the Engineer.

The specific method and equipment that the Contractor proposes to use for finishing will be supplied during the Preplacement Meeting and will be subject to approval by the Engineer based on the above listed requirements.

Prior to commencing concreting operations, the finishing machine shall be given a

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*(Continued)*

test run over the full length of the pavement segment to be paved, with the finishing machine adjusted to its finishing position. All necessary corrections shall be made and verified by the Engineer before concreting is begun.

A sufficient amount of concrete equal to the finishing machine capacity shall be supplied at all times.

After the concrete has been placed, spread, and consolidated to provide a uniformly dense pavement slab, the surface shall be struck off immediately by a single passage of the transverse finishing machine. The finishing machine shall carry sufficient concrete in front of the screed to fill low and porous places. This operation shall be done only once and shall produce a uniformly consolidated dense smooth surface of the required contour. The passage of the strike-off auger shall provide a concrete surface slightly above grade so that after settlement, if any, and the disappearance of excess water from the surface, the passage of the finishing screed will result in a uniform surface at the required grade and contour over its entire area, and provide the required cover over reinforcing.

In areas which are inaccessible to finishing machines, use of approved manual vibratory equipped power screeds may be used, with written approval of the County. Hand finishing shall be allowed only in areas inaccessible to finishing machines or manually driven vibratory-equipped power screeds. Hand finishing shall be performed in the same sequence and manner as machine finishing, unless otherwise permitted by the Engineer. Hand finishing shall be performed in such a manner as to produce a concrete surface with quality and uniformity identical to that produced by the finishing machine. Hand screeds or bullfloats shall be magnesium and 10 inches, or more, in width. Care shall be taken not to overwork the concrete surface during any finishing operation.

In the event the placement is delayed as a result of equipment breakdowns or delivery problems, all concrete in place shall be protected from evaporation by covering the surface with wet burlap, curing blankets, or plastic sheets. Excessive delays shall require the establishment of a bulkhead and the ceasing of the placement.

Prior to texturing, the finished concrete surface shall be examined by the Contractor and the Engineer using a straightedge. The straight-edge shall not be less than 10 feet long. It shall be furnished by the Contractor and maintained in good, usable condition at the placement site at all times. While the concrete is still plastic, surface depressions shall be filled with concrete of the same class as the placement in progress. Surface irregularities greater than 1/4 inch in 10 feet in either the longitudinal or the transverse direction shall be corrected in a manner acceptable to the Engineer. Thin mortar or laitance, which may have accumulated ahead of the finishing machine screed, shall be removed from the work site. They shall not be used to fill depressions.

After finishing, the surface shall be given a suitable texture with an artificial turf drag made of molded polyethylene with approximately 53,500 synthetic turf blades per

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*(Continued)*

square yard, each approximately 1/2 inch long. The artificial turf drag shall be of a type and brand appearing on the Department's Approved List.

The Contractor may apply texture in a transverse direction, longitudinal direction, or parallel to the finishing machine. Once begun, the direction of texturing shall not change. All texturing shall be done from a work bridge immediately following the finishing operation. Texturing shall be done prior to the beginning of curing operations. Only one pass of the turf drag over the finished area will be permitted. If texturing is done in a transverse or skewed direction, the Contractor shall texture by hand methods immediately after finishing machine passage.

If texturing is done in the longitudinal direction the turf drag shall be a seamless strip and shall be attached to the work bridge such that the surface of the concrete is textured immediately after finishing machine passage. Small areas, otherwise inaccessible to the attached drag, may be textured by hand methods. Texture resulting from the drag shall stop within 1 foot of curbs.

The finishing movement and resulting progress of the turf drag shall be done in a manner so as to prevent ridges or gouges forming in the concrete surface. The drag shall be weighted and the contact area changed as required to produce an acceptable texture. The drag shall be cleaned periodically to remove all hardened concrete particles.

- C. Curing - After finishing is completed, the concrete surface shall be completely covered with clean, prewetted burlap. The allowable time period for wet burlap covering shall not exceed five minutes from the completion of texturing, and 30 minutes from the time of concrete placement. Care shall be taken so as not to damage the finished surface and texturing. The curing shall not be delayed beyond the specified period. Burlap shall be lapped a minimum of 1 foot. Lapped edges are not required to be sealed. Burlap shall be thoroughly saturated over its entire surface area and shall be drained of excess water prior to its application. Burlap shall be kept continuously wet, commencing 10 minutes from the time the wet burlap is placed, and protected from displacement. The Contractor may cover the wet burlap and soaker hoses only if it is necessary to maintain curing temperature. In lieu of wet burlap, the Contractor may use single use concrete wet curing blankets capable of absorbing curing water to provide constant hydration and even distribution of wetting to the concrete surface in accordance with the requirements of this section, and the manufacturer's instructions, subject to the approval of the Engineer.

The curing period shall begin only after all concrete for a given placement is complete. A curing day is defined as any day during which the ambient air temperature at the concrete surface is 45°F or higher for the entire day.

Conditions may occur which prevent an entire day from qualifying as a curing day, but do not prevent portions of that day from reaching temperatures that qualify as curing temperatures. If these conditions occur and with the Engineer's approval, the Contractor may aggregate curing hours. A curing hour is defined as any hour during which the curing temperature remains at, or above 45°F.

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An aggregation of 24 curing hours will be credited as one curing day. Aggregations of less than 24 curing hours will not be credited.

Curing hours will be determined with continuous recording thermometers. The number and placement of the thermometers will be determined by the Engineer.

1. Thermometers used to monitor curing temperatures shall consist of the following types:

- a) Continuously Recording Thermometer. The thermometer shall be capable of continuously recording temperatures within a range of 0°F to 120°F for a minimum of 24 hours.
- b) Maximum - Minimum Recording Thermometer. For all placements the thermometer shall be capable of recording maximum and minimum temperatures in a range of 0°F to 120°F.

The curing temperature of concrete is the air temperature at the concrete surface, or the air temperature between the concrete surface and its protective covering. Temperatures at these locations are critical for proper concrete curing. For the purposes of this section the temperatures at the foregoing locations shall be maintained between 45°F and 85°F inclusive.

After the burlap placement has been fully completed, the concrete surface shall be cured for 7 curing days. Provide continuous, uniform wetting for the entire curing period. Removable forms shall remain in place until the curing period is complete. After seven curing days, the Contractor may be permitted to perform incidental work on the pavement under loading limitations. The Contractor shall inform the Engineer of the intended curing procedure at the Preplacement Meeting

**3.06 Construction Joints**

For the purpose of this specification, construction joints provide for interruptions in overlay concrete placement. At transverse and longitudinal construction joints, place the overlay concrete a distance at least equal to the depth of the overlay, beyond the intended joint location. After the overlay concrete has cured for 48 hours, sawcut along the joint to a depth of  $3/4 \pm 1/8$  inch. Chip the extra overlay concrete to the level of the original prepared surface at a 45° angle. Do not undercut existing concrete.

**3.07 Defective or Damaged Concrete**

After the concrete has hardened, the Engineer will examine it using the Contractor's straightedge. Surface irregularities greater than 1/4 inch in 10 feet shall be corrected. Unless otherwise directed by the County, the concrete used for repairs shall be of the same materials as that used for the original placement.

- A. Defects and damage, for the purposes of this specification, are imperfections caused by the Contractor's operations, including, but not limited to: cracking, tearing, and open areas. Repair all defective or damaged concrete at no cost to the Department, using the same concrete mixture originally placed.
- B. Make all repairs rectangular in plan shape and as close to square as possible. Sawcut the perimeter of the repair to a depth of  $3/4 \pm 1/8$  inch. Chip out the damaged or defective concrete to the level of the original prepared surface. Angle the walls of

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*(Continued)*

the repair cavity at 45° toward the center of the repair. Do not undercut existing concrete. Prepare the surfaces of the repair cavity to achieve a rough bondable surface exposing at least 50 percent of the coarse aggregate and place new concrete in accordance with this specification. Prior to placing repair concrete, all surfaces shall be wetted to a saturated surface dry condition

**4. METHOD OF MEASUREMENT**

For placements, the number of square yards of pavement overlay concrete as the number of square yards of plan area of Class DP overlay concrete placed. of overlay concrete.

**5. BASIS OF PAYMENT**

Include the cost of all labor, materials and equipment necessary to complete the work in the unit bid price.

*END OF SECTION*

## **ITEM 744 - FORCE ACCOUNT WORK**

### **A. Description.**

1. The amount estimated for the work under this Item is approximate and may be less or greater than the amount of the force account work indicated on the bid sheets. The amount will be based on the Force Account Work actually performed during the term of the contract with prior written approval of the Commissioner.
2. The use of this Item will require prior authorization of the County for each individual Force Account Work to be performed under this contract.

### **B. Materials and Construction Details.**

1. Materials incorporated into the force account work shall be approved by the Engineer prior to installation. When no applicable contract unit prices exist, material costs shall be reimbursed based upon acceptable receipts and/or invoices plus markup, as per the requirement of contract documents, and as approved by the Commissioner of Public Works.

### **C. Method of Measurement.**

1. All Force Account work performed under this Item shall be either:
  - a. agreed upon unit price with backup
  - b. agreed upon lump sum cost with detailed backup
  - c. not to exceed agreed prices with detailed backup (final cost may be lower but will never exceed the agreed price)
  - d. on a Time and Material basis plus applicable overhead and profit as stipulated within the Contract Documents and will be inspected and measured by the Engineer on a daily basis and signed off by the Contractor.

### **D. Basis of Payment.**

1. Under this Item, all provisions as incorporated in the Contract concerning payment for extra or additional work are applicable. Total payment for this Item is subject to the requirements and conditions of this contract.
2. The amount to be paid for each type of Force Account Work per work order shall be based (see Method of Measurement, Section C.1.) upon the actual work satisfactorily completed and/or materials/machines furnished and approved in accordance with the requirements of the Contract documents.

**(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:	_____

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**(On Construction firms letterhead)**

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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.