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nts:

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NOTE: Drawing may be printed at reduced scale.
Refer to graphic scale.

09-25-13 100% SUBMISSION

Date Submittal

Plan: SHADeD AREA = AREA OF WORK

Digitized by srujanika@gmail.com

An architectural site plan showing a building footprint highlighted by a thick black border. The footprint is a long, narrow rectangle oriented diagonally. The background shows a detailed sketch of the surrounding urban environment, including other buildings, streets, and green spaces. In the bottom right corner, there is a circular north arrow with four arrows pointing North (N), South (S), East (E), and West (W). The entire diagram is enclosed within a thin black rectangular frame.

Project Engineer:	EUGENE KIELMANOWICZ, P.E.	
Designer:	LUCIAN LUKE PARSONS P.E.	
Drawn by:	ALVIN WONG	
Checked by:	CARL J. CANNIZZARO, P.E.	
Design No. or W No.:	Facility Code:	Date:
—	N/A	07/22/13

object:

TASK 9

SANDY SITE AND PARK LIGHTING

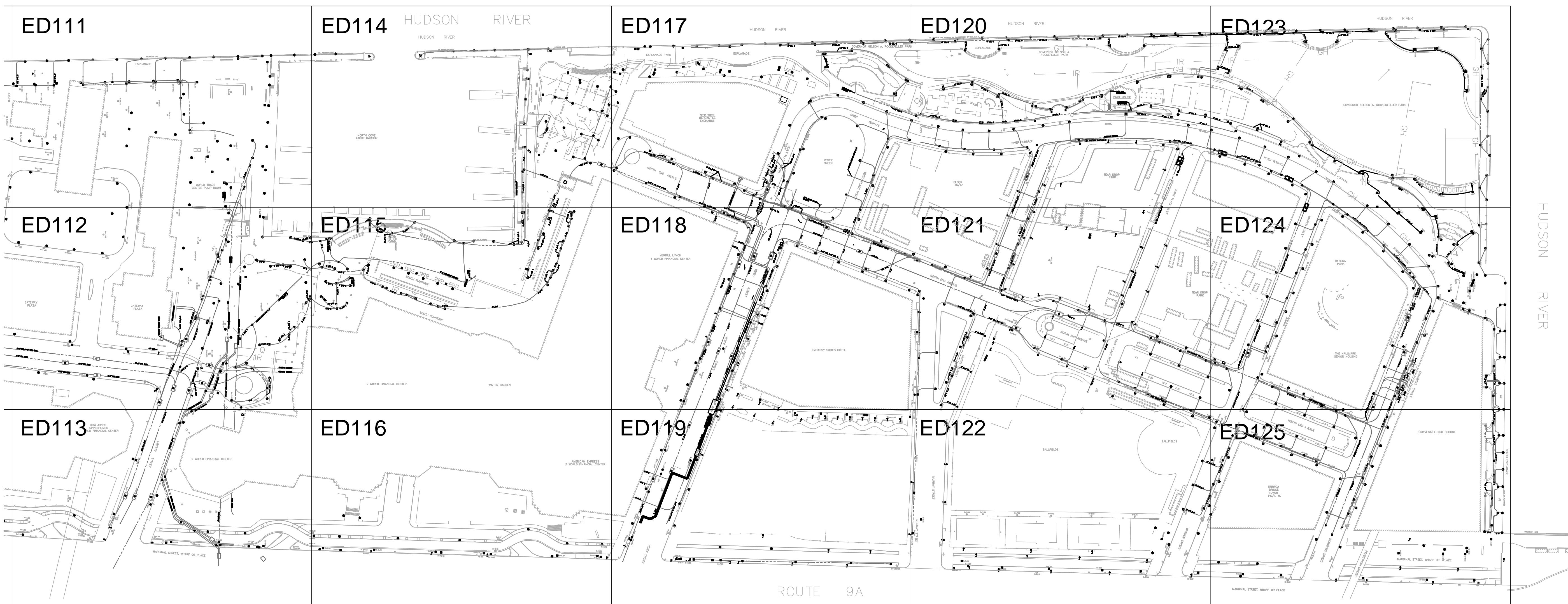
dress:
MANHATTAN
NEW YORK, NY

Drawing Title:
ELECTRICAL SITE PLAN

Drawing No.:

ED101N.00

	Sheets in Contract: 03 of 15
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0 30' 60' 120'

SITE DEMOLITION PLAN
SCALE 1" = 120' 0"

1

DEMOLITION NOTES

- PRIOR TO COMMENCING THE DEMOLITION WORK CONTRACTOR SHALL COORDINATE PHASING OF THE WORK WITH BPCA AND CON ED.
- CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING WIRING SUPPLYING PARK LIGHTING LOADS, INSTALLED IN EXISTING TO REMAIN UNDERGROUND CONDUITS AND MANHOLES, IN THIS PROJECT AREA.
- CONTRACTOR SHALL PROVIDE TEMPORARY LIGHTING FOR THE ENTIRE PROJECT AREA DAILY FROM SUNSET UNTIL SUNRISE. A MINIMUM ILLUMINATION OF 0.5 FOOT-CANDLE AT SIDEWALK SHALL BE MAINTAINED. CONTRACTOR SHALL SUBMIT A TEMPORARY LIGHTING PLAN TO OWNER DETAILING QUANTITY AND LOCATION OF LIGHTS FOR APPROVAL. CONTRACTOR SHALL BE RESPONSIBLE FOR COSTS AND MONITORING TEMPORARY LIGHTING UNTIL THE EXISTING LIGHTING HAS BEEN REWIRED, TESTED AND APPROVED BY BPCA.
- THE CONTRACT DRAWINGS ARE DIAGRAMMATIC IN NATURE AND MAY NOT REFLECT THE EXACT ROUTING OF EXISTING UNDERGROUND CONDUITS OR EXISTING CIRCUITING.
- THE EXISTING CON ED POWER FEEDER TO THE LOAD BOX SHALL BE DISCONNECTED AND THE ENDS SHALL BE TAPE TO RENDER THE INSIDE OF THE PEDESTAL SAFE FOR WORKING. PRIOR TO ANY WORK BEING DONE ON THE LOAD BOX, CONTRACTOR SHALL COORDINATE WITH CON ED AND BPCA, PRIOR TO COMMENCING THE WORK.
- CONTINUITY OF THE GROUNDING CONDUCTOR AND THE INTEGRITY OF THE GROUNDING SYSTEM SHALL BE MAINTAINED AT ALL TIMES DURING THE PROCESS OF CONSTRUCTION.
- CONTRACTOR SHALL TRACE AND IDENTIFY ALL BRANCH CIRCUIT WIRING TO BE DISCONNECTED AND REMOVED PRIOR TO THEIR DISCONNECTION AND REMOVAL. IN THE EVENT THAT LOADS OTHER THAN THIS PROJECT LOADS ARE FOUND TO BE SUPPLIED BY WIRING INSTALLED IN CONDUITS WHERE THIS PROJECT WIRING IS TO BE DISCONNECTED AND REMOVED, CONTRACTOR SHALL IDENTIFY THE LOCATION OF THE LOADS, MAINTAIN THE CONTINUITY OF THE RESPECTIVE CIRCUITS DURING THE CONSTRUCTION AND INFORM BPCA.
- WIRING AND CONDUITS DEDICATED TO LOADS OTHER THAN THIS PROJECT AREA LIGHTING LOADS SHALL REMAIN IN PLACE AND THE CONTINUITY OF THE RESPECTIVE CIRCUITS SHALL NOT BE DISRUPTED BY THIS PROJECT WORK. CONTRACTOR SHALL IDENTIFY LOADS AND CIRCUITS OUTSIDE THIS PROJECT PARK LIGHTING SCOPE OF WORK AND COORDINATE WITH BPCA.
- IN THE EVENT THAT DOT WIRING, SUPPLYING DOT LOADS, IS FOUND TO BE INSTALLED IN CONDUITS WHERE THIS PROJECT WIRING IS TO BE DISCONNECTED AND REMOVED, CONTRACTOR SHALL MAINTAIN INTEGRITY OF THE RESPECTIVE CIRCUITS AND COORDINATE WITH BPCA AND DOT.
- IN EACH EXISTING BPCA ELECTRICAL MANHOLE, CONTRACTOR SHALL CHECK THE GROUNDING ROD, GROUNDING CONDUCTOR AND EXISTING HARDWARE FOR CORROSION AND SHALL DISCONNECT AND REMOVE CORRODED ITEMS FOR REPLACEMENT. CONTRACTOR SHALL MAINTAIN AT ALL TIMES CONTINUITY OF GROUNDING SYSTEM.



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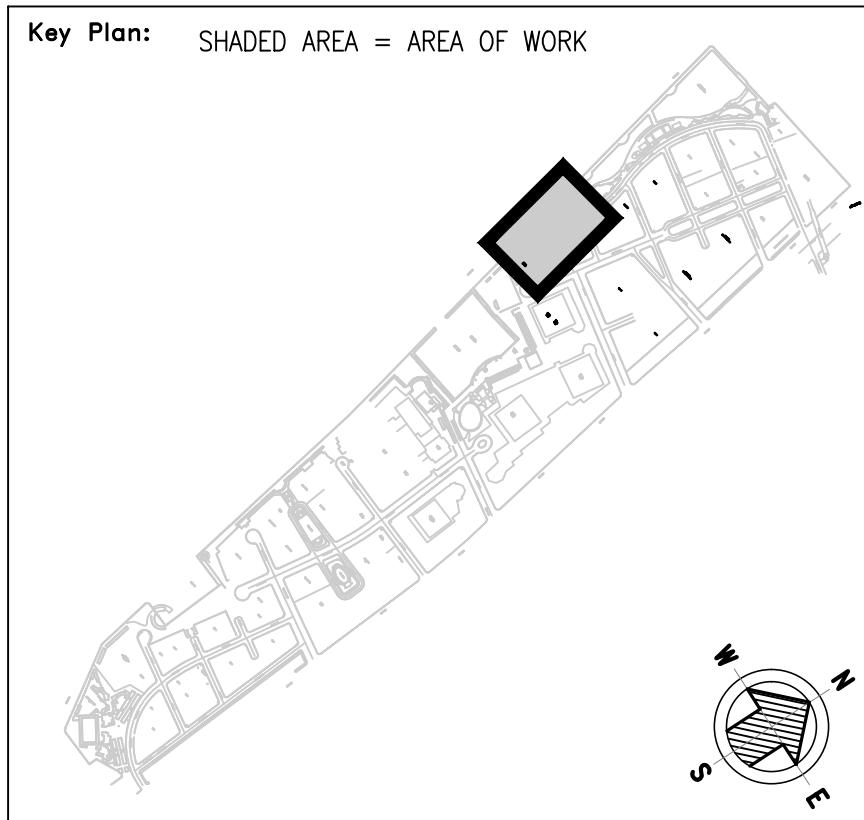
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No. Date Revision

 09-25-13 100% SUBMISSION

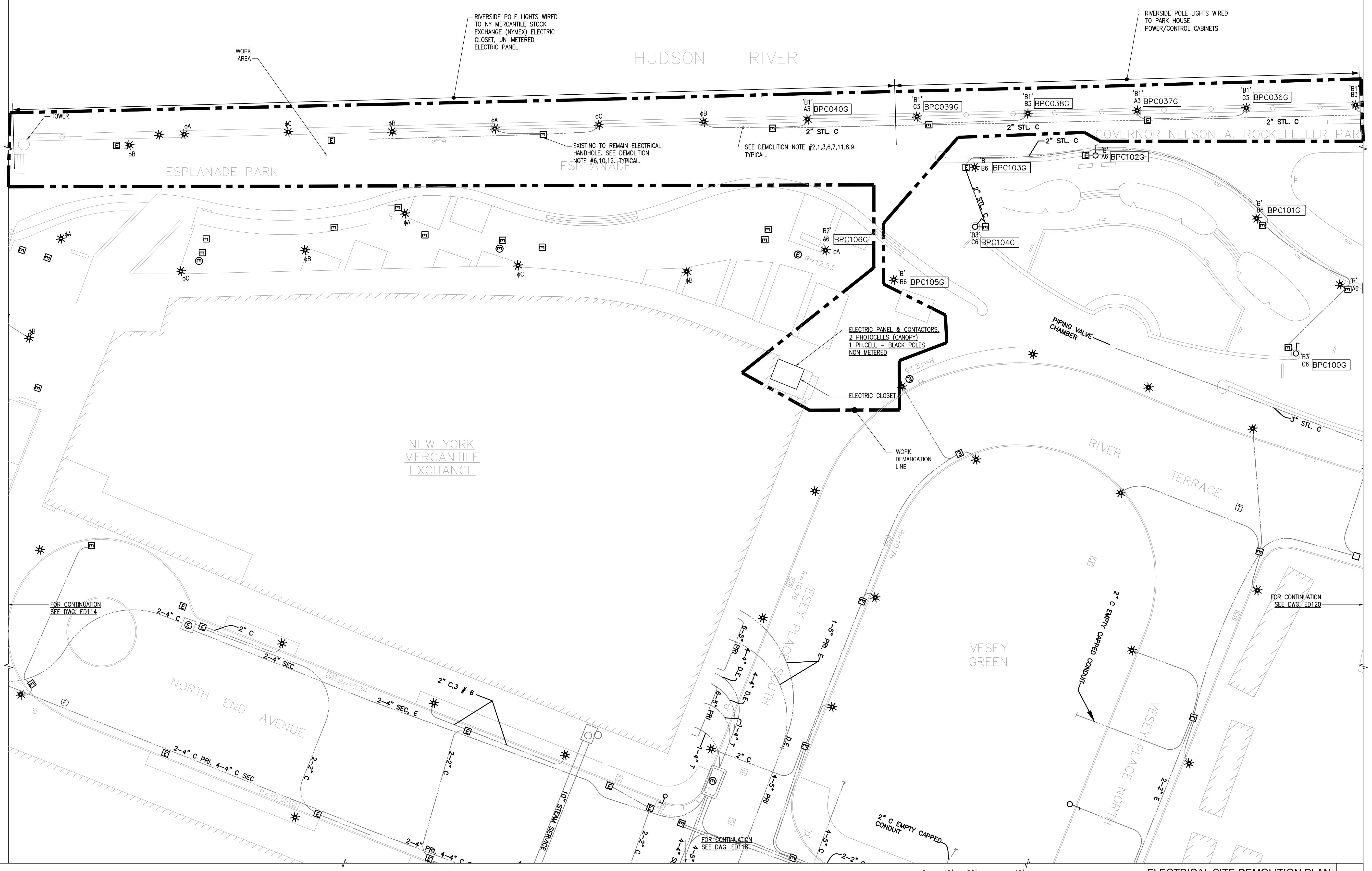
No. Date Submittal



Project Engineer: EUGENE KIELMANOWICZ, P.E.
 Designer: LUCIAN LUKE PARSONS P.E.
 Drawn by: ALVIN WONG
 Checked by: CARL J. CANNIZZARO, P.E.
 Design No. or LLW No.: - Facility Code: N/A Date: 07/22/13

Project: TASK 9
 SANDY SITE AND PARK LIGHTING
 Address: MANHATTAN NEW YORK, NY
 Drawing Title: ELECTRICAL SITE DEMOLITION PLAN SECTION 16

Drawing No.: ED117.00
 Sheets in Contract: 05 of 15
 Scale 1'-0" - 20'-0"



DEMOLITION NOTES

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- IN EACH EXISTING BPCA ELECTRICAL HANDHOLE, CONTRACTOR SHALL CHECK THE GROUNDING ROD, GROUNDING CONDUCTOR AND EXISTING HARDWARE FOR CORROSION AND SHALL DISCONNECT AND REMOVE CORRODED ITEMS FOR REPLACEMENT. CONTRACTOR SHALL MAINTAIN AT ALL TIMES CONTINUITY OF GROUNDING SYSTEM.
- CONTRACTOR SHALL MAINTAIN SUPPLIED WITH POWER AT ALL TIMES THE 24 HOUR LOADS OF SCHOOL LIGHTS AND POLICE EQUIPMENT.
- IN EXISTING ELECTRICAL MANHOLES WHERE THERE IS AN INTERFACE BETWEEN EXISTING TO REMAIN PARK LIGHTING AND EXISTING TO BE REMOVED LIGHTING, CONTRACTOR SHALL MODIFY EXISTING GRID TO SEPARATE EXISTING CABLES SUPPLYING EXISTING LIGHTING TO REMAIN FROM THE EXISTING LIGHTING TO BE REMOVED FOR REPLACEMENT.



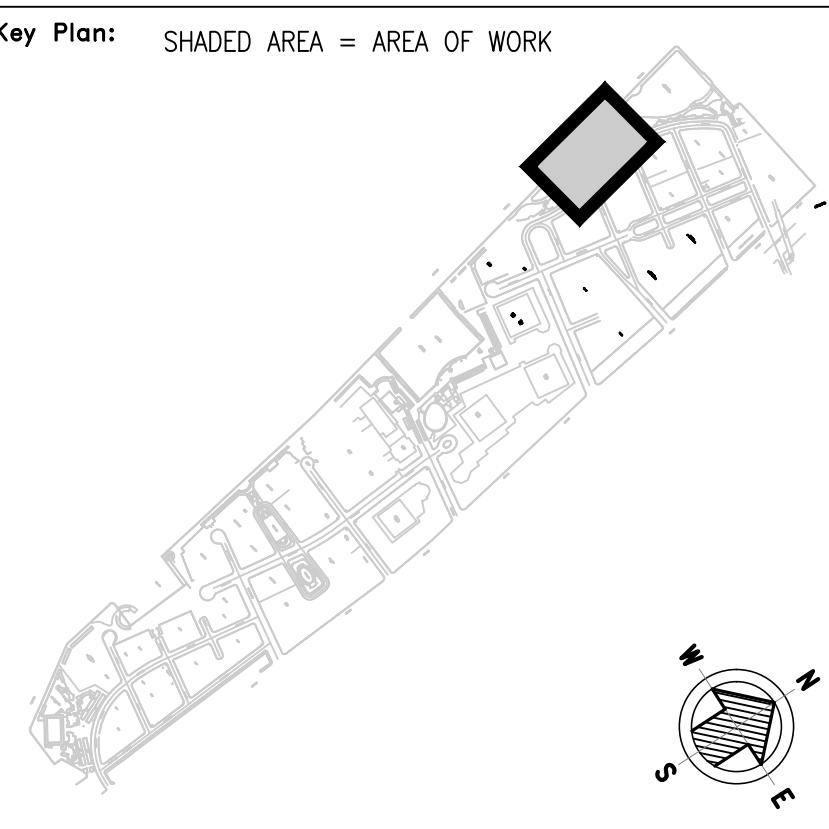
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No.	Date	Revision

09-25-13 100% SUBMISSION

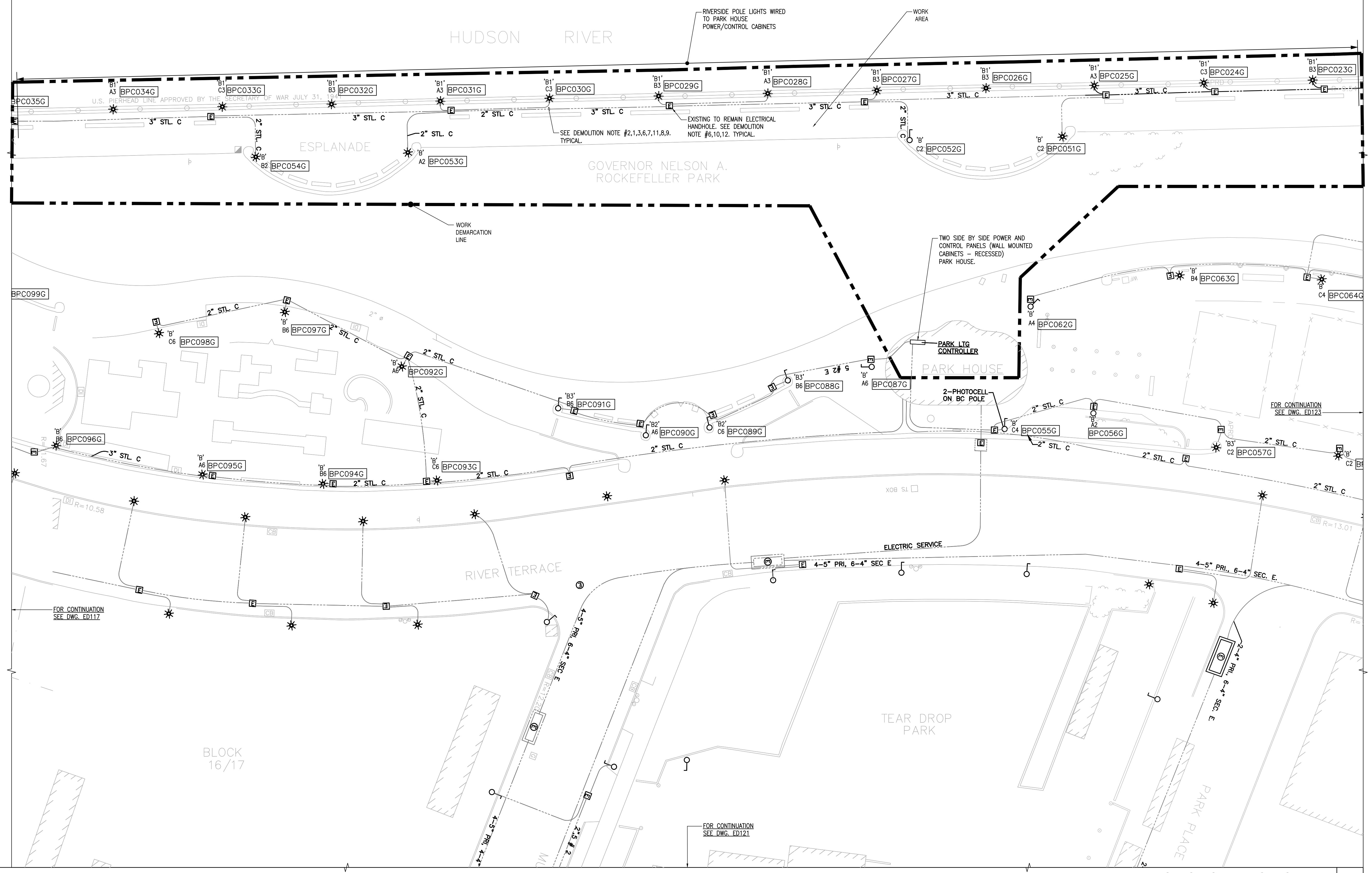
No. Date Submittal



Project Engineer: EUGENE KIELMANOWICZ, P.E.
 Designer: LUCIAN LUKE PARSONS P.E.
 Drawn by: ALVIN WONG
 Checked by: CARL J. CANNIZARO, P.E.
 Design No. or LLW No.: - Facility Code: N/A Date: 07/22/13

Project: TASK 9
 SANDY SITE AND PARK LIGHTING
 Address: MANHATTAN NEW YORK, NY
 Drawing Title: ELECTRICAL SITE DEMOLITION PLAN

Drawing No.: ED120.00
 Sheets in Contract: 06 of 15



DEMOLITION NOTES

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 10. IN EACH EXISTING BPCA ELECTRICAL HANDHOLE, CONTRACTOR SHALL CHECK THE GROUNDING ROD, GROUNDING CONDUCTOR AND EXISTING HARDWARE FOR CORROSION AND SHALL DISCONNECT AND REMOVE CORRODED ITEMS FOR REPLACEMENT. CONTRACTOR SHALL MAINTAIN AT ALL TIMES CONTINUITY OF GROUNDING SYSTEM.



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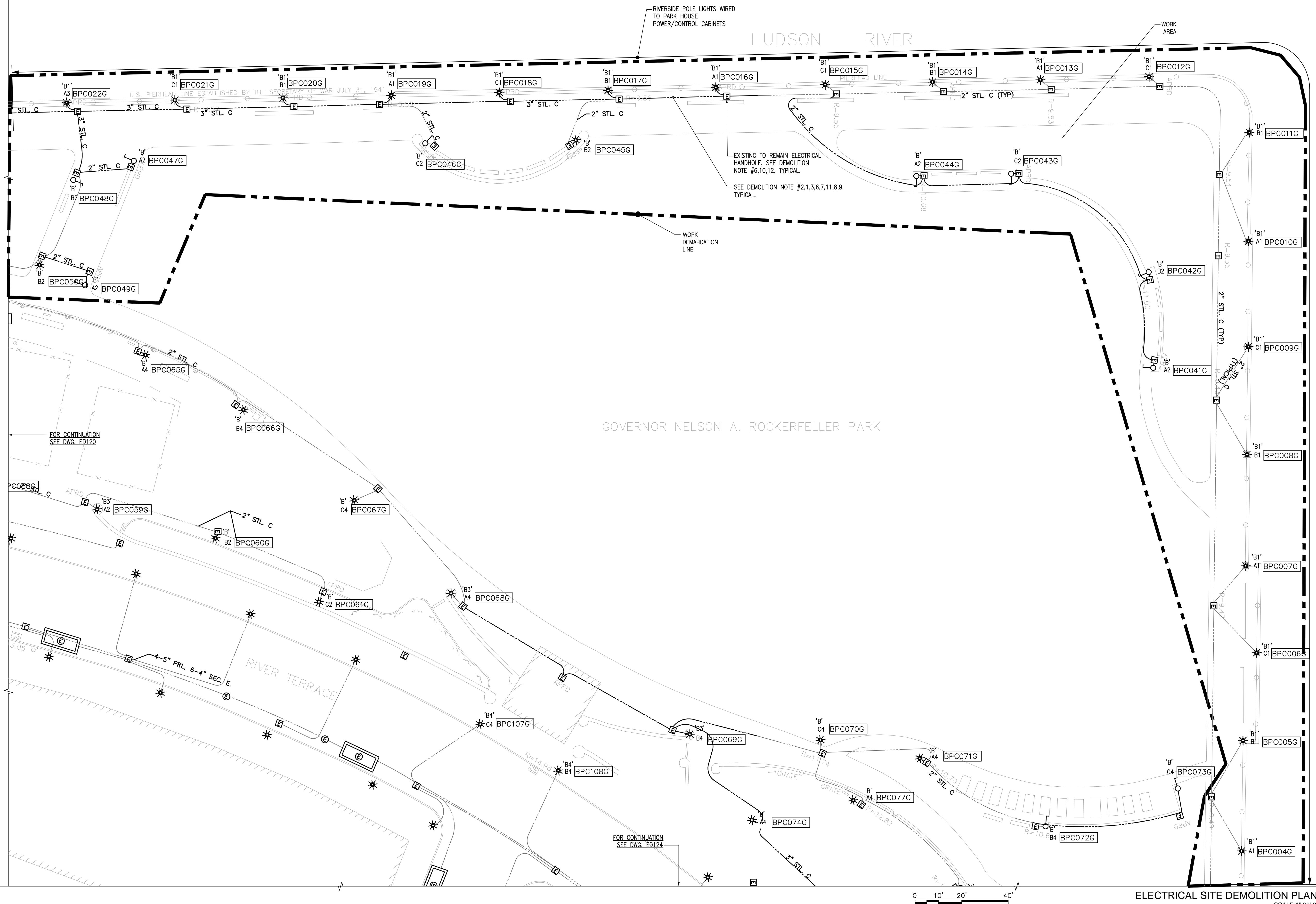
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09-25-13 100% SUBMISSION

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Design No. or LLW No.:	Facility Code:	Date:
—	N/A	07/22/13

Project:	TASK 9 SANDY SITE AND PARK LIGHTING
Address:	MANHATTAN NEW YORK, NY
Drawing Title:	ELECTRICAL SITE DEMOLITION PLAN

	Drawing No.:
	ED123.00
	Sheets in Contract:





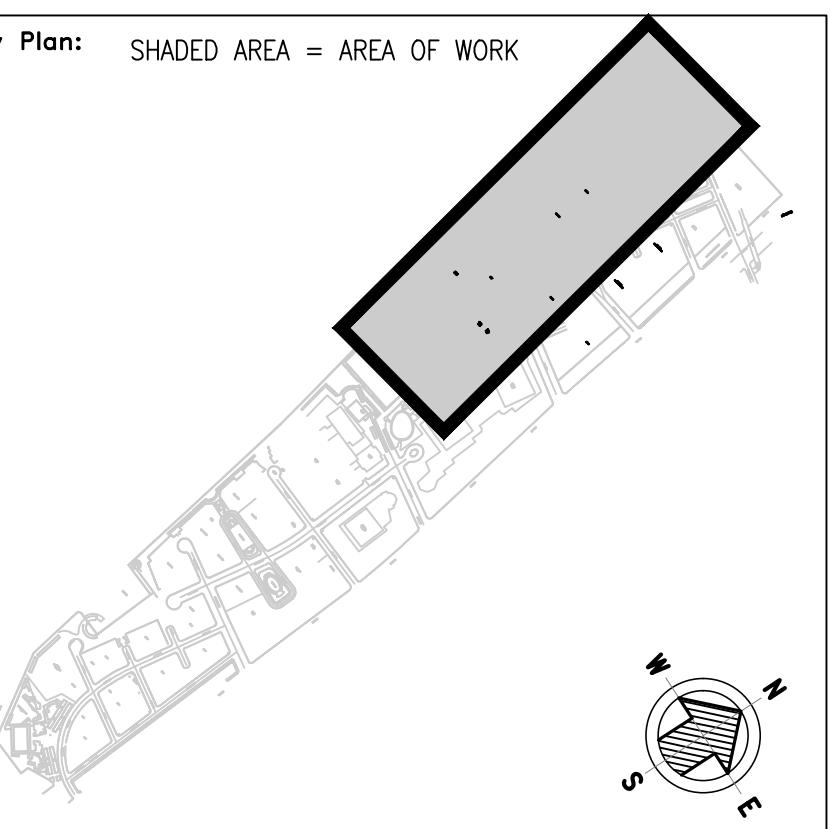
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No. Date Revision

09-25-13 100% SUBMISSION
No. Date Submittal

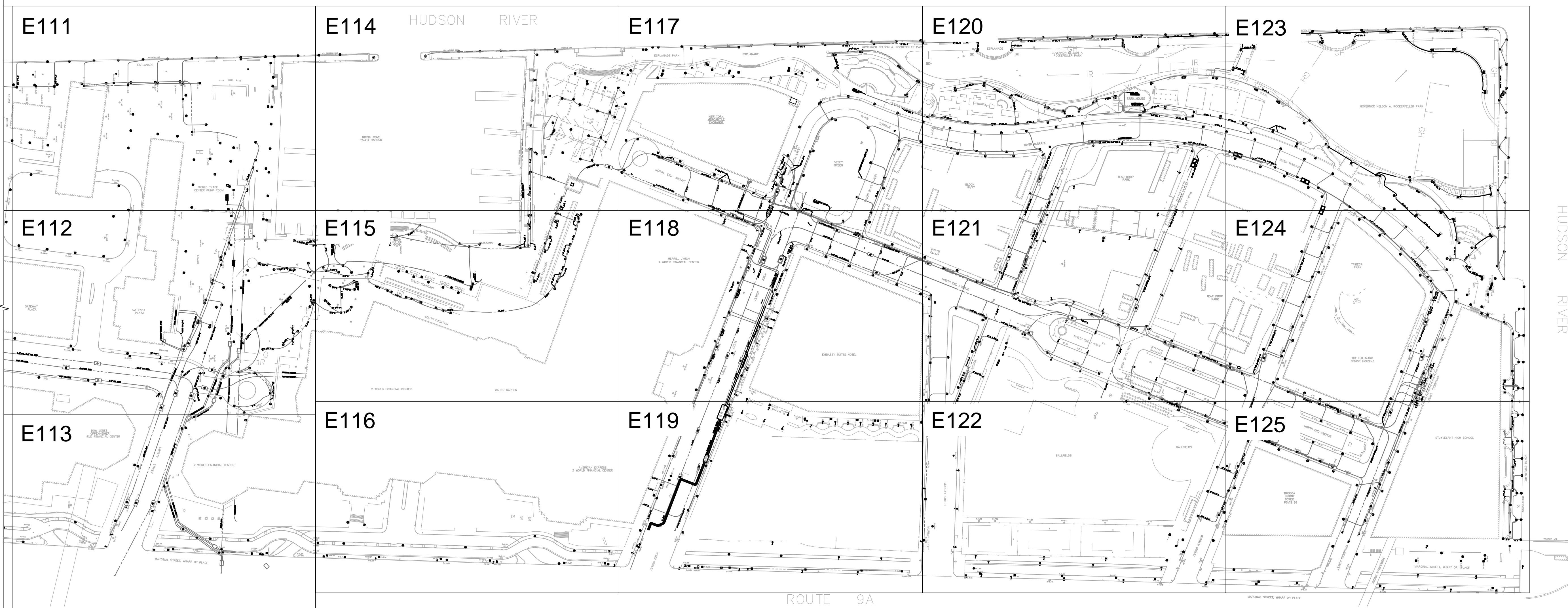


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Design No. or LLW No.: N/A Facility Code: Date: 07/22/13

Project: TASK 9
SANDY SITE AND PARK LIGHTING
Address: MANHATTAN NEW YORK, NY

Drawing Title: ELECTRICAL SITE PLAN

Drawing No.: E101N.00
Sheets in Contract: 1
09 of 15



0 30' 60' 120'

SITE CONSTRUCTION PLAN
SCALE 1"-120'-0"

1

SEQUENCE OF CONSTRUCTION NOTES

1. AFTER THE DISCONNECTION AND REMOVAL OF THE EXISTING CONDUCTORS. THE CONTRACTOR SHALL CLEAN THE CONDUITS BY PULLING THROUGH A WIRE BRUSH.
 2. TEST CONDUIT BY PULLING THROUGH CONDUIT A CYLINDRICAL MANDREL NOT LESS THAN TWO PIPE INSIDE DIAMETERS LONG, HAVING AN OUTSIDE DIAMETER EQUAL TO 90 PERCENT OF THE INSIDE DIAMETER OF THE CONDUIT. CONDUITS COATED INSIDE SHALL NOT BE TESTED WITH CYLINDRICAL MANDREL, FOAM SHALL BE USED. NOTIFY ENGINEER IF CONDUIT FOUND TO BE BLOCKED OR OTHERWISE DAMAGED. DAMAGED CONDUITS SHALL BE REPLACED UNDER THE SUPERVISION OF THE BPCA. CONTRACTOR SHALL EXCAVATE THE GROUND OR THE PAVED GROUND AS REQUIRED FOR THE INSTALLATION OF THE REPLACEMENT CONDUIT AND SHALL RESTORE THE PAVEMENT TO THE ORIGINAL CONDITIONS IN ACCORDANCE WITH THE LATEST DOT STANDARDS. PAYMENT SHALL BE BASED ON 10' LENGTHS OF CONDUIT IN ACCORDANCE WITH THE UNIT PRICES SUBMITTED AS PART OF THE BID DOCUMENTS.
 3. IN THE EVENT THAT LOADS OTHER THAN BPCA LOADS ARE FOUND TO BE SUPPLIED BY WIRES INSTALLED IN EXISTING CONDUITS WHICH ARE TO BE REWIRED FOR BPCA LIGHTING AS PART OF THIS PROJECT, CONTRACTOR SHALL IDENTIFY THE LOADS, MAINTAIN CONTINUITY OF THE CIRCUITS AND INFORM BPCA.
 4. REMOVE ALL EXISTING GASKETING MATERIAL FROM THE RIM AND COVER OF LIGHTING. PULL/DISTRIBUTION HANDHOLE.
 5. CLEAN AND RE-TAP EACH OF THE EXISTING FRAME BOLT HOLES.
 6. CLEAN EACH OF THE LIGHTING PULL/DISTRIBUTION HAND HOLE OF ALL SOIL, DEBRIS, CONCRETE RUNOFF, WATER, ETC.
 7. TAG ALL CONDUITS AT THE ENDS AND IN ALL INTERMEDIATE BOXES, HANDHOLES AND OTHER ENCLOSURES USING STAINLESS STEEL TAGS ATTACHED WITH STAINLESS STEEL WIRE.
 8. FURNISH AND INSTALL A NEW 1/8" THICK NEOPRENE GASKET FOR EACH BOX. GASKET SHALL BE FASTENED USING A PLIABLE ADHESIVE AS RECOMMENDED BY THE GASKET MANUFACTURER.
 9. INSTALL NEW REPLACEMENT LIGHTING CONDUCTORS. IDENTIFY ALL CONDUCTORS BY CIRCUIT NUMBER AND PHASE ON WIRE NUMBER, AT EACH TERMINAL OR SPLICING LOCATION AND IN ALL INTERMEDIATE BOXES, HANDHOLES AND OTHER ENCLOSURES USING ENGRAVED PLASTIC WATERPROOF TAGS PERMANENTLY ATTACHED WITH TIE WRAPS.
 10. FURNISH AND INSTALL AN IN-LINE FUSE HOLDER ON THE HOT LEG INSIDE EACH LIGHT POLE. FUSE HOLDERS SHALL BE RATED FOR 600 VOLTS AC AND SHALL BE SUITABLE FOR #6 AWG STRANDED COPPER LINE AND LOAD CRIMPED CONNECTIONS. FUSE HOLDERS SHALL BE FERRAZ SHAWMUT MODEL 'FEB' OR EQUAL. FURNISH AND INSTALL A 5-AMPERE FERRAZ SHAWMUT TYPE 'TRM' TIME-DELAY MIDGET FUSE IN EACH HOLDER. FURNISH BPCA WITH ONE HUNDRED (100) SPARE FUSES AND TWENTY (20) SPARE IN-LINE FUSE HOLDERS.
 11. RE-INSTALL EXISTING LIGHTING HANDHOLE COVERS USING NEW 3/8" DIAMETER STAINLESS STEEL HEX HEAD SHOULDER BOLTS. ALL MOUNTING DEVICES SHALL BE TAMPER RESISTANT TO PREVENT UNAUTHORIZED ACCESS TO LIVE PARTS. PROVIDE BONDING JUMPER FOR GROUNDING OF THE COVER AS PER NYCEC.
 12. IN EACH STREET OR GRASSY AREA LIGHTING HANDHOLE CONTRACTOR SHALL WELD A GROUNDING LUG ON THE UNDERSIDE OF EACH HANDHOLE COVER FOR CONNECTION TO THE HANDHOLE GROUND ELECTRODE (ROD).
 13. CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE GROUNDING CONDUCTOR AND THE INTEGRITY OF THE GROUNDING SYSTEM AT ALL TIMES DURING THE PROCESS OF CONSTRUCTION.
 14. INSIDE EXISTING LIGHT POLES, NEW WIRING SHALL BE 3 #6 AWG.
 15. IN THE EVENT THAT 'DOT' LIGHTING LOADS ARE SUPPLIED BY CONDUCTORS INSTALLED IN EXISTING CONDUITS WHICH ARE TO BE REWIRED FOR BPCA LIGHTING, CONTRACTOR SHALL IDENTIFY THE 'DOT' LOADS, MAINTAIN THE CONTINUITY OF THE CIRCUITS AND INFORM BPCA. CLEANING OF THE RESPECTIVE CONDUITS SHALL BE AS COORDINATED WITH AND AS APPROVED BY BPCA AND DOT.
 16. INSIDE EXISTING LIGHT POLES, CONTRACTOR SHALL CHECK THE CONDITION OF THE EXISTING GROUNDING LUG AND IF FOUND CORRODED CONTRACTOR SHALL REPLACE IT WITH NEW.
 17. DRAWINGS ARE DIAGRAMMATIC AND IDENTIFY THE BRANCH CIRCUITS ASSIGNED FOR EACH PARTICULAR AREA. ALL LIGHT POLES SHALL BE ALTERNATELY WIRED PER PHASE LEG SO THAT NO AREA SHALL REMAIN IN TOTAL DARKNESS IN THE EVENT OF A PHASE FAULT. FOLLOWING AND MAINTAINING THE BRANCH CIRCUIT ASSIGNMENTS AND METHOD OF CIRCUITING, EXACT WIRING SHALL BE AS PER FIELD CONDITIONS, AS PER EXACT LAYOUT OF THE UNDERGROUND CONDUITS. THE LOADS SHALL BE BALANCED PER PHASE LEG AND THE CONTRACTOR SHALL SUBMIT AS-BUILTS SHOWING THE EXACT WIRING OF THE LIGHT POLES. CIRCUITING AND WIRE SIZES SHALL TAKE INTO ACCOUNT THE VOLTAGE DROP TO THE REMOTEST LOAD (LIGHT POLE) FOR EACH RESPECTIVE
 18. IN ALL EXISTING BPCA ELECTRICAL HANDHOLES WHERE CORRODED GROUNDING HARDWARE AND CONDUCTORS MOUNTING HARDWARE HAVE BEEN REMOVED, UNDER THE DEMOLITION WORK, CONTRACTOR SHALL PROVIDE TEMPORARY LIGHTING FOR THE ENTIRE PROJECT AREA DAILY FROM SUNSET UNTIL SUNRISE. A MINIMUM ILLUMINATION OF 0.5 FOOT-CANDLE AT SIDEWALK MOUNTING HARDWARE. IN ADDITION, CONTRACTOR SHALL PROVIDE NEW REPLACEMENT GROUNDING HARDWARE AND CONDUCTORS MOUNTING HARDWARE IN ALL EXISTING HANDHOLES AS REQUIRED TO SUPPORT THE NEW CONDUCTORS. CONTRACTOR SHALL BE RESPONSIBLE FOR COSTS AND MONITORING TEMPORARY LIGHTING UNTIL THE EXISTING LIGHTING HAS BEEN REWIRED, TESTED AND ACCEPTED BY THE ENGINEER.
 19. CONTRACTOR SHALL MAINTAIN SUPPLIED WITH POWER AT ALL TIMES THE 24 HOUR LOADS OF SCHOOL LIGHTS, POLICE EQUIPMENT AND LIGHTING POLE RECEPTACLES.
 20. ALL REPLACEMENT CONDUIT SHALL BE PVC COATED HEAVY WALL, RIGID GALVANIZED STEEL, SIZE AS REQUIRED TO MATCH EXISTING.
 21. IN EXISTING ELECTRICAL HANDHOLES WHERE THERE IS AN INTERFACE BETWEEN EXISTING TO REMAIN PARK LIGHTING, EXISTING TO REMAIN STREET LIGHTING AND EXISTING TO BE REWIRED PARK LIGHTING, CONTRACTOR SHALL SEPARATE EXISTING TO REMAIN CABLES SO AS TO MAINTAIN THE CONTINUITY OF THE EXISTING TO REMAIN CIRCUITS. CONTRACTOR SHALL IDENTIFY AND DISCONNECT THE RESPECTIVE CABLES PRIOR TO SEPARATION. CONTRACTOR SHALL PROVIDE NEW CONNECTORS, STREET LIGHTING CONNECTORS AS MANUFACTURED BY POLARIS OR APPROVED EQUAL. COORDINATE WITH BPCA.
 22. IN EXISTING ELECTRICAL HANDHOLES SERVING PARK LIGHTING THE CONDUIT ENDS SHALL HAVE THE CORROSION REMOVED AND SHALL BE TREATED WITH ANTI-CORROSIVE COATING. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR THE COATING.
 23. PROVIDE NEW WIRING SUPPLYING THE GLASS BENCH. PROVIDE NEW LIGHTING IF REQUIRED.



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Design No. or File No.:	Facility Code:	Date:
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TASK 9

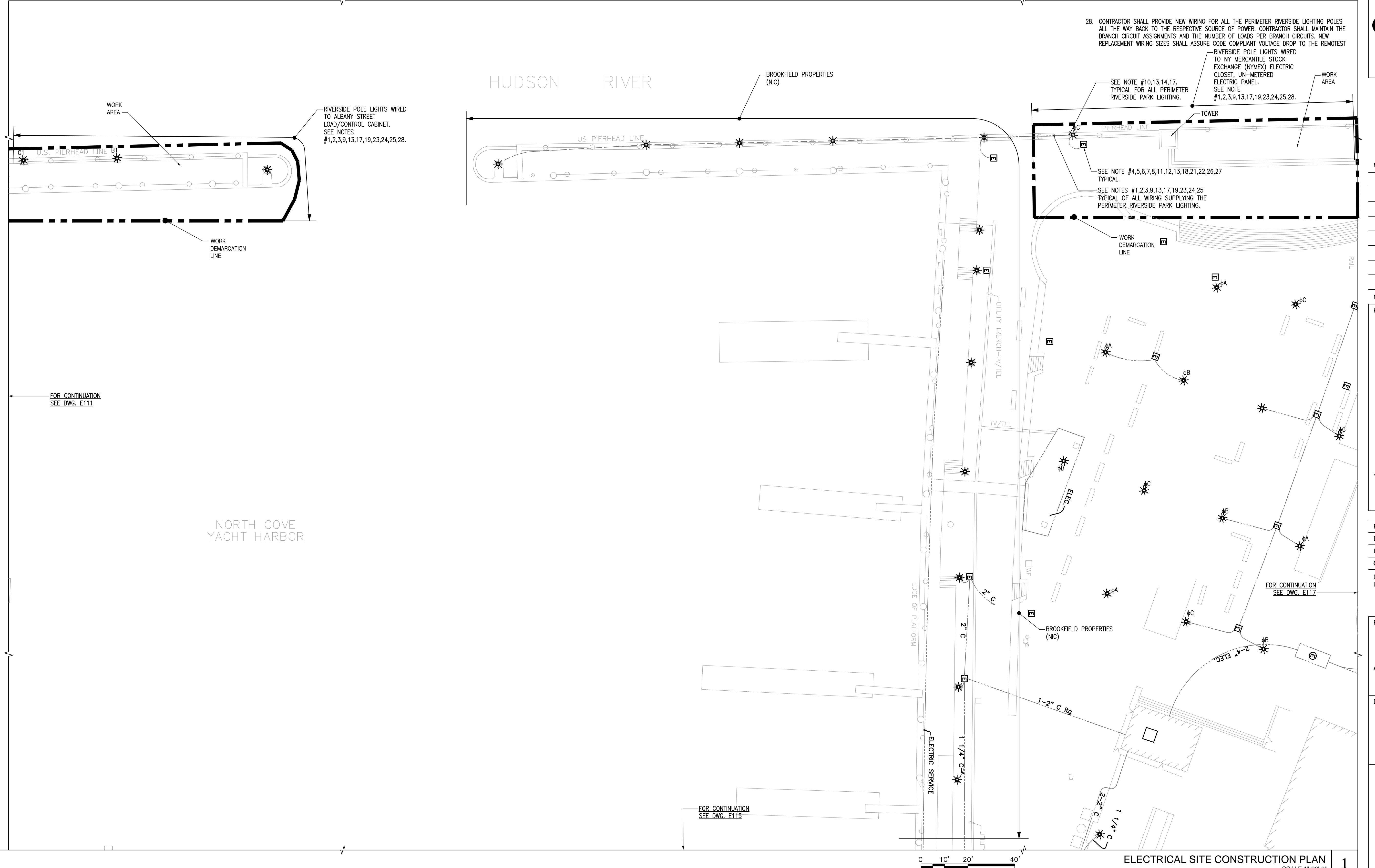
SANDY SITE AND PARK LIGHTING

Address: MANHATTAN
NEW YORK, NY

Job Title: ELECTRICAL SITE CONSTRUCTION
Plan:

Drawing No.:

E114.00



SEQUENCE OF CONSTRUCTION NOTES

1. AFTER THE DISCONNECTION AND REMOVAL OF THE EXISTING CONDUCTORS. THE CONTRACTOR SHALL CLEAN THE CONDUITS BY PULLING THROUGH A WIRE BRUSH.
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 7. TAG ALL CONDUITS AT THE ENDS AND IN ALL INTERMEDIATE BOXES, HANDHOLES AND OTHER ENCLOSURES USING STAINLESS STEEL TAGS ATTACHED WITH STAINLESS STEEL WIRE.
 8. FURNISH AND INSTALL A NEW 1/8" THICK NEOPRENE GASKET FOR EACH BOX. GASKET SHALL BE FASTENED USING A PLIABLE ADHESIVE AS RECOMMENDED BY THE GASKET MANUFACTURER.
 9. INSTALL NEW REPLACEMENT LIGHTING CONDUCTORS. IDENTIFY ALL CONDUCTORS BY CIRCUIT NUMBER AND PHASE ON WIRE NUMBER, AT EACH TERMINAL OR SPLICING LOCATION AND IN ALL INTERMEDIATE BOXES, HANDHOLES AND OTHER ENCLOSURES USING ENGRAVED PLASTIC WATERPROOF TAGS PERMANENTLY ATTACHED WITH TIE WRAPS.
 10. FURNISH AND INSTALL AN IN-LINE FUSE HOLDER ON THE HOT LEG INSIDE EACH LIGHT POLE. FUSE HOLDERS SHALL BE RATED FOR 600 VOLTS AC AND SHALL BE SUITABLE FOR #6 AWG STRANDED COPPER LINE AND LOAD CRIMPED CONNECTIONS. FUSE HOLDERS SHALL BE FERRAZ SHAWMUT MODEL 'FEB' OR EQUAL. FURNISH AND INSTALL A 5-AMPERE FERRAZ SHAWMUT TYPE 'TRM' TIME-DELAY MIDGET FUSE IN EACH HOLDER. FURNISH BPCA WITH ONE HUNDRED (100) SPARE FUSES AND TWENTY (20) SPARE IN-LINE FUSE HOLDERS.
 11. RE-INSTALL EXISTING LIGHTING HANDHOLE COVERS USING NEW 3/8" DIAMETER STAINLESS STEEL HEX HEAD SHOULDER BOLTS. ALL MOUNTING DEVICES SHALL BE TAMPER RESISTANT TO PREVENT UNAUTHORIZED ACCESS TO LIVE PARTS. PROVIDE BONDING JUMPER FOR GROUNDING OF THE COVER AS PER NYCEC.
 12. IN EACH STREET OR GRASSY AREA LIGHTING HANDHOLE CONTRACTOR SHALL WELD A GROUNDING LUG ON THE UNDERSIDE OF EACH HANDHOLE COVER FOR CONNECTION TO THE HANDHOLE GROUND ELECTRODE (ROD).
 13. CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE GROUNDING CONDUCTOR AND THE INTEGRITY OF THE GROUNDING SYSTEM AT ALL TIMES DURING THE PROCESS OF CONSTRUCTION.
 14. INSIDE EXISTING LIGHT POLES, NEW WIRING SHALL BE 3 #6 AWG.
 15. IN THE EVENT THAT 'DOT' LIGHTING LOADS ARE SUPPLIED BY CONDUCTORS INSTALLED IN EXISTING CONDUITS WHICH ARE TO BE REWIRED FOR BPCA LIGHTING, CONTRACTOR SHALL IDENTIFY THE 'DOT' LOADS, MAINTAIN THE CONTINUITY OF THE CIRCUITS AND INFORM BPCA. CLEANING OF THE RESPECTIVE CONDUITS SHALL BE AS COORDINATED WITH AND AS APPROVED BY BPCA AND DOT.
 16. INSIDE EXISTING LIGHT POLES, CONTRACTOR SHALL CHECK THE CONDITION OF THE EXISTING GROUNDING LUG AND IF FOUND CORRODED CONTRACTOR SHALL REPLACE IT WITH NEW.
 17. DRAWINGS ARE DIAGRAMMATIC AND IDENTIFY THE BRANCH CIRCUITS ASSIGNED FOR EACH PARTICULAR AREA. ALL LIGHT POLES SHALL BE ALTERNATELY WIRED PER PHASE LEG SO THAT NO AREA SHALL REMAIN IN TOTAL DARKNESS IN THE EVENT OF A PHASE FAULT. FOLLOWING AND MAINTAINING THE BRANCH CIRCUIT ASSIGNMENTS AND METHOD OF CIRCUITING, EXACT WIRING SHALL BE AS PER FIELD CONDITIONS, AS PER EXACT LAYOUT OF THE UNDERGROUND CONDUITS. THE LOADS SHALL BE BALANCED PER PHASE LEG AND THE CONTRACTOR SHALL SUBMIT AS-BUILTS SHOWING THE EXACT WIRING OF THE LIGHT POLES. CIRCUITING AND WIRE SIZES SHALL TAKE INTO ACCOUNT THE VOLTAGE DROP TO THE REMOTEST LOAD (LIGHT POLE) FOR EACH RESPECTIVE
 18. IN ALL EXISTING BPCA ELECTRICAL HANDHOLES WHERE CORRODED GROUNDING HARDWARE AND CONDUCTORS MOUNTING HARDWARE HAVE BEEN REMOVED, UNDER THE DEMOLITION WORK, CONTRACTOR SHALL PROVIDE TEMPORARY LIGHTING FOR THE ENTIRE PROJECT AREA DAILY FROM SUNSET UNTIL SUNRISE. A MINIMUM ILLUMINATION OF 0.5 FOOT-CANDLE AT SIDEWALK CONTRACTOR SHALL PROVIDE NEW REPLACEMENT GROUNDING HARDWARE AND CONDUCTORS MOUNTING HARDWARE. IN ADDITION, CONTRACTOR SHALL PROVIDE NEW CONDUCTORS MOUNTING HARDWARE IN ALL EXISTING HANDHOLES AS REQUIRED TO SUPPORT THE NEW CONDUCTORS. MOUNTING HARDWARE SHALL BE HOT DIPPED GALVANIZED STEEL OR FIBERGLASS. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS. CONTRACTOR SHALL MAINTAIN AT ALL TIMES CONTINUITY OF THE GROUNDING SYSTEM.
 19. CONTRACTOR SHALL MAINTAIN SUPPLIED WITH POWER AT ALL TIMES THE 24 HOUR LOADS OF SCHOOL LIGHTS, POLICE EQUIPMENT AND LIGHTING POLE RECEPTACLES.
 20. CONTRACTOR SHALL MAINTAIN SUPPLIED WITH POWER AT ALL TIMES THE 24 HOUR LOADS OF SCHOOL LIGHTS, POLICE EQUIPMENT AND LIGHTING POLE RECEPTACLES.
 21. ALL SPLICES AND WIRE TAPS SHALL BE COMPRESSION TYPE. ALL SPLICES AND TAPS INSTALLED IN WEATHERPROOF ENCLOSURES LISTED AS "IN USE" TYPE.
 22. IN EXISTING ELECTRICAL HANDHOLES WHERE THERE IS AN INTERFACE BETWEEN EXISTING TO REMAIN PARK LIGHTING, EXISTING TO REMAIN STREET LIGHTING AND EXISTING TO BE REWIRED PARK LIGHTING, CONTRACTOR SHALL SEPARATE EXISTING TO REMAIN CABLES SO AS TO MAINTAIN THE CONTINUITY OF THE EXISTING TO REMAIN CIRCUITS. CONTRACTOR SHALL IDENTIFY AND DISCONNECT THE RESPECTIVE CABLES PRIOR TO SEPARATION. CONTRACTOR SHALL PROVIDE NEW CONNECTORS, STREET LIGHTING CONNECTORS AS MANUFACTURED BY POLARIS OR APPROVED EQUAL. COORDINATE WITH BPCA.
 23. PROVIDE NEW WIRING SUPPLYING THE GLASS BENCH. PROVIDE NEW LIGHTING IF REQUIRED.
 24. IN EXISTING ELECTRICAL HANDHOLES SERVING PARK LIGHTING THE CONDUIT ENDS SHALL HAVE THE CORROSION REMOVED AND SHALL BE TREATED WITH ANTI-CORROSIVE COATING. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR THE COATING.
 25. BRANCH CIRCUIT PHASE LEG.



**HUGH L. CAREY
BATTERY PARK
CITY AUTHORITY**

A business card for Ensign Engineering, P.C. The card features a black oval logo on the left containing the company name and a small map of New York State. To the right of the logo, the company name is printed in large, bold, black capital letters. Below it, the address and city information are listed in a smaller, bold, black font. At the bottom, the telephone and fax numbers are provided, along with the company's website address.

nsultants:

**ENSIGN
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NOTE: Drawing may be printed at reduced scale.
Refer to graphic scale.

Date **Submittal**

Plan: SHADED AREA = AREA OF WORK

The figure shows a plan view map of a street network. A large rectangular area is overlaid on the map, divided into a grid. The top-right corner of this rectangle is shaded gray, representing the 'AREA OF WORK'. A compass rose at the bottom right indicates the cardinal directions: North (N), South (S), East (E), and West (W).

Project Engineer:	EUGENE KIELMANOWICZ, P.E.	
Signer:	LUCIAN LUKE PARSONS P.E.	
Drawn by:	ALVIN WONG	
Checked by:	CARL J. CANNIZZARO, P.E.	
Design No. or W No.:	Facility Code:	Date:
—	N/A	07/22/13

object:

TASK 9

SANDY SITE AND PARK LIGHTING

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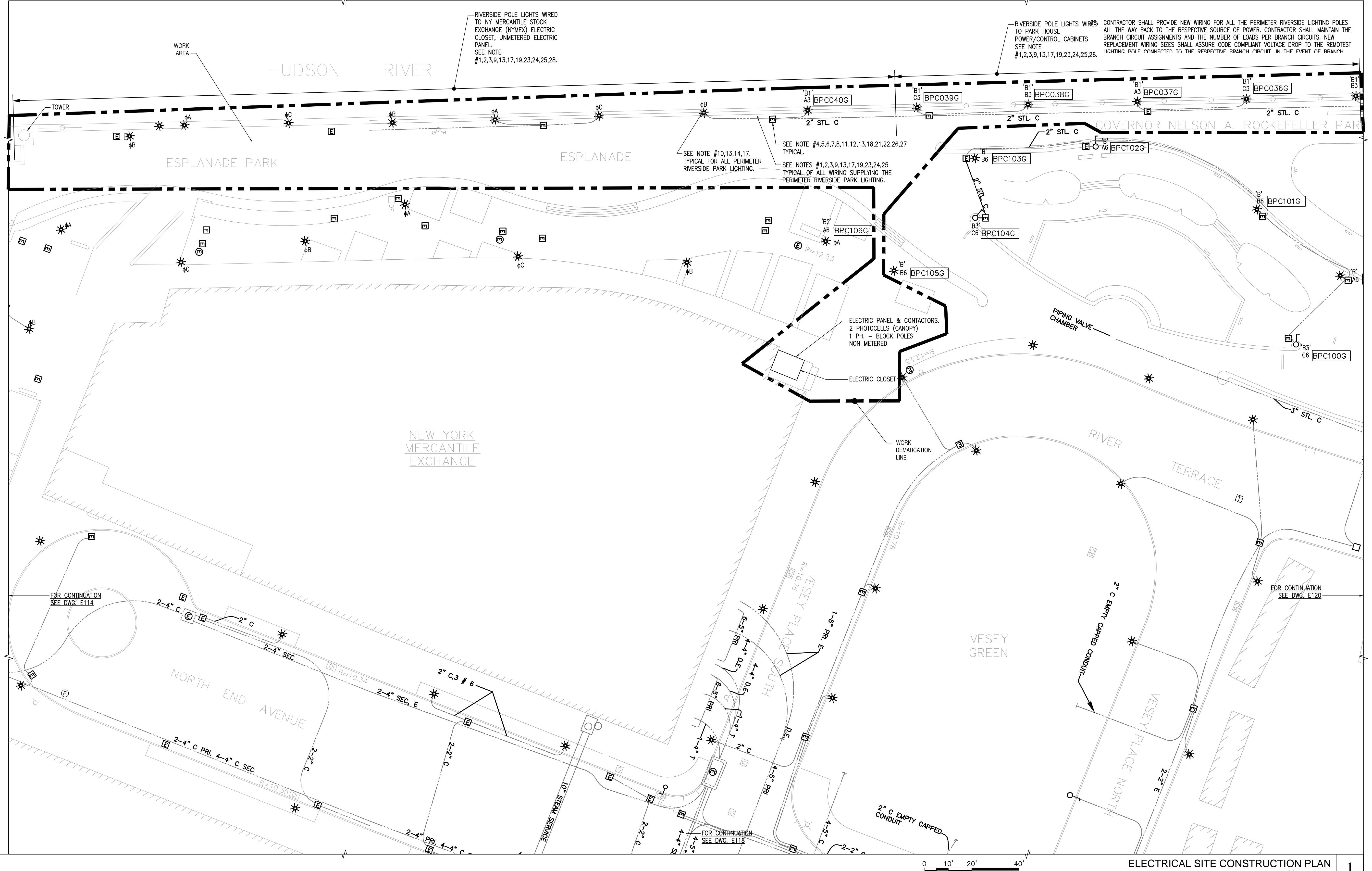
MANHATTAN
NEW YORK, NY

rawing Title:

ELECTRICAL SITE CONSTRUCTION

PLAN

	Drawing No.:
	E117.00
	Sheets in Contract:



SEQUENCE OF CONSTRUCTION NOTES

1. AFTER THE DISCONNECTION AND REMOVAL OF THE EXISTING CONDUCTORS. THE CONTRACTOR SHALL CLEAN THE CONDUITS BY PULLING THROUGH A WIRE BRUSH.
 2. TEST CONDUIT BY PULLING THROUGH CONDUIT A CYLINDRICAL MANDREL NOT LESS THAN TWO PIPE INSIDE DIAMETERS LONG, HAVING AN OUTSIDE DIAMETER EQUAL TO 90 PERCENT OF THE INSIDE DIAMETER OF THE CONDUIT. CONDUITS COATED INSIDE SHALL NOT BE TESTED WITH CYLINDRICAL MANDREL, FOAM SHALL BE USED. NOTIFY ENGINEER IF CONDUIT FOUND TO BE BLOCKED OR OTHERWISE DAMAGED. DAMAGED CONDUITS SHALL BE REPLACED UNDER THE SUPERVISION OF THE BPCA. CONTRACTOR SHALL EXCAVATE THE GROUND OR THE PAVED GROUND AS REQUIRED FOR THE INSTALLATION OF THE REPLACEMENT CONDUIT AND SHALL RESTORE THE PAVEMENT TO THE ORIGINAL CONDITIONS IN ACCORDANCE WITH THE LATEST DOT STANDARDS. PAYMENT SHALL BE BASED ON 10' LENGTHS OF CONDUIT IN ACCORDANCE WITH THE UNIT PRICES SUBMITTED AS PART OF THE BID DOCUMENTS.
 3. IN THE EVENT THAT LOADS OTHER THAN BPCA LOADS ARE FOUND TO BE SUPPLIED BY WIRES INSTALLED IN EXISTING CONDUITS WHICH ARE TO BE REWIRED FOR BPCA LIGHTING AS PART OF THIS PROJECT, CONTRACTOR SHALL IDENTIFY THE LOADS, MAINTAIN CONTINUITY OF THE CIRCUITS AND INFORM BPCA.
 4. REMOVE ALL EXISTING GASKETING MATERIAL FROM THE RIM AND COVER OF LIGHTING. PULL/DISTRIBUTION HANDHOLE.
 5. CLEAN AND RE-TAP EACH OF THE EXISTING FRAME BOLT HOLES.
 6. CLEAN EACH OF THE LIGHTING PULL/DISTRIBUTION HAND HOLE OF ALL SOIL, DEBRIS, CONCRETE RUNOFF, WATER, ETC.
 7. TAG ALL CONDUITS AT THE ENDS AND IN ALL INTERMEDIATE BOXES, HANHOLES AND OTHER ENCLOSURES USING STAINLESS STEEL TAGS ATTACHED WITH STAINLESS STEEL WIRE.
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23. CONTRACTOR SHALL PROVIDE TEMPORARY LIGHTING FOR THE ENTIRE PROJECT AREA DAILY FROM SUNSET UNTIL SUNRISE. A MINIMUM ILLUMINATION OF 0.5 FOOT-CANDLE AT SIDEWALK SHALL BE MAINTAINED. CONTRACTOR SHALL SUBMIT A TEMPORARY LIGHTING PLAN TO OWNER DETAILING QUANTITY AND LOCATION OF LIGHTS FOR APPROVAL. CONTRACTOR SHALL BE RESPONSIBLE FOR COSTS AND MONITORING TEMPORARY LIGHTING UNTIL THE EXISTING LIGHTING HAS BEEN REWIRED, TESTED AND ACCEPTED BY THE ENGINEER.
 24. ALL WIRE SHALL BE STRANDED COPPER WITH XLP INSULATION UL LISTED AS TYPE XHHW-2, 600V, UON. SIZE AS INDICATED ON THE DRAWINGS.
 25. ALL REPLACEMENT CONDUIT SHALL BE PVC COATED HEAVY WALL, RIGID GALVANIZED STEEL, SIZE AS REQUIRED TO MATCH EXISTING.
 26. ALL SPLICES AND WIRE TAPS SHALL BE COMPRESSION TYPE. ALL SPLICES AND TAPS INSTALLED WITHIN THE PAVEMENT LIGHTING BOXES SHALL UTILIZE SCOTCHCAST RESIN-FILLED SPLICE KITS AS MANUFACTURED BY 3M, OR EQUAL. IN EACH ELECTRICAL HANDHOLE, PROVIDE 3'-0" OF SLACK FOR EACH NEW BRANCH CIRCUIT CONDUCTOR.
 27. IN ALL EXISTING PAVEMENT OR GRASSY AREA LIGHTING HANDHOLES WHERE WATER IS PRESENT ON THE REGULAR BASIS, CONTRACTOR SHALL USE SLWB/SLOWB SUBMERSIBLE STREET LIGHTING CONNECTORS AS MANUFACTURED BY POLARIS OR APPROVED EQUAL. COORDINATE WITH BPCA.



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NOTE: Drawing may be printed at reduced scale.
Refer to graphic scale.

25-13 100% SUBMISSION

No. Date Submittal

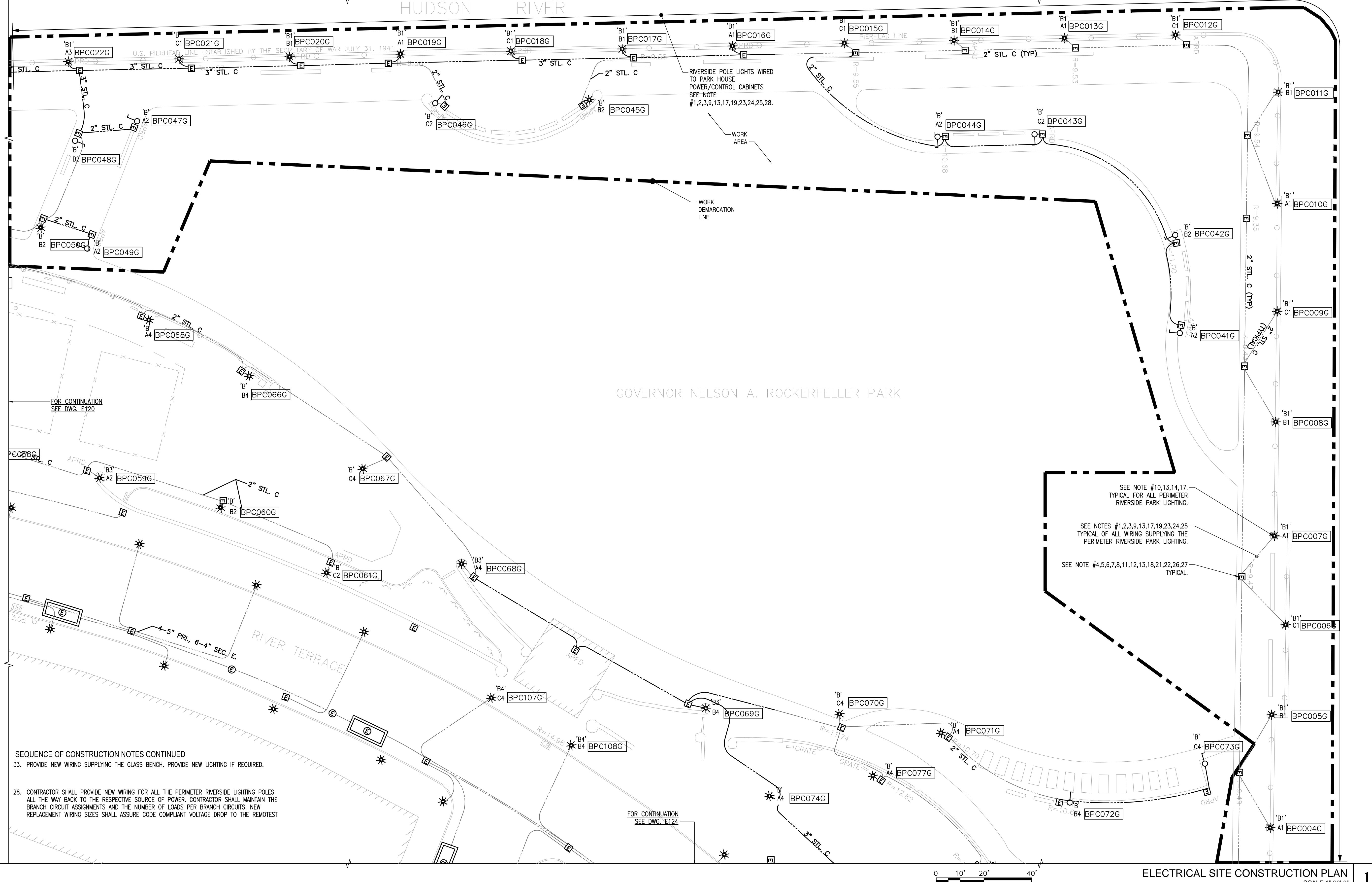
Key Plan: SHADED AREA = AREA OF WORK

The figure is a Key Plan map. It features a large, tilted rectangular area outlined in black, representing the 'Area of Work'. This area is divided into several smaller rectangles by a grid of lines. The background shows a detailed street map with various buildings and roads. In the bottom right corner, there is a compass rose with four arrows pointing North (N), South (S), East (E), and West (W). The compass rose is oriented vertically.

Project Engineer:	EUGENE KIELMANOWICZ, P.E.	
Designer:	LUCIAN LUKE PARSONS P.E.	
Drawn by:	ALVIN WONG	
Checked by:	CARL J. CANNIZZARO, P.E.	
Design No. or LLW No.:	Facility Code:	Date:
=	N/A	07/22/13

Project:	TASK 9 SANDY SITE AND PARK LIGHTING
Address:	MANHATTAN NEW YORK, NY
Drawing Title:	ELECTRICAL SITE CONSTRUCTION PLAN

	Drawing No.:
	E123.00
	Sheets in Contract: 17 - 15



SEQUENCE OF CONSTRUCTION NOTES

- AFTER THE DISCONNECTION AND REMOVAL OF THE EXISTING CONDUCTORS, THE CONTRACTOR SHALL CLEAN THE CONDUITS BY PULLING THROUGH A WIRE BRUSH.
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- REMOVE ALL EXISTING GASKETING MATERIAL FROM THE RIM AND COVER OF LIGHTING PULL/DISTRIBUTION HANDHOLE.
- CLEAN AND RE-TAP EACH OF THE EXISTING FRAME BOLT HOLES.
- CLEAN EACH OF THE LIGHTING PULL/DISTRIBUTION HAND HOLE OF ALL SOIL, DEBRIS, CONCRETE, RUNOFF, WATER, ETC.
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HUGH L. CAREY
BATTERY PARK
CITY AUTHORITY

Consultants:

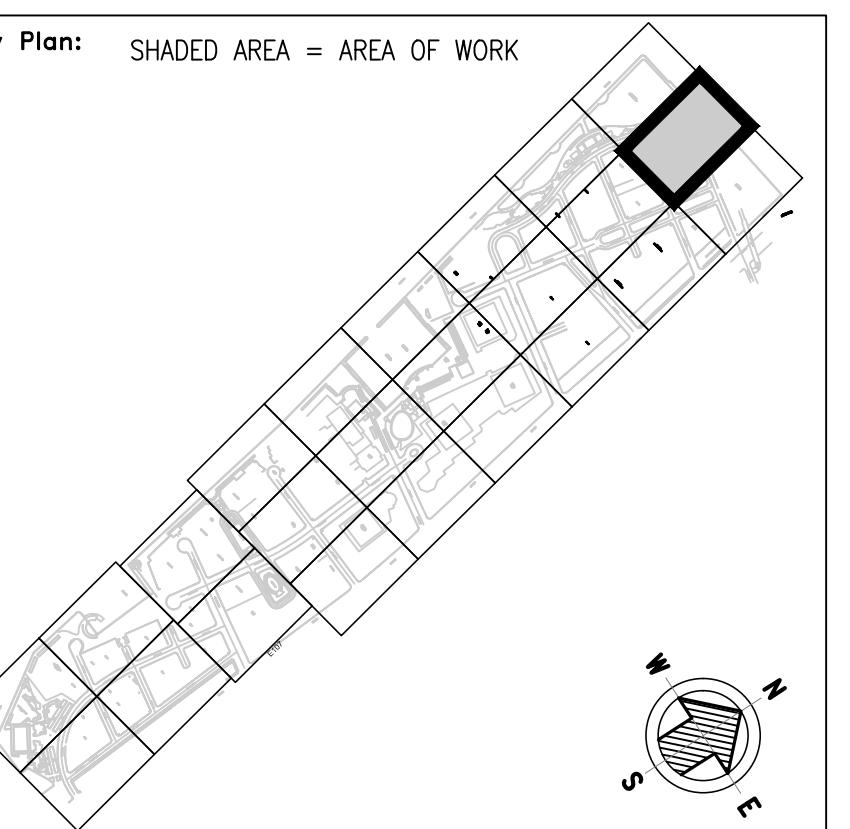
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No.	Date	Revision

09-25-13 100% SUBMISSION

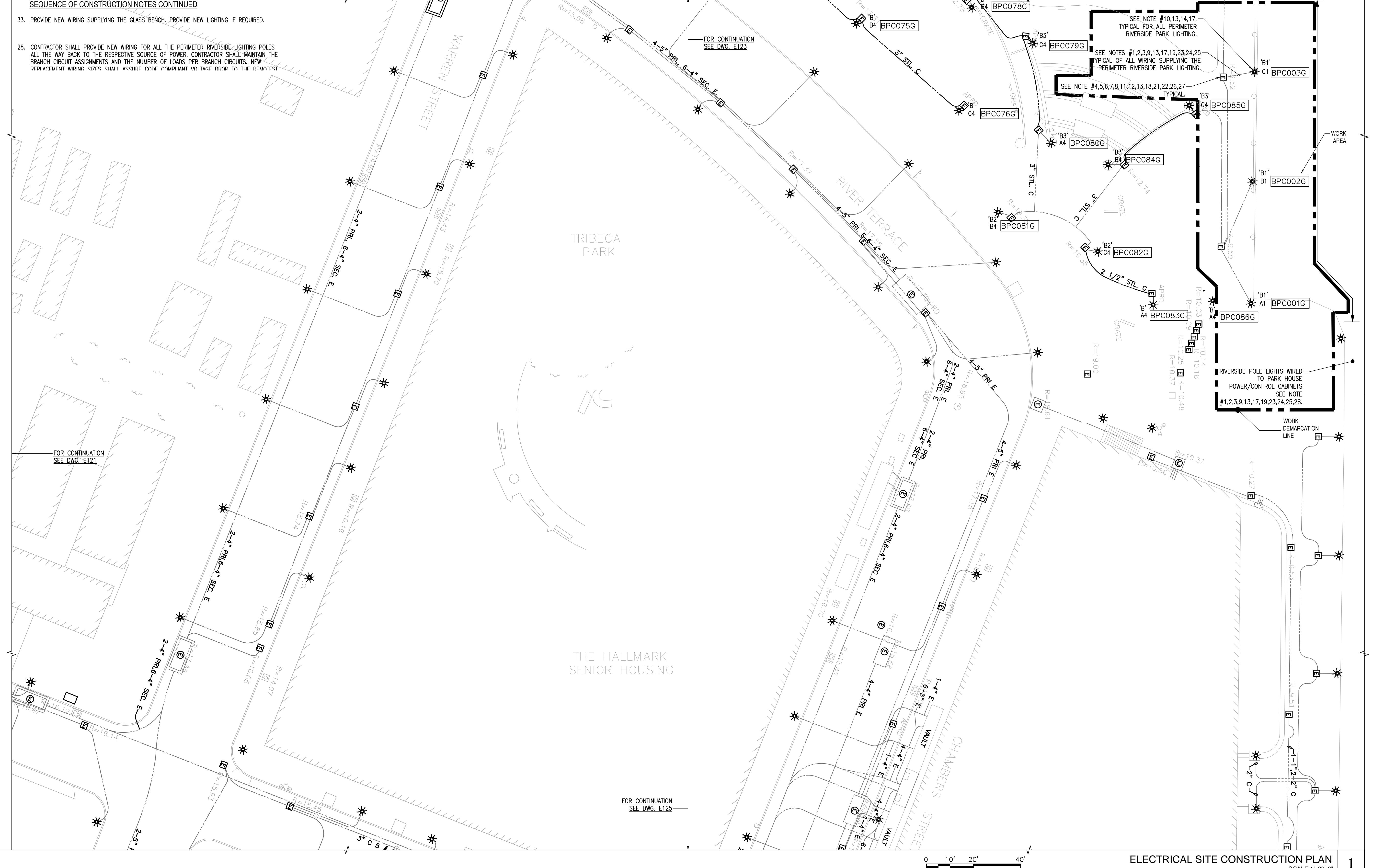
No. Date Submittal



Project Engineer: EUGENE KIELMANOWICZ, P.E.
Designer: LUCIAN LUKE PARSONS P.E.
Drawn by: ALVIN WONG
Checked by: CARL J. CANNIZARO, P.E.
Design No. or LLW No.: - Facility Code: N/A Date: 07/22/13

Project: TASK 9
SANDY SITE AND PARK LIGHTING
Address: MANHATTAN NEW YORK, NY
Drawing Title: ELECTRICAL SITE CONSTRUCTION PLAN

Drawing No.: E124.00
Sheets in Contract: 14 of 15





HUGH L. CAREY
BATTERY PARK
CITY AUTHORITY

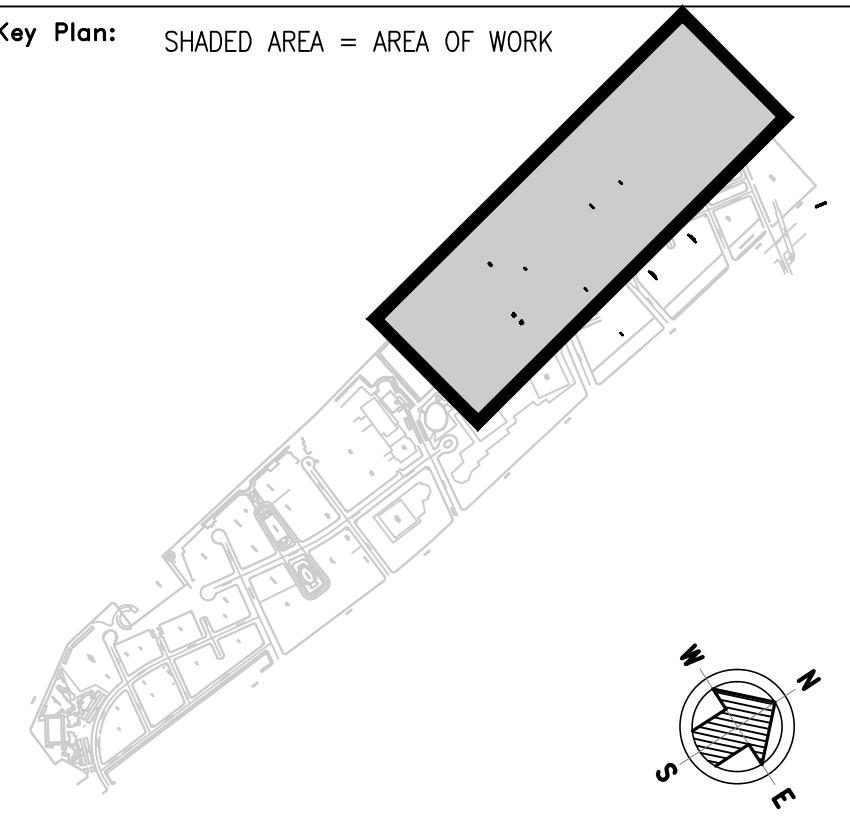
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No. Date Revision

09-25-13 100% SUBMISSION

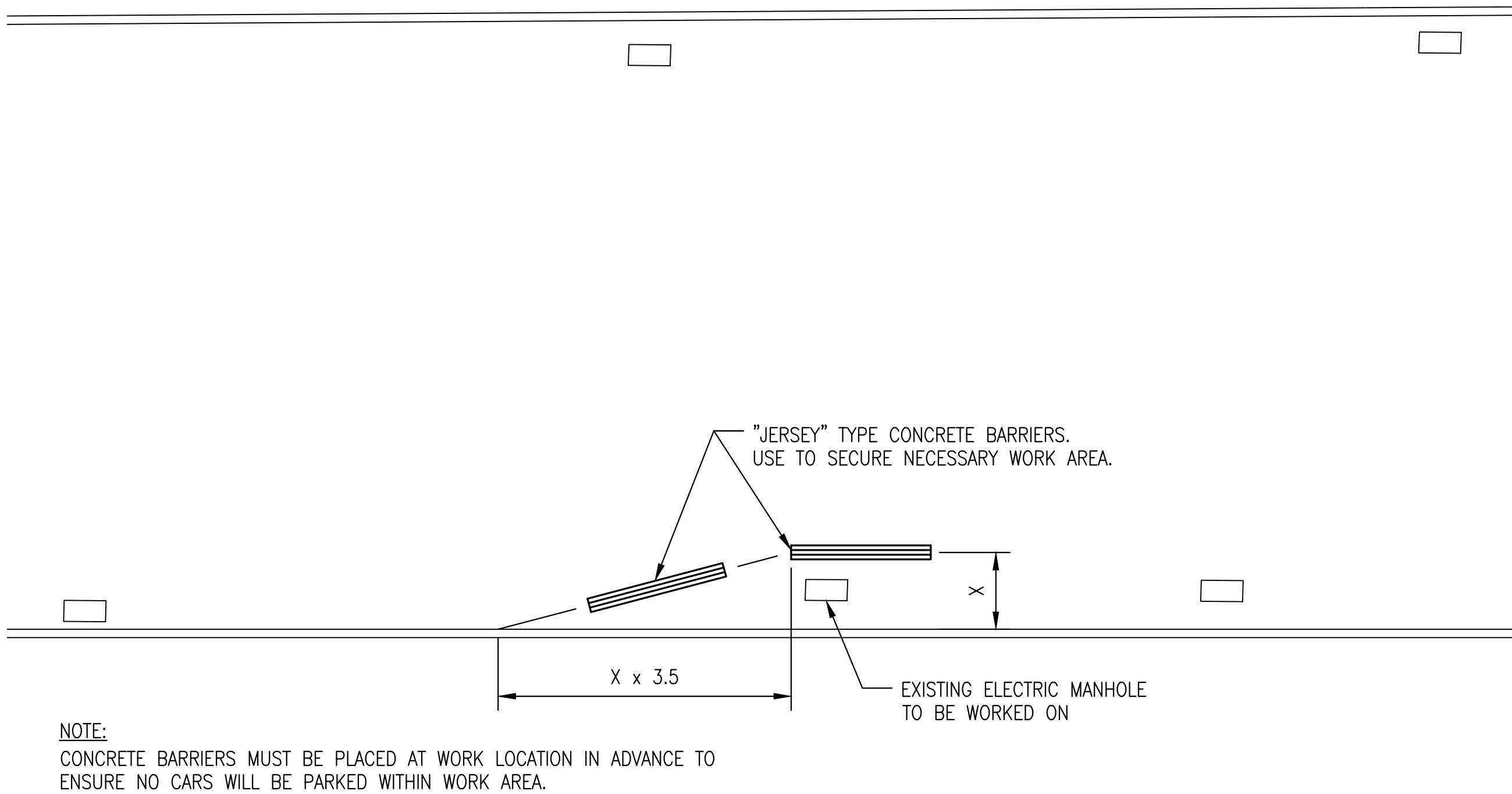
No. Date Submittal



Project Engineer: EUGENE KIELMANOWICZ, P.E.
 Designer: LUCIAN LUKE PARSONS P.E.
 Drawn by: JAMES M. DUMORNE
 Checked by: CARL J. CANNIZARO, P.E.
 Design No. or LLW No.: - Facility Code: N/A Date: 07/22/13

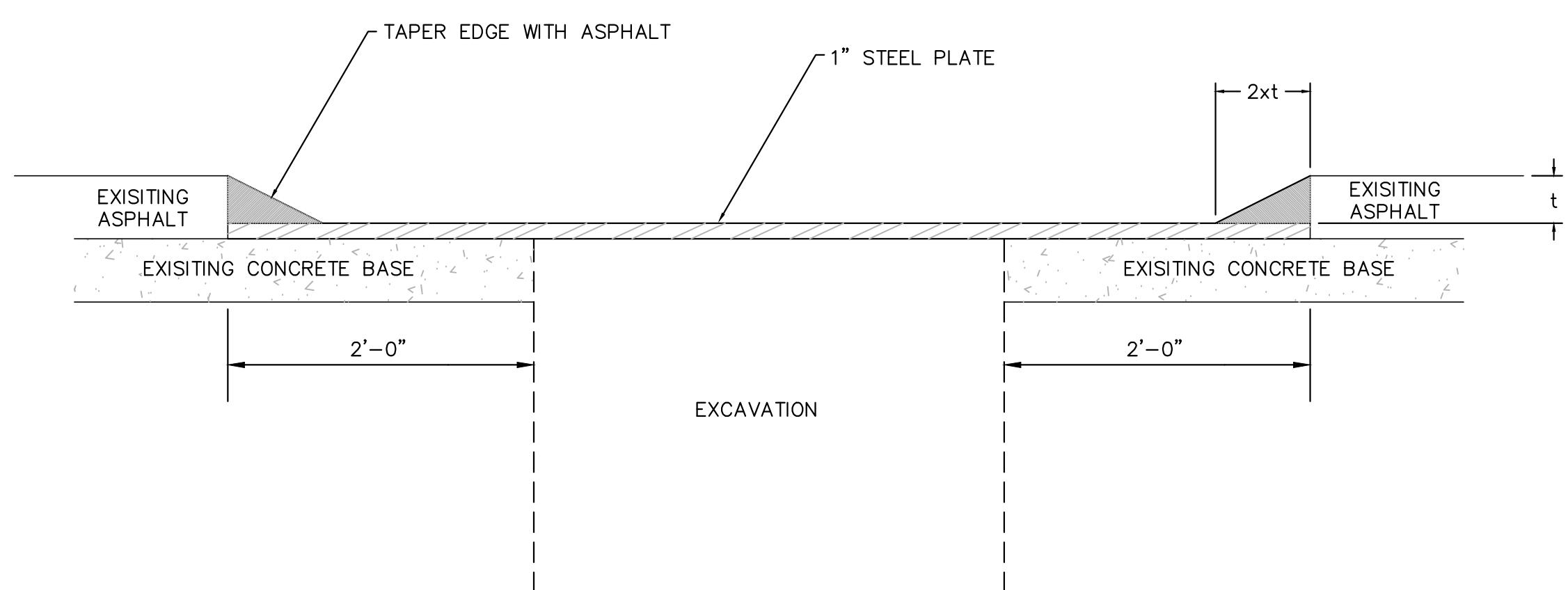
Project: TASK 9
 SANDY SITE AND PARK LIGHTING
 Address: MANHATTAN NEW YORK, NY
 Drawing Title: ELECTRICAL DETAILS

Drawing No.: E601.00
 Sheets in Contract: 15 of 15



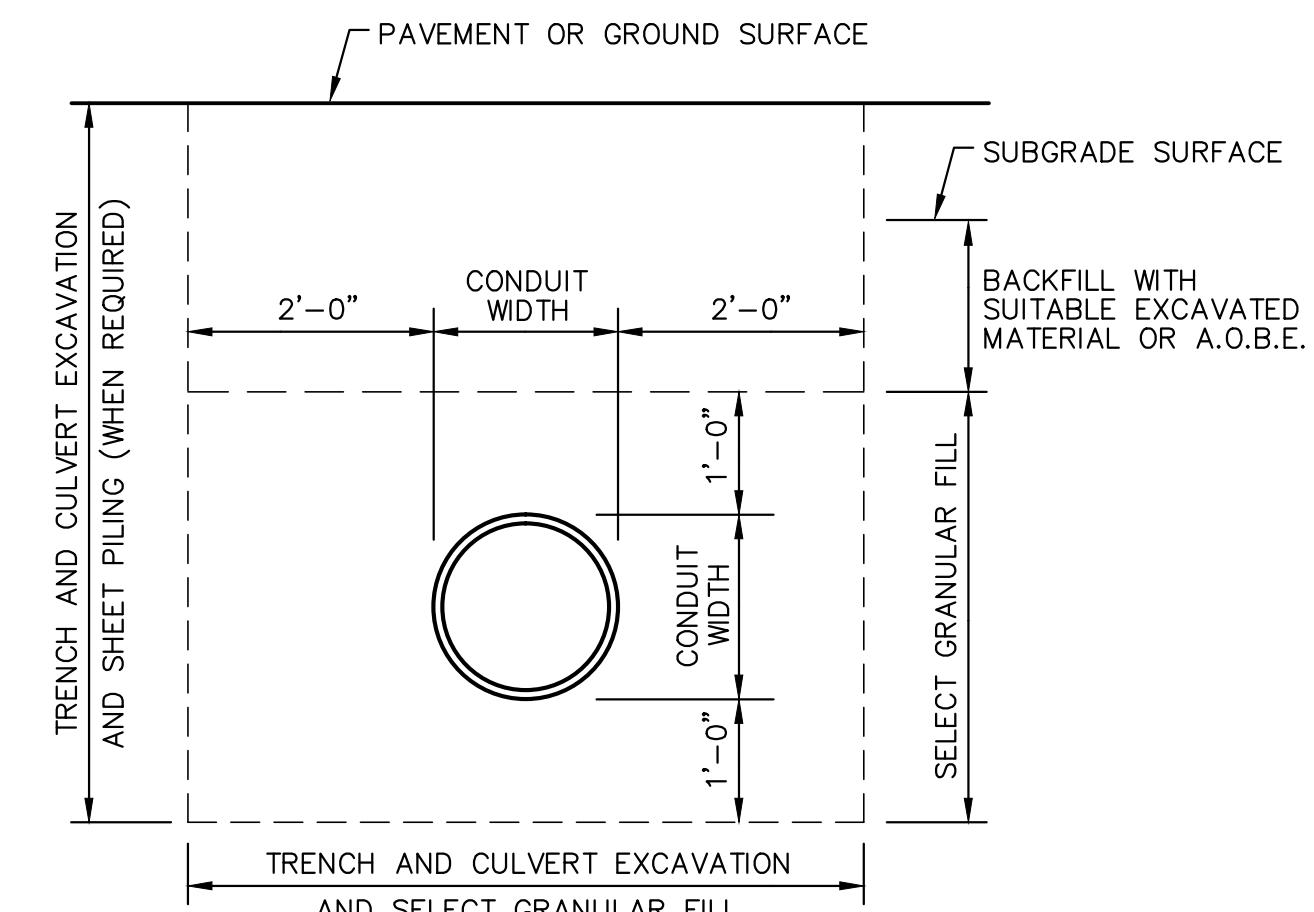
TRAFFIC PROTECTION DETAIL

1" = 10'-0"



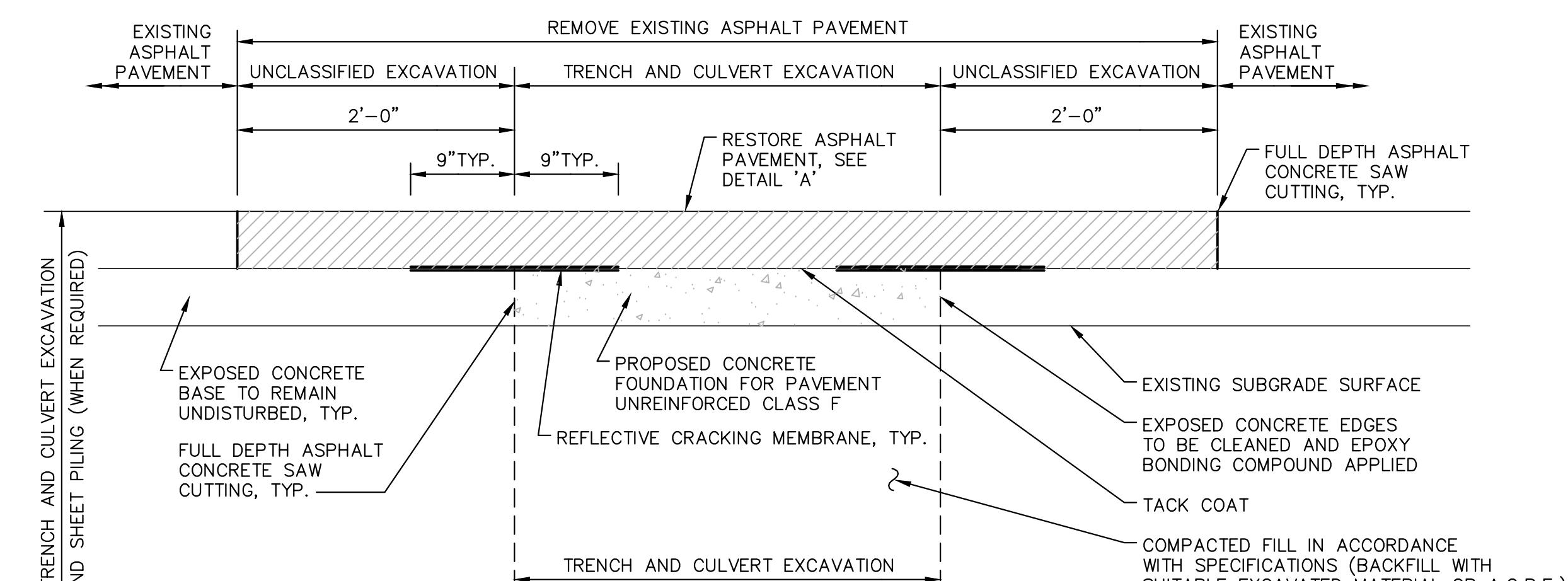
TEMPORARY PLATING DETAIL

N.T.S.



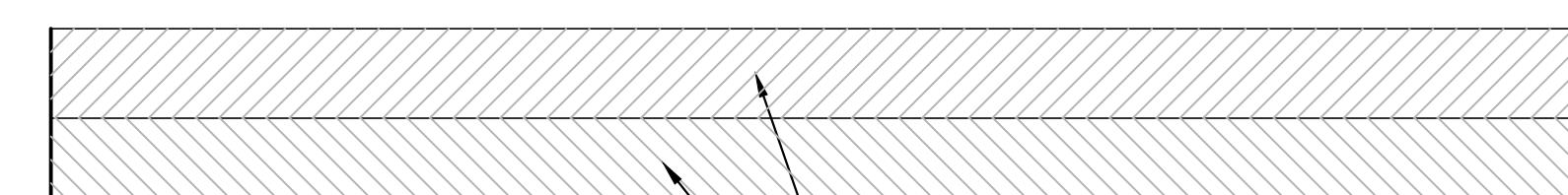
CONDUIT ON BEDDING MATERIAL

N.T.S.



PAVEMENT RESTORATION

N.T.S.



DETAIL 'A' ASPHALT PAVEMENT

N.T.S.

NOTES:

- ALL CONSTRUCTION DETAILS SHOWN ON THE DRAWING SHALL COMPLY WITH NYC DOT STANDARDS AND BE SUBJECT TO APPROVAL BY SAME NYC DOT AND BATTERY PARK CITY AUTHORITY.
- REQUIRED STREET CLOSING SHALL BE COORDINATED AND APPROVED BY NYC DOT AND BATTERY PARK CITY AUTHORITY.

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following electrical materials and methods:

1. Connectors, and splices for branch circuits and feeders.
2. Supporting devices for electrical components.
3. Concrete equipment bases.
4. Electrical identification.
5. Electrical demolition.
6. Cutting and patching for electrical construction.
7. Touchup painting.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items.
- D. Coordination Drawings for electrical installation.
1. Prepare Coordination Drawings according to Division 1 Section "Submittals" to a **1/4-inch>equals-1-foot (1:50)** scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Sections. Include the following:
- a. Provisions for scheduling, sequencing, moving, and positioning large equipment in the building during construction.
- b. Floor plans, elevations, and details, including the following:
- 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - 2) Equipment support details.
 - 3) Sizes and locations of required concrete pads and bases.

- E. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

1.4 QUALITY ASSURANCE

- A. Comply with NYCEC - 2011 for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with existing conditions.
- B. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.
- E. Coordinate connecting electrical service to components furnished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
- I. Coordinate installing electrical identifying devices and markings.

PART 2 - PRODUCTS**2.1 BUILDING WIRE**

- A. Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated. Select to comply with Project's installation requirements.

2.2 SUPPORTING DEVICES

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

- B. Steel channel supports have **9/16-inch (14-mm)** diameter holes at a maximum of **8 inches (203 mm)** o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.
- C. Raceway and Cable Supports: Riser clamps, straps, threaded C-clamps with retainers and spring steel clamps or "click"- type hangers.
- E. Sheet-Metal Sleeves: **0.0276-inch (0.7-mm)** or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.3 CONCRETE EQUIPMENT BASES

- A. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: **3000-psi (20.7-MPa)**, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.4 ELECTRICAL IDENTIFICATION

- A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.
 - 1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
 - 2. Color: Black legend on orange field.
 - 3. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than **3 mils thick by 1 inch wide (0.08 mm thick by 25 mm wide)**.
- D. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Size: Not less than **4 mils thick by 6 inches wide (0.102 mm thick by 152 mm wide)**.
 - a. Compounded for permanent direct-burial service.
 - 2. Embedded continuous metallic strip or core.

- a. Printed Legend: Indicates type of underground line.
- E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched for mechanical fasteners **1/16-inch (1.6-mm)** minimum thick for signs up to **20 sq. in. (129 sq. cm)**, **1/8 inch (3.2 mm)** thick for larger sizes. Engraved legend in black letters on white face.
- H. Interior Warning and Caution Signs: Preprinted, aluminum, baked-enamel finish signs, punched for fasteners, with colors, legend, and size appropriate to the application.
- I. Exterior Warning and Caution Signs: Weather-resistant, nonfading, preprinted, cellulose acetate butyrate signs with **0.0396-inch (1-mm)**, galvanized steel backing, with colors, legend, and size appropriate to the application. **1/4-inch (6.4-mm)** grommets in corners for mounting.
- J. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.6 TOUCHUP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION**3.1 EQUIPMENT INSTALLATION REQUIREMENTS**

- A. Install items level and plumb.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- C. Give right of way to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING METHODS

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Conform to manufacturer's recommendations for selecting supports.
- C. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; **200-lb- (90-kg-)** minimum design load.

3.4 INSTALLATION

- A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Conductor Splices: Keep to the minimum and comply with the following:
 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 2. Use splice and tap connectors that are compatible with conductor material.
- C. Wiring at Outlets: Install with at least **12 inches (300 mm)** of slack conductor at each outlet.
- D. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- E. Install devices to securely and permanently fasten and support electrical components.
- F. Raceway Supports: Comply with NFPA 70 and the following requirements:
 1. Conform to manufacturer's recommendations for selecting and installing supports.
 2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 6. Hanger Rods: **1/4-inch (6-mm)** diameter or larger threaded steel, except as otherwise indicated.
 7. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for **1-1/2-inch (38-mm)** and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- G. Vertical Conductor Supports: Install simultaneously with conductors.
- H. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- I. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than **24 inches (610 mm)** from the box.
- J. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

- K. Firestopping: Apply to cable and raceway penetrations of fire-rated assemblies. Perform firestopping to reestablish the original fire-resistance rating of the assembly at the penetration.
- L. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
 3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
 4. In partitions of light steel construction use sheet-metal screws.
 5. Fill and seal holes drilled in concrete and not used.
 6. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.
- M. Install concrete pads and bases according to requirements of Division 3 Section "Cast-in-Place Concrete."
- N. Install identification devices where required.
 1. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
 2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.
 3. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
 4. Identify raceways and cables of certain systems with color banding as follows:
 - a. Bands: Colored adhesive marking tape. Make each color band **2 inches (51 mm)** wide, completely encircling conduit, and place adjacent bands of 2-color markings in contact, side by side.
 - b. Locate bands at changes in direction, at penetrations of walls and floors, at **50-foot (15-m)** maximum intervals in straight runs, and at **25 feet (8 m)** in congested areas.
 - c. Colors: As follows:
 - 1) Fire-Alarm System: Red.
 - 2) Security System: Blue and yellow.
 - 3) Telecommunications System: Green and yellow.
 5. Tag or label power circuits for future connection and circuits in raceways and enclosures with other circuits. Identify source and circuit numbers in each cabinet, pull box, junction box, and outlet box. Color coding may be used for voltage and phase indication.
 6. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above power and communication lines. Locate **6 to 8 inches (150 to 200 mm)** below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of **16 inches (400 mm)**, use a single line marker.
 7. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.5 DEMOLITION

- A. Where electrical work to remain is damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work Indicated to Be Demolished: Remove exposed electrical installation in its entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring indicated to be abandoned in place, **2 inches (50 mm)** below the surface of adjacent construction. Cap and patch surface to match existing finish.
- D. Removal: Remove demolished material from the Project site.
- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.7 TOUCHUP PAINTING

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 16050

SECTION 03733
CONCRETE REPAIR WORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide labor, materials, equipment, and services to provide for the structural repair of concrete members with manufactured structural repair concrete/mortar as shown on Drawings and as specified herein

1.02 RELATED SECTIONS

(NOT USED)

1.03 REFERENCE STANDARDS

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society of Testing and Materials (ASTM)
- B. International Concrete Restoration Institute (ICRI)

1.04 SUBMITTALS

A. Product Data

Provide manufacturer's information on the anti-corrosion coating and structural repair concrete/mortar, including application instructions and specifications.

B. Quality Control Submittals

1. Certificates:

- a. Furnish manufacturer's certification that materials meet or exceed Specification requirements.

2. Contractor Qualifications

Provide proof of Installer and Manufacturer qualifications specified under "Quality Assurance".

1.05 QUALITY ASSURANCE**A. Qualifications**

1. Installer: Company specializing in the Work of this Section shall have a minimum of three years experience and at least two projects with similar quantity of materials. Contractor shall be trained by the repair mortar manufacturer and shall have a certificate of training on file from the manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Materials specified shall be delivered to the site in sealed, properly labeled containers. Containers shall indicate manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable).
- B. Keep containers tightly closed when not in use. Comply with manufacturer's printed instructions for storing and protecting materials.
- C. Do not store liquid material in hot sun. Keep material from freezing.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply if the temperature is below 50°F or above 85°F unless the material manufacturer is consulted for recommendations.
- B. Do not use frozen materials or materials coated with ice or frost.
- C. Do not apply when there is expectation of rain within 24 hours.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Sto Concrete Restoration Div., Atlanta, GA 30331
- B. Sika Corp, Lyndhurst, NJ 07071
- C. Strongwall Industries, Ridgewood, NJ 07451

2.02 MATERIALS

- A. Structural Repair Concrete/Mortar - Horizontal Application

1. Shall have non-shrink characteristics and be of high compressive and bond strength. Material shall be capable of being poured or troweled in place for horizontal applications and for formed applications of sufficient dimensions to allow for proper placement of material and conform to the following properties:
 - a. Compressive strength of 5000 psi in 28 days when tested in accordance with ASTM C109.
 - b. Bond strength of 2000 psi in 28 days when tested in accordance with ASTM C882 modified). Results of tests showing failure of base material is acceptable alternative.
 - c. Flexural strength of 1600 psi in 28 days when tested in accordance with ASTM C78 or ASTM C293.
 - d. Maximum linear length change shall be maximum of 0.08% at 28 days when tested in accordance with ASTM C157.
 - e. Modulus of elasticity shall be between 3.0 and 3.5×10^6 when tested in accordance with ASTM C469.
 2. Repair concrete/mortar shall be "CR701 Sto Trowel-Grade Mortar" as manufactured by Sto Concrete Restoration Division, "Sikatop 122 Plus" as manufactured by Sika Corporation, or "SW-81/SW-81F" as manufactured by Strongwall Industries.
- B. Anti-corrosion Coating
1. Corrosion-inhibiting, epoxy/acrylic resin, protective coating for steel reinforcing bars that will not form a vapor barrier or bond break with the repair mortar with the following properties:
 - a. Bond strength of 1800 psi in 2 hours when tested in accordance with ASTM C882.
 - b. Flexural strength of 2000 psi in 28 days when tested in accordance with ASTM C78.
 - c. Tensile strength of 800 psi in 28 days when tested in accordance with ASTM C190.
 2. Anti-corrosion coating shall be "CR246 Sto Bonding and Anti-corrosion Agent" by Sto Concrete

Restoration Division or "Armatec 110" as manufactured by Sika Corporation.

E. Miscellaneous Materials

1. Water: Potable water, ASTM C94
2. J hooks: 1/4" diameter threaded rod, Type 316 stainless steel
3. Epoxy paste adhesive: ASTM C882
4. Coarse aggregate: Clean, washed crushed stone, 3/8" maximum size, conforming to ASTM C33.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine all adjoining work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Authority any conditions that prevent the performance of this Work.
- B. The Contractor shall determine the most suitable material indicated in Part 2 of this Specification to be used for each application to achieve the most structural sound repair with appropriate finish, unless specifically indicated on the Drawings. As an example, the Contractor may decide to form an application on a vertical surface in lieu of using the overhead repair mortar. The contractor shall include in the repair work procedure what materials will be used where and how the repair will be achieved for both the structural integrity of the patch and the correct finish.

3.02 PREPARATION AND PROTECTION

A. Protection

Protect adjacent surfaces not to be restored. Protect sills, ledges, and projections from material droppings.

B. Surface Preparation

1. Remove spalled and weak concrete and remove all loose and foreign material. Chip substrate by

bush hammering or other mechanical means acceptable to the repair concrete/mortar manufacturer to obtain a minimum aggregate-fractured surface profile of $1/8\pm"$ conforming to an ICRI CSP 7 or greater surface preparation. Minimum depth of repair shall be $1/2"$, with the perimeter of the repair having a minimum of $1/8"$ in depth. Feather edging is not permitted.

2. If steel reinforcing is exposed, chip out behind the reinforcing steel. Chip a minimum of $1/2"$ behind the bar and $3"$ past the point where the bar is exposed. Concrete behind bars shall be removed enough to allow for the entire circumference of the bar to be cleaned. Remove concrete to the point past where sound material begins.
3. Exposed steel reinforcement and steel beams shall be free of all rust, scale, oil, paint, grease, loose mill scale, and all other foreign matter that will prevent bonding with the repair concrete. Use power chipping or power driven brushes and clean to an SSPC-SP2 or SP3 surface preparation.

2

3.03 ANTI-CORROSION COATING APPLICATION

- A. Mix anti-corrosion coating in accordance with manufacturer's instructions. Apply to dry reinforcing steel using a stiff bristle brush. Brush in well to ensure continuous coverage. Apply in two coats of approximately 10 mils each or as per manufacturer's latest recommendations.
- B. Protect coated steel from weather and allow to dry a minimum of 30-45 minutes between coats or repair concrete/mortar application. However, apply repair material within 24 hours after last coating. If 24 hour period elapses, reapply bonding agent and allow to dry as above.

3.04 REPAIR CONCRETE/MORTAR APPLICATION

- A. Mix structural repair concrete in accordance with manufacturer's instruction. Follow time limits set by manufacturer to prevent hardening of material prior to placement. For material requiring extension with aggregate due to depth of repair, provide $3/8"$ aggregate of proportions specified by the repair mortar manufacturer.

- B. Prior to application of material, thoroughly saturate surface with water. Remove any standing water prior to patching.
- C. Apply a scrub coat of the repair material of proportions determined by manufacturer (indicate in written repair procedure). While still damp, apply repair concrete/mortar.
- D. Apply material behind and around rebars first to completely fill void.
- E. Overhead/Vertical Repairs - Apply repair concrete/mortar, non-formed/overhead application, on vertical and overhead members with a trowel or other such device, all in accordance with the manufacturer's recommendations. Apply in lifts of up to 2" or as determined by material manufacturer at a consistency that the material will not slump. Follow manufacturer's instructions for scoring, curing, priming, and approximate time between layers. Do not leave voids. Trowel exposed surface smooth and to same shape and finish as the adjacent existing surface.
- F. Horizontal Repairs - Pour or trowel repair concrete/mortar, horizontal application, into hole until it is to the same level and at the same pitch as the surrounding slab. For deep repairs, extend mortar with clean aggregate by the amount recommended by the manufacturer. Provide finish as follows:
 1. Surfaces to receive bonded applied cementitious applications such as full-set terrazzo and vitreous ceramic tile: Darby and float surface and follow with a rough broom finish.
 2. Surfaces to receive floor coverings such as resilient flooring, thin-set terrazzo and vitreous ceramic tile, carpeting, wood floors, or surfaces which are intended as walking surfaces such as exposed or painted (cement finish), unless specified otherwise: Steel trowel surface to a smooth plane finish, free of score marks, grooves, depressions and ripples with a tolerance no greater than $\pm 1/8"$ in ten feet.
 3. Surfaces intended to receive roofing, waterproofing membranes: Darby and float surface. Leave surface free from depressions, bulges, rough spots, and other defects.
 4. Ramps, Exterior Concrete Steps: Level surface with wood float and follow with a broom finish perpendicular to direction of traffic.

G. Formed Repairs

1. Apply repair concrete, horizontal application, on vertical members where formwork can be utilized to confine the concrete and the width of repair permits its proper installation.
2. Apply flowable repair mortar for repairs to be formed, especially for thin repairs.
3. Place so as not to leave voids. Vibrate forms with pencil vibrator to remove air bubbles. Remove formwork as soon as possible and trowel exposed surface smooth and to same shape and finish as the adjacent existing surface.

3.05 CURING

- A. As soon as surface of patch has hardened, cure patch a minimum of 48 hours by applying water-based acrylic curing compounds conforming to ASTM C309 or C1315, misting, wet burlap, etc. For patches to be covered with other material, only use curing compounds acceptable to the finish material manufacturer, unless the compound is removed prior to placing the finish material in a manner acceptable to the finish manufacturer.
- B. Follow manufacturer's latest recommendations for any other recommendations. The curing provision of A above shall not be waived unless manufacturer does not permit it.

3.06 PROTECTION AND CLEANING

- A. Clean all adjacent areas of excess material and clean all floors and walls of powder and droppings. Remove misplaced materials from surfaces immediately.
- B. Protect material from freezing and from rainfall prior to final set.

3.07 FIELD QUALITY CONTROL

- A. The Authority will inspect surfaces and reject any that contain cracks or other defects. The repair will be tested for soundness and structural integrity. Any defective areas shall be fixed at Contractor's expense. Notify the Authority's representative in advance of the concrete repairs. The Authority's representative will review the mixing, surface preparation and proper application of all materials.

- B. Engage the services of the material manufacturer's representative to inspect the surface preparation, instruct in the proper usage of the material and to inspect the work throughout the project. Pay for all required fees.

END OF SECTION

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Product Data:	_____	_____
1. Anti-corrosion coating 2. Repair concrete/mortar		
Certificates:	_____	_____
1. Material certification 2. Training certificate		
Qualifications	_____	_____
1. Installer 2. Manufacturer		

* * *

SECTION 16120
CONDUCTORS AND CABLES

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, apply to this Section.

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: In addition to requirements specified in Division 1 Section "Quality Control," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907; or shall be a full-member company of the InterNational Electrical Testing Association.

- 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

- B. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

- 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

- C. Comply with NYCEC-2011.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wires and Cables:
 - a. Alcan Aluminum Corporation; Alcan Cable Div.
 - b. American Insulated Wire Corp.; Leviton Manufacturing Co.
 - c. BICC Brand-Rex Company.
 - d. Carol Cable Co., Inc.
 - e. Senator Wire & Cable Company.
 - f. Southwire Company.
 - 2. Connectors for Wires and Cables:
 - a. AMP Incorporated.
 - b. General Signal; O-Z/Gedney Unit.
 - c. Monogram Co.; AFC.
 - d. Square D Co.; Anderson.
 - e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Rubber Insulation Material: Comply with NEMA WC 3.
- C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- F. Conductor Material: Copper.
- G. Conductor Material: Copper, except feeders and services larger than No. 6 AWG may be aluminum.
- H. Conductor Material: Copper.
- I. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

2.3 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

- A. Service Entrance: Type USE.
- B. Service Entrance: Type RHW or THWN, in raceway.
- C. Feeders: Type THWN, in raceway.
- D. Feeders: Type UF, 90C insulation.
- E. Feeders: Type MC, 3-conductor, 90C insulation, aluminum corrugated sheath, PVC jacket, in cable tray.
- F. Branch Circuits: Type XHHW, in raceway.
- H. Class 1 Control Circuits: Type THWN, in raceway.
- M. Class 2 Control Circuits: Power-limited tray cable, in cable tray.
- N. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.
- O. Class 2 Control Circuits: Type THWN, in raceway.

3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Remove existing wires from raceway before pulling in new wires and cables.
- C. Pull Conductors: 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.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

- F. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
- H. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
- I. Identify wires and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

- A. Conductor Splices: Keep to minimum.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.
- D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
- E. Wiring at Outlets: Install conductor at each outlet, with at least **12 inches (300 mm)** of slack.
- F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- G. 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 and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field quality-control testing.
- B. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing.
- C. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- D. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 16120

SECTION 02201
EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Remove all items designated to be removed and excavate for new construction, fill and backfill as required, prepare subgrades and place aggregate bases for pavements. Protect existing vegetation and all adjoining properties and existing structures from damage.

1.02 RELATED SECTIONS

(NOT USED)

1.03 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society of Testing and Materials (ASTM) standards, latest editions.
- B. United States Department of Labor (USDOL), Occupational Safety and Health Administration (OSHA):
29 CFR 1910, Occupational Safety and Health Standards
- G. All Applicable New York City Department of Environmental Protection (NYCDEP) Rules and Regulations
- H. All applicable New York City Department of Transportation (NYCDOT), Department of Sanitation (NYCDOS), Department of Buildings (NYCDOB), and Transit Authority (NYCTA) Rules and Regulations

1.04 DEFINITIONS**A. Excavation**

Excavation is considered unclassified and consists of removal of material encountered to contract level, stockpiling, testing, loading, handling, transporting and subsequent legal disposal of such.

B. Improvements

Man-produced items such as concrete, brick, asphalt, piping, etc. Those items not naturally occurring.

C. Non-Hazardous Excavated Material

Material that may include or contain mixtures of the following: soil (including, but not limited to, natural undisturbed material), debris, concrete and concrete products (including steel or fiberglass reinforcing rods that are embedded in the concrete), asphalt pavement, brick, glass, rock, municipal solid waste, refuse, and incidental ash. This material includes material defined in Title 6 New York Code of Rules and Regulations 360-7.1(b)(1)(i) and will exceed 6 NYCRR 375-6 Unrestricted Use and Restricted Use Soil Cleanup Objectives and NYSDEC CP-51: Soil Cleanup Guidance Supplemental Soil Cleanup Objectives.

All material excavated from the site is assumed to meet the definition of non-hazardous excavated material.

D. Environmentally Clean Fill and Backfill

1. For fill and backfill proposed for use below cover material (as defined in the previous paragraph) and underneath areas with no potential for public contact (e.g., pavement), environmentally clean fill is defined as soil that has been tested utilizing methods which yield laboratory reporting limits that are below the regulatory comparison criteria and found to contain:

a. No detectable concentrations of volatile organic compounds;

- b. No other organic compounds or inorganic analytes at concentrations above the lower of DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 5, "Allowable Constituent Levels for Imported Fill or Soil" Restricted Residential Use and Ecological Resources Soil Cleanup Objectives; and,
- c. No other organic compounds or inorganic analytes at concentrations above the lower of the NYSDEC CP-51: Soil Cleanup Guidance Residential Use, Protection of Ecological Resources, and Protection of Groundwater Supplemental Soil Cleanup Objectives.
- d. For sites with no ecological resources (as described in CP-51, Section V.C.) the Soil Cleanup Objectives for Ecological Resources shall not apply. The determination regarding whether ecological resources are present shall be made by the IEH Division of the Authority.

1.05 SUBMITTALS**A. Product Data**

Provide manufacturer's information on the compaction equipment to be used on each type of material for review.

B. Shop Drawings

Submit shop drawings and associated calculations for sheeting, shoring, and bracing. Shop drawings and calculations shall be signed and sealed by a New York State licensed professional

D. Quality Control Submittals**1. Contractor Qualifications**

Provide proof of Contractor qualifications specified under "Quality Assurance".

1.06 QUALITY ASSURANCE**A. Qualifications**

1. Company specializing in performing the Work of this Section shall have a minimum of 3 years experience and shall have worked on 3 projects of similar size.

B. Regulatory Requirements

1. Work of this Section shall conform to all requirements of and all applicable regulations and guidelines of all governmental authorities having jurisdiction, including, but not limited to, safety, health, and anti-pollution regulations. Where more stringent requirements than those contained in the Building Code or other applicable regulations are given in this Section, the requirements of this Section shall govern.
2. Conform to requirements of "Safety and Health Standards, Subpart P - Excavations, Trenching and Shoring" - OSHA.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stockpile material in such a manner as to prevent erosion and dust. Provide silt curbs if necessary.
- B. Testing and certification of all imported environmentally clean fill and aggregate are the responsibilities of the Contractor.

1.08 PROJECT/SITE CONDITIONS

- A. Obtain all available on the site affecting or being affected by the project construction.
- B. Prior to clearing and removal or abandonment of improvements, ascertain the exact locations of all existing underground utilities. Protect these during subsequent operations.
 1. Demolish and remove underground utilities designated to be removed. Coordinate with utility

companies for shut-off of services if lines are active.

2. Consult immediately with the owner for directions should uncharted or incorrectly charted piping or other utilities be encountered during excavation. Cooperate with the owner in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Owner.
3. Do not interrupt existing utilities serving facilities occupied others during occupied hours, except when permitted in writing by the owner, and only after acceptable temporary utility service has been provided. Do not proceed with interruption of services without providing a minimum of 48 -hours notice to the affected parties and receiving their written approval.

C. Coordination

Examine drawings to determine sequence of operations, and relation to work of other trades. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.09 SEQUENCING AND SCHEDULING

- A. Perform work in such a manner to ensure a minimum interference with roads, walks, adjacent properties, and facilities to remain open. Do not close or obstruct these items without obtaining permission of the owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Restricted Excavated Material

Remove all debris not explicitly designated to be salvaged (to remain) from improvements and soil excavated during construction from premises and legally dispose of away from premises as part of the base bid.

B. Fill and Backfill

Only environmentally clean fill (as defined in Paragraph 1.04F of this Section) shall be used as fill and backfill. Composition shall consist of angular sands and gravels. Flat structured material such as mica (the main component of "mole" rock) falling into the acceptable gradation or other material affecting the permeability and structural characteristics of the sand material shall be no more than .4% of the total material. Material shall not contain salts or foreign materials of any kind and the material shall show a percentage of wear by the Los Angeles wear test (ASTM C131) of not more than 35%. These fill materials shall contain no particles exceeding 4" in the largest dimension. No more than 30% of the material by weight shall be retained on a $\frac{3}{4}$ " sieve. Of the material passing the No. 4 sieve, no more than 10% shall pass the No. 200 sieve by weight. The Contractor shall provide the Authority with laboratory data on material proposed for use as fill/backfill. Samples shall be collected from imported material and material proposed for reuse on-site. The Contractor shall collect and analyze one representative sample of each material for every 500 cubic yards of imported fill/backfill brought to the site or material proposed for reuse on site for the complete list of 6 NYCRR Part 375 and NYSDEC CP-51 Supplemental Soil Cleanup Objectives Parameters as defined in Paragraph 1.04F.

2.02 EQUIPMENT

- A. Provide proper compaction equipment to properly compact subgrade, fill and backfill, aggregate base, crushed stone and broken stone base.

2.03 SOURCE QUALITY CONTROL**1. Contractor's Responsibility**

Inspections and testing performed by the Authority's agent(s) shall not relieve the Contractor of responsibility for performing all other testing and inspection specified herein or otherwise necessary to meet the quality control and quality assurance requirements of this Section.

PART 3 - EXECUTION**3.01 EXAMINATION****A. Verification of Conditions**

Verify existing site conditions match those of the Drawings and pre-bid inspections. Notify the Authority in writing prior to commencement of Work of any discrepancies.

B. Preparation

1. Before starting any excavation work for new construction, ascertain the exact locations of all existing underground drain lines, piping, and conduits. Consult with the Mechanical Trades.
2. At location where any of the above services interfere with the excavation work, notify the Authority and Mechanical Trade under whose jurisdiction such work falls before continuing with any more excavation.

3.02 PREPARATION AND PROTECTION**A. General**

1. Provide adequate protection measures to protect workmen and pedestrians at the site.
2. Prevent damage to existing improvements designated to remain. If they are damaged during construction, restore improvements to their original condition.
3. Prevent damage to improvements on the site. Restore damaged improvements to their original condition to the satisfaction of the owner. Restore grades and vegetation to their original condition or better.
4. Salvable Improvements
 - a. Carefully remove and protect all items to be saved and reused. Replace any items which are damaged by removal at own cost.

- b. Notify the Authority in writing of any item which is damaged prior to removal so that they may ascertain the item's condition.

B. Condition Survey

1. General: The Contractor shall perform a condition survey of the adjoining structures prior to beginning excavation. Note damage to existing structures.

C. Shoring, Sheeting, and Bracing

1. General

- a. Inspect site, examine existing conditions and make all necessary preparations for the safe and proper sequence of work.
- b. Properly guard and protect excavations so as to prevent them from becoming dangerous to person or property.
- c. Brace, shore, and protect existing structures when excavations are made adjacent to the existing structures or within a distance that they will be affected by the excavation.
- d. Maintain sides and slope of excavation in safe condition until backfilling or other work is complete. Maintain shoring and bracing in place till completion of work.
- e. Provide materials for work in good serviceable order.
- f. All shoring, bracing, etc. is to be removed upon completion of the work where they are installed.

C. Workability of Excavation Subgrade

1. Take all steps necessary to prepare or improve existing conditions for proposed work, including general excavation throughout the project site.

2. Properly grade site and perform operations to avoid disturbing the existing subgrade and any intermediate subgrade.
3. If subgrade conditions are disturbed that prevent earthwork operations or safe operation of installation equipment, the Contractor shall take steps to improve subgrade conditions at own expense.

3.03 EXCAVATION - GENERAL

- A. No additional compensation will be allowed for excavation or foundation work carried below the levels shown on Drawings unless same has been authorized in writing by the Authority. Contractor is responsible for all remedial work due to unauthorized excavation.
- B. For pavements, excavate to depths required for installation of aggregate base or pavement as specified herein or shown on Drawings.
- C. Remove all excavated material from the site and legally dispose of away from the premises, in accordance with the requirements specified in this section. Burning of material on the site is not permitted.

3.04 FILLING AND GRADING

- A. Placement and Compaction of Aggregate Bases
 1. Provide aggregate base under all exterior pavements and wherever else indicated on the Drawings or specified herein. Provide crushed stone under all interior slabs. Provide 6" minimum unless specified otherwise elsewhere.
- B. Inspection
 1. Contractor's Responsibility: The Contractor shall notify the Authority at least 48 hours prior to filling operations, pouring of footings, and installation of excavation support to allow for the Authority to have the appropriate personnel at the site.

2. Contractor's Inspections: Inspections and testing performed by the Authority shall not relieve the Contractor of responsibility for performing all other testing and inspection specified herein or otherwise necessary to meet the quality control and quality assurance requirements of this Section.

C. Responsibility

1. All required testing and/or analysis not specifically defined as being provided by the Authority shall be provided by the Contractor as part of the included Work and costs of this Project.
2. No testing and/or analysis by the Authority shall relieve the Contractor of the responsibility of conforming to the requirements of these specifications.
3. Time for conducting the tests and/or inspections defined in these specifications shall be considered as part of the Work of this Project and neither extension of time nor additional costs shall be accepted as a result.

3.04 PROTECTION

- A. Protect graded and compacted areas from traffic and erosion. Keep free of trash and debris.
- B. When completed compacted areas are disturbed by subsequent construction or weather, scarify surface, re-shape, and compact to required density prior to further construction.
- C. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION

LIST OF SUBMITTALS

SUBMITTAL

DATE SUBMITTED

DATE APPROVED

Qualifications: _____

1. Contractor

* * *

SECTION 16521**EXTERIOR LIGHTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior luminaires with lamps and ballasts, but not mounted on exterior surfaces of buildings.
- B. Related Sections include the following:

1.3 SUBMITTALS

- A. Product Data: For each luminaire, arranged in the order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. High-intensity-discharge ballasts.
 - 2. High-intensity-discharge lamps.
 - 3. Electrical and energy-efficiency data for ballasts.
- B. Wiring Diagrams: Power and control wiring.
- C. Coordination Drawings: Mounting and connection details, drawn to scale, for exterior luminaires.
- D. Samples for Verification: For exterior luminaires designated for sample submission in the Exterior Luminaire Schedule.
 - 1. Lamps: Specified units installed.
 - 2. Ballast: 120-V models of specified ballast types.
 - 3. Finishes: For each finished metal used in support components.
- E. Source quality-control test reports.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For luminaires to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NYCEC 2011, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- C. Comply with IEEE C2, "National Electrical Safety Code."
- D. Comply with NYCEC 2011.

1.5 COORDINATION**1.6 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace lamps that fail in materials or workmanship; corrode; or fade, stain, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Lamps: Replace lamps and fuses that fail within **12** months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second **12** months from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: **10 for every 100** of each type and rating installed. Furnish at least one of each type.
 - 2. Ballasts: **10 for every 100** of each type and rating installed. Furnish at least one of each type.
 - 3. Globes and Guards: **10 for every 20** of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 LUMINAIRES, GENERAL

- A. Complying with UL **[1572] [1598]** and listed for installation in wet locations.

- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

2.3 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated:
 - 1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
 - 2. Minimum Starting Temperature: **Minus 22 deg F (Minus 30 deg C)** for single-lamp ballasts.
 - 3. Normal Ambient Operating Temperature: **104 deg F (40 deg C)**.
 - 4. Open-circuit operation will not reduce average life.
 - 5. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
- B. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- C. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
 - 1. Instant Restrike Device: Solid-state potted module, mounted inside high-pressure-sodium fixture and compatible with high-pressure-sodium lamps, ballasts, and sockets up to 150 W.
 - a. Restrike Range: 105- to 130-V ac.
 - b. Maximum Voltage: 250-V peak or 150-V ac RMS.

2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
3. Open-circuit operation will not reduce average life.

2.4 HIGH-INTENSITY-DISCHARGE LAMPS

- A. High-Pressure-Sodium Lamps: NEMA C78.42, wattage and burning position as scheduled, CRI 21 (minimum), color temperature [1900] <Insert value>, and average rated life of 24,000 hours.
- B. Low-Pressure-Sodium Lamps: NEMA C78.41.
- C. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000,

2.5 FACTORY FINISHES

- A. Field Painting Finish: Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match process and color of pole or support materials specified in Division 2 Section "Lighting Poles and Standards."

2.6 SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test luminaires with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.
- B. Factory test fixtures with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install lamps in each fixture.
- B. Luminaire Attachment: Fasten to indicated structural supports.
- C. Adjust luminaires that require field adjustment or aiming.

3.2 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 and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

- B. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
1. IESNA LM-5.
 2. IESNA LM-50.
 3. IESNA LM-52.
 4. IESNA LM-64.
 5. IESNA LM-72.
- C. 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.

END OF SECTION 16521

SECTION 16475
FUSES

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Fuses.
2. Spare fuse cabinet.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each fuse type specified.
- C. Product Data for each fuse type specified. Include the following:
 1. Descriptive data and time-current curves.
 2. Let-through current curves for fuses with current-limiting characteristics.
 3. Coordination charts and tables and related data.
 4. Fuse size for elevator feeder and disconnect applications.
- D. Field test reports indicating and interpreting test results.
- E. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from one source and by a single manufacturer.
- B. Comply with NYCEC 70 for components and installation.
- C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
 - 1. Cooper Industries, Inc.; Bussmann Div.
 - 2. Eagle Electric Mfg. Co., Inc.
 - 3. Ferraz Corp.
 - 4. General Electric Co.; Wiring Devices Div.
 - 5. Gould Shawmut.
 - 6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.
- B. In line fuses holders: 600VAC, Model 'FEB' as manufactured by Ferazz Shawmut or equal. Fuses: 5 - Ampere Ferraz Shawmut type 'TRM' or equal.
- C. Class 'G' fuse holders, 600VAC, for SC fuses as manufactured by Bussmann or equal.

2.3 SPARE FUSE CABINET

- A. Cabinet: Wall-mounted, **0.05-inch- (1.27-mm-)** thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.
 - 1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: Stencil legend "SPARE FUSES" in **1-1/2-inch (40-mm)** letters on door.
 - 4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Main Service: Class L, fast acting.
- B. Main Feeders: Class J, time delay.
- C. Branch Circuits: 600V, Class G, Time delay, Type SC as manufactured by Bussmann or equal.
- D. Light pole: Midget type 'TRM' as manufactured by Ferraz Shawmut or equal.

3.3 INSTALLATION

- A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.
- B. Install spare fuse cabinet where indicated.

3.4 IDENTIFICATION

- A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION 16475

SECTION 16010
GENERAL PROVISIONS FOR ELECTRICAL WORK

PART 1 - GENERAL**1.01 SCOPE OF WORK**

- A. Provide labor, materials, tools, machinery, equipment, and services necessary to complete the Electrical Work under this Contract. All systems and equipment shall be complete in every aspect and all items of material, equipment and labor shall be provided for a fully operational system and ready for use. Coordinate the work with the work of the other trades in order to resolve all conflicts without impeding the job progress.
- B. When an item of equipment is indicated on a layout plan and not shown on associated riser diagram or vice-versa, the Contractor shall provide said item and all required conduit and wiring connections for a complete system as part of the Contract.
- C. **All penetrations made into other trades work are to be sealed to air tight/watertight condition. Sealant on interior side of such insulated spaces/equipment shall be silicone recommended by manufacturer.**

1.03 EXAMINATION OF SITE

- A. The Contractor shall be held to have examined the site and to have compared it with the Drawings and Specifications, and deemed to have been satisfied as to the conditions existing at the site, as relating to the actual conditions of the site at the time estimating the Work, the storage and handling of materials, and all other matters as may be incidental to the Work under the Contract, before bidding, and no allowance will subsequently be made to the Contractor by reason of any error due to the Contractor's neglect to comply with the requirements of this clause.

1.04 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract.

1.05 ELECTRICAL EQUIPMENT

- A. All electrical equipment shall be the latest of the current year in design, material and workmanship, and shall be the type or model called for in these Specifications.
- B. If the type or model specified has been superseded by a later type or model, the latest shall be submitted for approval and shall be provided as part of the Contract.

1.06 SUBMITTALS

Provide as outlined in each individual section of these Specifications, including but not limited to:

- A. Product Data: Submit manufacturer's product data for equipment including capacity, performance charts, test data, materials, dimensions, weights, and installation instructions.
- B. Shop Drawings: Submit manufacturer's shop drawings indicating dimensions, weight loading, required clearances, location, and method of assembly of components.
Submittals are mandatory as noted in the respective specifications. Schedules, installation instructions, startup manuals, operation and maintenance manuals, and shop drawings are always required to be submitted.

- A. Samples
- B. Special Warranty
- C. Quality Assurance submittals
- D. Operation and Maintenance Manuals
- E. Test results and certificates
- F. Manuals and video tape of the personnel training.

1.07 COORDINATION DRAWINGS

- A. Coordination Drawings: The Electrical contractor shall cooperate with other contractors in the development of the coordination drawings. The specified order in which the trade contractors impose their work on the coordination drawings is not intended to grant priority to any one trade contractor in the allocation of space. At the completion of this phase, hold a coordination meeting to eliminate any interference among the trades that the drawings indicate and to avoid any conflicts in installing the Work.

1.08 BUREAU OF ELECTRICAL CONTROL

- A. Drawings and Specifications:
 1. The Contract Drawings and Specifications shall be submitted by the Contractor to the Bureau of Electrical Control to facilitate any inspections that may be made by that agency.
 2. It is the intent of these Specifications that all electric work shall be done in strict accordance with the rules of the Bureau of Electrical Control, and with the NYC Amendments to the 2008 National Electrical Code together with NFPA's 2008 National Electrical Code. Where the requirement of the Drawings or Specifications exceeds the requirements of the Electrical Code, the requirements of the Drawings and Specifications shall be binding upon the Contractor.
 3. Should the Bureau of Electrical Control inspect the work and issue a violation, the Contractor shall correct the Work and eliminate the violation as part of the Contract.
- B. Interpretation
 1. The electric work detailed in these Specifications and shown on Drawings shall be under the jurisdiction of the Authority, subject to the approval of the Bureau of Electric Control.
 2. The Authority shall be the sole source for interpretation of the Contract Documents. Any discrepancies or conflicts shall be brought to the attention of the Authority for clarification.
- C. Materials and Appliance: All materials and appliance shall be approved by the Authority's Representative and installed in accordance with the rules and regulations of the Building Department, Bureau of Electrical Control; certificates of approval including the temporary light and power wiring, shall be obtained by the Contractor and delivered to the Authority's Representative before the Work is finally accepted.

1.09 WORK IN EXISTING STRUCTURES

- A. All existing material, fixtures, and equipment which have been removed shall not be used again unless specifically required by the Drawings or Specifications.

B. Removals, Replacements, Adjustments

1. The Contractor shall remove, relocate, replace, adjust or adapt, all existing conduit, wiring and other electric equipment or apparatus, as required, to provide a complete installation.
2. The Work shall include, providing all materials, all necessary extensions, connections, cuttings, repairing, adapting and other Work incidental thereto, together with such temporary connections as may be required to maintain service pending the completion of the permanent Work. All Work shall be left in good working order and in a condition equal to the adjacent new or existing Work.

C. Care in Removing Existing Conductors

1. The Contractor shall use due care and diligence in removing existing conductors from existing conduits in order to prevent conductors from breaking and becoming an irretrievable obstruction within the conduits.

D. Cutting and Repairing

1. Whenever the cutting, or drilling, or removal of any part of the structure (ceilings, walls, floors, shelving, bookcases, partitions, etc.), is required in order to remove, relocate, alter or install any article of electrical equipment (including conduits, boxes, fittings, etc.), the Contractor shall perform all cutting, drilling, etc., and remove the section of structure required. After removal and installation of the electric equipment, the Contractor shall repair the section of structure, as directed by the Authority's Representative, with new materials, equal to that of adjacent structure of the same type.

Note that in general, all holes through existing structures for conduit installation shall be core drilled, unless prior written approval is provided by the Authority.

Contractor shall use extreme care when core drilling to avoid damaging the existing infrastructure.

2. Whenever holes are cut in fire-rated walls or floor slabs in order to permit the installation of conduit or electrical equipment, these holes shall be repaired with material that will restore the fire rating of the wall or floor slab to its original condition.
3. The Contractor shall paint all repaired areas of the building. The paint shall match the paint of adjacent surface areas, or extend to the nearest architectural break-line, as directed.
4. Wherever any part of the structure is marred or damaged, the Contractor shall repair the damaged or marred areas of the structure.
5. Where a piece of electrical equipment is removed, the Contractor shall finish that part of the surface to match surroundings.

E. Damaged Apparatus: Should any damage, due to the execution of this Contract, occur to the furniture, fixtures, or any equipment or apparatus, such damage shall be properly repaired and/or replaced by the Contractor without charge.

F. Non-Interruption of Services

1. It is imperative that all existing services (electric, light, power, fire alarm, telecommunications, etc.) be kept in operation at all times, unless prior written approval is received from the Authority.
2. Provide fire watch services, as necessary, during disruption of fire alarm system.

1.10 TESTS

- A. The Contractor shall demonstrate to the Authority operation of all equipment and systems. All tests shall be completed to the satisfaction of the Authority. Each test shall be performed as indicated in the individual specification section.

1.11 GUARANTEES, WARRANTIES, BONDS, AND MAINTENANCE CONTROL

- A. Refer to individual equipment specifications for warranty requirements.
 - 1. Compile and assemble the warranties specified for Electrical work into a separated set of documents, tabulated and indexed for easy reference.
 - 2. Provide complete warranty information for each item to include product or equipment including duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.
 - 3. Warranties for the equipment, workmanship and materials should be provided for the period of one year with the exception of the warranty on the refrigeration compressors. Five- (5) years warranty shall be provided for the refrigeration compressors.
 - 4. Manufacturers', in addition to Contractors' warranties, shall be provided for all Electrical equipment and accessories.
 - 5. All warranties are to start from the date of Substantial Completion.

1.12 OPERATIONS, TRAINING, AND MAINTENANCE MANUALS

- A. General
 - 1. Provide SYSTEMS OPERATION AND MAINTENANCE MANUAL for procedures and requirements for preparation and submittal of operation and maintenance manuals for each equipment. Refer to individual equipment specifications for maintenance manual additional requirements. In addition, include the following information:
 - 2. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 3. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 - 4. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassemble; aligning and adjusting instructions.
 - 5. Servicing instructions and lubrication charts and schedules.
- B. Refer to individual equipment specifications for the additional training requirements.
- C. Contractor shall videotape all the training sessions for various equipment and systems as specified in individual sections of these Specifications. If a manufacturer's particular equipment item is furnished with a training video, the manufacturer's video shall be provided in addition to the requirements of this Section, not in lieu thereof and at no additional cost to the Authority. Contractor shall be responsible for providing

informative videotapes covering all the materials and content outlined in each individual section of these Specifications.

1.13 CLEANING AND REPAIR

- A. On completion of installation, inspect interior and exterior of installed equipment. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.
- B. Contractor shall not leave sharp exposed metal edges (bottom of threaded rods, electrical equipment supports, etc.) that could otherwise present safety hazards to the building's occupants/work staff.

END OF SECTION

* * *

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Product Data	_____	_____
Shop Drawings	_____	_____
Samples	_____	_____
Special Warranty	_____	_____
Quality Assurance submittals	_____	_____
Operation and Maintenance Manuals	_____	_____
Test results and certificates	_____	_____
Manuals and video tape of the personnel training.	_____	_____

* * *

SECTION 16452
GROUNDING

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 1. Division 16 Section "Underground Ducts and Utility Structures" for manhole bonding and grounding requirements.
 2. Division 16 Section "Wires and Cables" for requirements for grounding conductors.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for grounding rods, connectors and connection materials, and grounding fittings.
- C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the InterNational Electrical Testing Association (NETA).
 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Comply with NYCEC - 2011
- C. Comply with UL 467.

- D. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Apache Grounding; Nashville Wire Products.
 2. Boggs: H. L. Boggs & Co.
 3. Chance: A. B. Chance Co.
 4. Dossert Corp.
 5. Erico Inc.; Electrical Products Group.
 6. Galvan Industries, Inc.
 7. Hastings Fiber Glass Products, Inc.
 8. Heary Brothers Lightning Protection Co.
 9. Ideal Industries, Inc.
 10. ILSCO.
 11. Kearney.
 12. Korns: C. C. Korns Co.
 13. Lightning Master Corp.
 14. Lyncole XIT Grounding.
 15. O-Z/Gedney Co.
 16. Raco, Inc.
 17. Salisbury: W.H. Salisbury & Co., Utility.
 18. Thomas & Betts, Electrical.
 19. Utilco Co.

2.2 GROUNDING AND BONDING PRODUCTS

- A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) 2008, as amended in NYC, requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.3 WIRE AND CABLE GROUNDING CONDUCTORS

- A. Comply with Division 16 Section "Wires and Cables." Conform to NYCEC, except as otherwise indicated, for conductor properties, including stranding.
1. Material: copper. Use only copper wire for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. Equipment Grounding Conductors: Insulated with green color insulation.

- C. Grounding-Electrode Conductors: Stranded cable.
- D. Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.
- E. Bare Copper Conductors: Conform to the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.

2.4 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.
- C. Bonding Straps: Soft copper, **0.05 inch (1 mm)** thick and **2 inches (50 mm)** wide, except as indicated.

2.5 CONNECTOR PRODUCTS

- A. Pressure Connectors: High-conductivity-plated units.
- B. Bolted Clamps: Heavy-duty type.
- C. Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.6 GROUNDING ELECTRODES AND TEST WELLS

- A. Grounding Rods: Copper-clad steel.
- B. Grounding Rods: Sectional type; copper-clad steel.
 - 1. Size: **3/4 inch by 120 inches (19 by 3000 mm)**.
 - 2. Size: **5/8 inch by 96 inches (16 by 2400 mm)**.
- C. Test Wells: Fabricate from **15-inch- (400-mm-)** long, square-cut sections of **8-inch- (200-mm-)** diameter, Schedule 80, PVC pipe.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Equipment Grounding Conductors: Comply with NYCEC-2011 Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NYCEC-2011 are indicated.

1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.
 - c. Receptacle circuits.
 - d. Flexible raceway runs.
 - e. Armored and metal-clad cable runs.
 2. Busway Supply Circuits: Install separate equipment grounding conductor from the grounding bus in the distribution panel to equipment grounding-bar terminal on busway.
- B. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a separate equipment grounding conductor run with supply branch circuit.

3.2 INSTALLATION

- A. General: Ground electrical systems and equipment according to NYCEC requirements, except where Drawings or Specifications exceed NYCEC requirements.
- B. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- E. Underground Grounding Conductors: Use bare copper wire. Bury at least **24 inches (600 mm)** below grade.
- F. Test Wells: One for each driven grounding electrode, except as otherwise indicated. Set top of well flush with finished grade or floor. Fill with **1-inch- (25-mm-)** maximum-size crushed stone or gravel.

3.3 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 1. Use electroplated or hot-tin-coated materials to assure 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. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing.

Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and grounding rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.4 OVERHEAD LINE GROUNDING

- A. Lightning Arresters: Separate arrester grounds from other grounding conductors.
- B. Protect grounding conductors running on surface of wood poles with molding manufactured for this purpose. Extend from grade level up to and through communications and transformer spaces.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Manholes and Handholes: Install a driven grounding rod close to wall and set rod depth so **4 inches (100 mm)** will extend above finished floor. Where necessary, install grounding rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from grounding rod into manhole through a waterproof sleeve in manhole wall. Protect grounding rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from **2 inches (50 mm)** above to **6 inches (150 mm)** below concrete. Seal floor opening with waterproof, nonshrink grout.
- B. Connections to Manhole Components: Connect exposed metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to grounding rod or grounding conductor. Make connections with minimum No. 4 AWG stranded, hard-drawn copper wire. Train conductors plumb or level around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.
- C. Grounding System: Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes.

3.6 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Engage an independent electrical testing organization to perform tests described below.
- B. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without

the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.

- C. Maximum grounding to resistance values are as follows:

1. Equipment Rated 500 kVA and Less: 10 ohms.
2. Equipment Rated 500 to 1000 kVA: 5 ohms.
3. Equipment Rated More than 1000 kVA: 3 ohms.
4. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.
5. Manhole Grounds: 10 ohms.

- D. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.
- E. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.7 ADJUSTING AND CLEANING

- A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 16452

SECTION 16145 - LIGHTING CONTROL DEVICES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
- B. Related Sections include the following:
 1. Division 16 Section "Wiring Devices".

1.3 SUBMITTALS

- A. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.
- B. Samples: Occupancy sensors for color selection and evaluation of technical features.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain lighting control devices from a single source with total responsibility for compatibility of lighting control system components specified in this Section, in Division 13 Section "Lighting Controls," and in Division 16 Section "Dimming Controls."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.
- C. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.
- D. Comply with NYCEC 2011.

1.5 COORDINATION

- A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Contactors and Relays:
 - a. Automatic Switch Co.
 - b. Challenger Electrical Equipment Corp.
 - c. Cutler-Hammer Products; Eaton Corporation.
 - d. Furnas Electric Co.
 - e. GE Lighting Controls.
 - f. Hubbell Lighting, Inc.
 - g. Siemens Energy and Automation, Inc.
 - h. Square D Co.; Power Management Organization.
 - i. Zenith Controls, Inc.
 - j. American Electronic Components, Inc. (Durakool)
 2. Time Switches:
 - a. Diversified Electronics, Inc.
 - b. Grasslin Controls Corp.
 - c. Intermatic, Inc.
 - d. Leviton Manufacturing.
 - e. Paragon Electric Co., Inc.
 - f. Tork, Inc.
 - g. Zenith Controls, Inc.
 3. Photoelectric Relays:
 - a. Allen-Bradley/Rockwell Automation.
 - b. Area Lighting Research, Inc.
 - c. Fisher Pierce.
 - d. Grasslin Controls, Corp.
 - e. Intermatic, Inc.
 - f. Paragon Electric Co., Inc.
 - g. Rhodes: M H Rhodes, Inc.
 - h. SSAC, Inc.
 - i. Tork, Inc.

2.2 TIME SWITCHES

- A. Description: Solid-state programmable units with alphanumeric display complying with UL 917.
- B. Description: Electromechanical-dial type complying with UL 917.
 1. Astronomic dial.
 2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.

3. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
4. Eight-day program uniquely programmable for each weekday and holidays.
5. Skip-day mode.

2.3 PHOTORELAYS

- A. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.
- B. Light-Level Monitoring Range: **0 to 3500 fc (0 to 37 673 lx)**, with an adjustment for turn-on/turn-off levels.
- C. Time Delay: Prevents false operation.
- D. Indoor Ceiling- or Wall-Mounting Units: Adjustable for turn-on/turn-off levels, semiflush, calibrated to detect adequacy of daylighting in perimeter locations, and arranged to turn artificial illumination on and off to suit varying intensities of available daylighting.
- E. Indoor Skylight Units: Housed in a threaded plastic fitting for mounting under skylight.
- F. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.4 MULTIPOLE CONTACTORS AND RELAYS

- A. Description: Electrically operated and held, and complying with UL 508 and NEMA ICS 2.
 1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
 2. Control Coil Voltage: Match control power source.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment level and plumb and according to manufacturer's written instructions.
- B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 16 Section "Basic Electrical Materials and Methods."
- C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 16 Section "Conductors and Cables" for low-voltage connections.
- B. Wiring Method: Install all wiring in raceway as specified in Division 16 Section "Raceways and Boxes."

- C. Wiring Method: Install all wiring in raceway as specified in Division 16 Section "Raceways and Boxes," unless run in accessible ceiling space and gypsum board partitions.
- D. Bundle, train, and support wiring in enclosures.
- E. Ground equipment.
- F. Connections: 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.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 16 Section "Basic Electrical Materials and Methods."
- B. Identify components and power and control wiring according to Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
- B. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- C. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.
- D. Verify settings of photoelectric devices with photometer calibrated within previous six months.
- E. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 - 1. Continuity tests of circuits.
 - 2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
 - a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
- F. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
- G. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- H. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.6 DEMONSTRATION

- A. Coordinate with training for low-voltage, programmable lighting control system specified in Division 13 Section "Lighting Controls."
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
 - 1. Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of three hours' training.
 - 2. Training Aid: Use the approved final version of maintenance manuals as a training aid.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.7 ON-SITE ASSISTANCE

- A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 16145

SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Surface preparation, priming and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

1.02 REFERENCES

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
 - 1. Federal Specifications (FS)
 - 2. N.Y.S. Department of Environmental Conservation
 - 3. U.S. Department of Labor
 - 4. Occupational Safety and Health Administration (OSHA)
 - 5. Steel Structures Painting Council (SSPC)

DEFINITIONS

- A. The term "Painting" as used in this Section, means the application of all coatings such as paint, primer, enamel.

- B. The term "Painting" also includes preparation of surfaces for such applications, and the clean-up as hereinafter specified.
- C. Touching-up bare spots specified for previously primed or painted surfaces is in addition to the coats specified for the paint system.
- D. Finishes:
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data

Provide manufacturers' product literature for all materials specified and material manufacturer's printed directions and recommendations for environmental conditions, surface preparation, priming, mixing, reduction, spreading rate, application, storage and VOC content, as applicable for each of the materials specified.

B. Samples

1. Initial Selection

Submit manufacturer's color charts for each type of finish for approval by the Authority. Verify colors specified with manufacturers' color charts for availability and notify the Authority if any discrepancies should occur.

2. Verification prior to installation
 - a. Contractor shall furnish color chips for surfaces to be painted.
 3. All samples shall be labeled; and include the following information:
 - a. Manufacturer's name
 - b. Type of paint/stain/hardener
 - c. Manufacturer's stock number
 - d. Color: name and number
 - e. Federal Specification number, as specified
 - f. Federal regulations for amount of lead in paint.
 - g. VOC content
- C. Quality Assurance
1. Certification that materials for each system are obtained from a single manufacturer.
 2. Certification that Work shall be performed by personnel with a minimum of three years experience who meet the qualifications set forth in OSHA, 29 CFR 1926.62 (Lead In Construction Standard).
 3. Certification that material meets or exceeds the performance requirements of Federal Specifications.
- D. Guarantee

Provide Guarantee per Article 1.08.

1.05 QUALITY ASSURANCE

A. General

1. All painting materials shall arrive at the job ready-mixed.
3. Remove all rejected materials from the premises immediately.
4. All thinning and tinting materials shall be as recommended by the manufacturer. Generally, all paints shall not require additional thinning.
5. Verify that the specified shop prime paint for each applicable item in this Project is compatible with the total coating system, prior to application.

B. Qualifications

1. Work of this Section shall be performed by personnel with a minimum of three years experience in performing this type of Work.

F. Field Samples

1. Provide samples of each color and finish, under natural lighting conditions, in a location where each finish is to be applied.
2. Primer coat is to be inspected and approved in all locations before any subsequent finish coats are applied.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery

Deliver materials to the site in original, unopened containers bearing manufacturers name and label containing the following information:

1. Product name or title of material

2. Manufacturer's stock number, batch number, VOC content in grams per liter and date of manufacture.
3. Manufacturer's name
4. Federal Specification number, if applicable.
5. Federal regulations for amount of lead in paint (less the 0.06% lead in non-volatile ingredients)
6. Contents by volume for major pigment and vehicle constitutions
7. Thinning instructions
8. Application instructions
9. Color name and number

1.07 PROJECT CONDITIONS**A. Environmental Requirements**

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
2. Do not apply finish in areas where dust is being generated or will be generated while the material is drying.
3. Provide paint and coating products to comply with applicable environmental regulations, VOC requirements and local authorities.

1.08 GUARANTEES

- A. Adherence of workmanship and materials to Specifications requirements shall be maintained for the one year Contract guarantee period. These requirements shall include the following:

1. There shall be no evidence of blistering, peeling, crazing, alligatoring, streaking, staining, or chalking.
 2. Dirt shall be removed without blemishing the finish by washing with mild soap and water.
 3. Colors of surfaces shall remain free from serious fading; the variation, if any, shall be uniform.
- B. Correct all defects, appearing within the guarantee period, by removal of the defective work and replacement as directed.
- C. All corrective measures shall be the Contractor's responsibility, and shall be made at no extra cost to the Authority. The requirements set forth in Part 3 of these Specifications shall be strictly adhered to.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Subject to compliance with specified requirements, provide "First Line" or "Top Quality" products of one of the following manufacturers:
1. Benjamin Moore and Co.
 2. Devoe and Reynolds Co.
 3. Glidden Coatings and Resins.
 4. PPG Industries, Pittsburgh Paints Inc.
 5. Pratt and Lambert
 6. The Sherwin-Williams Co.
 7. Tnemec Company, Inc.
 8. MAB Paints
 9. CarboLine
 10. Mercury Paint Corp.

2.02 MATERIALS

- A. Provide products which meet all Federal regulations for amount of lead in paint (less than 0.06% lead in non-volatile ingredients).
- B. Provide best quality grade of various types of coatings as regularly manufactured by the paint materials manufacturers. Materials not displaying manufacturers' identification as a standard, best-grade product will not be acceptable.
- C. Use only thinners approved by paint manufacturers for applications intended and use only within recommended limits.

2.03 REFERENCE STANDARDS

- A. Paint materials shall meet or exceed the requirements of the following standards:

Federal Specifications

1. Primers, Sealers, Undercoats

A. Acrylic Primer TT-P-650-C

2. Finish Paints

A. Ext. Acrylic Latex Paint; Flat: FS TT-P-19

B. Gloss Acrylic Latex Enamel: FS TT-P-1511-B

2.04 COLORS

A. Selection

1. Paint colors, surface treatments and finishes will be selected by the Authority.

2. Color Schedule will be issued to the Contractor after award of the Contract.
 - a. Final acceptance of colors will be from actual job applications.

2.05 EXTERIOR PAINT SYSTEMS

A. New Ferrous Metal

Structural steel, all ferrous metals, and steel window trim.

1st Coat - Touch up with epoxy Polyamide Paint

2nd Coat - Polyamide Epoxy Paint applied at the rate of -- 4.0 to 6.0

Mils DFT.

SSPC-PS

Guide 13.01

3rd Coat (Top Coat) - Acrylic Aliphatic Polyurethane applied at rate of -- 1.5 to 2.0

Mils DFT.

SSPC-PS

Guide 17.00

Type 5.

PART 3 - EXECUTION**3.01 EXAMINATION**

A. Verification of Conditions

1. The application of painter's finish to any surface shall be taken to indicate that the Contractor considers such surfaces suitable for a first-class finish.
2. Do not apply painter's finish in any locations until the Work of other Contractors that might damage the new finish is completed.
3. Notify the Authority in writing regarding Work by others that does not provide a suitable surface for the new finish.

4. In case of dispute regarding the suitability of any surface, the Authority's decision shall be final and conclusive upon all concerned.
5. Contractor shall check the compatibility of previously painted surface with the new coating by applying a test panel 4 foot wide x wall height. Allow test panel to dry thoroughly; verify proper adhesion before proceeding with painting Work.

3.02 PREPARATION AND APPLICATION**A. Protection**

1. For exterior metal surfaces on the building or site the ground beneath the work area shall be surrounded on all sides by a washable construction tarp or 10-mil polyethylene. The covering need not be airtight; however, it must be of adequate size and durability to completely enclose the work area and prevent the dispersal of any paint chips or dust during paint removal activities. Any dust and debris shall be contained in the work area and shall be removed immediately upon generation. Protect from damage landscaping, paving, and other improvements near the building. Protect and seal all windows and openings within the work area with a minimum of 1 layer of 6-mil polyethylene sheeting.
2. All protection is to be carefully removed, cleaned or discarded after painting is complete.

3. Touch-Up

1. Spot prime defects in existing Work and Work primed under other Paragraphs of Work as necessary to produce an even plane in the new finish.

B. Existing Metal:

- a. Prepare surfaces as indicated in Art. 3.02,C., Subparagraphs 1., 2., 3., 4., above.

- b. Machine tool clean exposed steel to an SSPC-SP3 surface preparation.
- b. For steel surfaces exposed to view, repair defects in surfaces to provide for an even plane in the new finish. Use auto-body filler to even out surface and sand smooth.

3.03 APPLICATION**A. General**

- 1. No Work shall be performed where cement or plaster is being applied or is in the process of drying.
- 2. No Work shall be performed in spaces that are not broom clean and free of dust and waste.
- 3. Apply paint materials to produce smooth finished surfaces, free of brush or roller marks, drops, runs, or sags.
- 4. Paint materials shall be kept at a proper and uniform consistency.
- 5. Thin only when necessary to achieve best results.
- 6. Thinners shall be material recommended by manufacturer of paint, and in quantity as recommended.
- 7. Excessive use of thinner as indicated by variation in absorption, lack of "hide", thickness of dry film, mottled or streaky coat, shall be cause for rejection. Correct as directed.
- 8. Apply all coats with brush or roller, varying slightly the color of succeeding coats. Spraying will not be permitted.
- 9. Brush out or roll on first or prime coat; work well into surface.
- 10. Each coat shall be inspected, approved and dry before proceeding with additional coats.

11. Allow at least 48 hrs for enamels and exterior oil paint to dry.

3.04 FIELD QUALITY CONTROL

- A. The Authority reserves the right to require the following material testing procedures at any time, and any number of times during period of field painting:
 1. Measurement of dry film thickness (DFT) by use of a dry film thickness gauge in accordance with use and calibration requirements of Structural Steel Painting Council [SSPC], "Method of Measurement of Dry Paint Thickness with Magnetic Gauges".
 - a. If the samples do not comply with requirements of the Specifications, costs of testing and remediation of rejected work shall be borne by Contractor.
 - b. If the tests find that the samples do comply with the requirements of the Specifications, the cost of the testing will be borne by the Authority.

3.05 CLEANING

A. General

Contractor shall clean-up behind each paint crew such that painting and clean-up will be a continuous uninterrupted operation. The practice of one general clean-up after completion of all painting will be strictly prohibited. This clean-up will include, but not be limited to the following:

1. Remove spots or defacement resulting from Work of this Section.
2. Retouch all damaged surfaces to leave Work in perfect finished condition.
3. If spots or defacement cannot be satisfactorily removed and retouched, re-finish the surfaces as directed.

3.08 PROTECTION

- A. Provide caution tape and/or locked entryways during paint removal activities in existing buildings to prevent access to the work area from unauthorized personnel.
- B. Provide "Wet Paint" signs to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their Work after completion of painting operations.
- C. At the completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces as

END OF SECTION

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
-------------------------	------------------------------	-----------------------------

Product Data: _____

1. Manufacturer's product literature for all materials with directions and recommendations for environmental conditions, surface preparation, priming, mixing, reduction, spreading rate, application, storage and VOC content.

Samples: _____

1. Initial selection: manufacturer's color charts for each type of finish.
2. Verification prior to installation: color chips for surfaces to be painted.

Quality Assurance: _____

1. Certification that materials for each system are obtained from a single manufacturer.
2. Certification that Work shall be performed by personnel with a minimum of three years experience who meet the qualifications set forth in OSHA, 29 CFR 1926.62 (Lead In Construction Standard).

Guarantees _____

* * *

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

- 1. Raceways include the following:

- a. RMC.
 - b. IMC.
 - c. PVC externally coated, rigid steel conduits.
 - d. PVC externally coated, IMC.
 - e. EMT.
 - f. FMC.
 - g. LFMC.
 - h. LFNC.
 - i. RNC.
 - j. ENT.
 - k. Wireways.
 - l. Surface raceways.

- 2. Boxes, enclosures, and cabinets include the following:

- a. Device boxes.
 - b. Floor boxes.
 - c. Outlet boxes.
 - d. Pull and junction boxes.
 - e. Cabinets and hinged-cover enclosures.

- B. Related Sections include the following:

- 1. Division 7 Section "Firestopping."
 - 2. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
 - 3. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.

- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RMC: Rigid metal conduit.
- H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation."
- C. Comply with NYCEC-2011.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Conduit and Tubing:
 - a. Alflex Corp.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. Anixter Brothers, Inc.

- d. Carol Cable Co., Inc.
- e. Cole-Flex Corp.
- f. Electri-Flex Co.
- g. Flexcon, Inc.; Coleman Cable Systems, Inc.
- h. Grinnell Co.; Allied Tube and Conduit Div.
- i. Monogram Co.; AFC.
- j. Spiraduct, Inc.
- k. Triangle PWC, Inc.
- l. Wheatland Tube Co.
- m. Thomas&Betts Corp.

2. Nonmetallic Conduit and Tubing:

- a. Anamet, Inc.; Anaconda Metal Hose.
- b. Arnco Corp.
- c. Breeze-Illinois, Inc.
- d. Cantex Industries; Harsco Corp.
- e. Certainteed Corp.; Pipe & Plastics Group.
- f. Cole-Flex Corp.
- g. Condux International; Electrical Products.
- h. Electri-Flex Co.
- i. George-Ingraham Corp.
- j. Hubbell, Inc.; Raco, Inc.
- k. Lamson & Sessions; Carlon Electrical Products.
- l. R&G Sloan Manufacturing Co., Inc.
- m. Spiraduct, Inc.
- n. Thomas & Betts Corp.

3. Conduit Bodies and Fittings:

- a. American Electric; Construction Materials Group.
- b. Crouse-Hinds; Div. of Cooper Industries.
- c. Emerson Electric Co.; Appleton Electric Co.
- d. Hubbell, Inc.; Killark Electric Manufacturing Co.
- e. Lamson & Sessions; Carlon Electrical Products.
- f. O-Z/Gedney; Unit of General Signal.
- g. Scott Fetzer Co.; Adalet-PLM.
- h. Spring City Electrical Manufacturing Co.
- i. Thomas&Betts Corp.

4. Metal Wireways:

- a. Hoffman Engineering Co.
- b. Keystone/Rees, Inc.
- c. Square D Co.

5. Nonmetallic Wireways:

- a. Hoffman Engineering Co.
- b. Lamson & Sessions; Carlon Electrical Products.

6. Surface Metal Raceways:

- a. Airey-Thompson Co., Inc.; A-T Power Systems.
- b. American Electric; Construction Materials Group.

- c. Butler Manufacturing Co.; Walker Division.
- d. Wiremold Co. (The); Electrical Sales Division.

7. Surface Nonmetallic Raceways:

- a. Anixter Brothers, Inc.
- b. Butler Manufacturing Co.; Walker Division.
- c. Hubbell, Inc.; Wiring Device Division.
- d. JBC Enterprises, Inc.; Enduro Fiberglass Systems.
- e. Lamson & Sessions; Carlon Electrical Products.
- f. Panduit Corp.
- g. Thermotools Co.
- h. United Telecom; Premier Telecom Products, Inc.
- i. Wiremold Co. (The); Electrical Sales Division.

8. Boxes, Enclosures, and Cabinets:

- a. American Electric; FL Industries.
- b. Butler Manufacturing Co.; Walker Division.
- c. Crouse-Hinds; Div. of Cooper Industries.
- d. Electric Panelboard Co., Inc.
- e. Erickson Electrical Equipment Co.
- f. Hoffman Engineering Co.; Federal-Hoffman, Inc.
- g. Hubbell Inc.; Killark Electric Manufacturing Co.
- h. Hubbell Inc.; Raco, Inc.
- i. Lamson & Sessions; Carlon Electrical Products.
- j. O-Z/Gedney; Unit of General Signal.
- k. Parker Electrical Manufacturing Co.
- l. Robroy Industries, Inc.; Electrical Division.
- m. Scott Fetzer Co.; Adalet-PLM.
- n. Spring City Electrical Manufacturing Co.
- o. Thomas & Betts Corp.
- p. Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1, UL6, ANSI C80.1, UL Listed for UV resistance.
- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
 - 2. Fittings: Set-screw type.
 - 3. Fittings: Compression type.

- H. FMC: Zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- C. ENT and RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- D. LFNC: UL 1660.

2.4 METAL WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: As indicated
- E. Wireway Covers: Hinged type.
- F. Wireway Covers: Screw-cover type.
- G. Wireway Covers: Flanged-and-gasketed type.
- H. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

- A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captivated screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections using plastic fasteners.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
- B. Surface Nonmetallic Raceways: 2-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
- C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.
- C. Nonmetallic Boxes: NEMA OS 2.

2.8 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.9 ENCLOSURES AND CABINETS

- A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
 - 1. Exposed: PVC coated Rigid galvanized steel.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

- B. Indoors: Use the following wiring methods:
 - 1. Exposed: EMT or RNC.
 - 2. Concealed: EMT, ENT, or RNC.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
 - b. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.

3.3 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

- B. Minimum Raceway Size: **1/2-inch trade size (DN16)**.

- C. Minimum Raceway Size: **3/4-inch trade size (DN21)**.

- D. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

- E. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- F. Install raceways level and square and at proper elevations. Provide adequate headroom.

- G. Complete raceway installation before starting conductor installation.

- H. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

- I. Use temporary closures to prevent foreign matter from entering raceways.

- J. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

- K. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

- L. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

- M. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- N. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least **1-inch (25-mm)** concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than **1-inch trade size (DN27)** parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- O. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- P. Join raceways with fittings designed and approved for the purpose and make joints tight.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
- Q. Tighten set screws of threadless fittings with suitable tools.
- R. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
- S. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- T. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of the pull wire.
- U. Telephone and Signal System Raceways, **2-Inch Trade Size (DN53)** and Smaller: In addition to the above requirements, install raceways in maximum lengths of **150 feet (45 m)** and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- V. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-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 at the following points:
 - 1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.

- W. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used **6 inches (150 mm)** above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.
- X. Flexible Connections: Use maximum of **6 feet (1830 mm)** of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- Y. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.
- Z. Do not install aluminum conduits embedded in or in contact with concrete.
- AA. PVC Externally Coated, Rigid Galvanized Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- AB. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.
 - 1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
 - 2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
 - 3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
 - 4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.
- AC. Set floor boxes level and adjust to finished floor surface.
- AD. Set floor boxes level and trim after installation to fit flush to finished floor surface.
- AE. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16130

SECTION 16289
TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide complete transient voltage surge suppression for the protection of the low voltage, control and communication systems.

1.02 SUPPLEMENTAL SUBMITTALS

- A. Product Certificates

Signed by manufacturers of transient voltage suppression devices, certifying that the products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification.
2. UL 1449 3rd Edition listing and classification

- B. Operation and Maintenance instructions.

- C. **Certificate of compliance with Quality Assurance requirements.**

- D. **Certificate of compliance with field quality control.**

- E. **Warranty.**

- F. Training videotape as specified under paragraph 3.05 herein.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. IEEE Compliance: Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide for Surge Suppressor Testing."
- D. NEMA Compliance: Comply with NEMA LS 1, "Low Voltage Surge Protective Devices."
- E. UL Compliance: Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449 3rd Edition, "Transient Voltage Surge Suppressors."

1.05 WARRANTY

- A. The surge suppressor manufacturer shall warrant the surge suppression device and supporting components against defects and workmanship for a period of 10 years from date of substantial completion.
- B. The Contractor shall provide preventative maintenance during the warranty period. Maintenance shall include, but no be limited to:
 - 1. Labor and materials, to repair, test and adjust surge suppression devices.
 - 2. Regular inspections.

PART 2- PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. The approved manufacturers for the surge suppression devices shall be Cutler-Hammer, Siemens Energy & Automation, Square D, Leviton, MCG Electronics, LEA International, Advanced Protection Technologies, Current Technology, Ademco and Transjector Systems.

2.02 SURGE SUPPRESSION DEVICES

- A. Service Entrance Suppressors



Modular type suppression devices shall be installed, inside or adjacent to electrical service entrance panel and shall have the following features and accessories:

1. LED indication lights (Green & Red) for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. One set of Form C dry contacts (normally open/normally closed) rated at 5 Amp, 250 VAC, for remote monitoring of protection status.
4. Suppression elements shall be between each phase conductor and neutral, between each phase conductor and ground and between neutral conductor and ground.
5. Fuses, rated at 200 KA interrupting capacity.
6. Minimum single impulse current rating (L-N + L-G): 240,000 amps per phase for service entrance
7. UL1449 3rd Edition (ANSI C62.41-2002) clamping voltage for service entrance shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
120/208	700	700	700

8. Suppressors shall exhibit redundant protection with redundant fusing for each phase and consist of solid state components and shall operate bi-directionally. Gas diodes or silicon avalanche diodes in surge path are not acceptable. Series installed protectors are not acceptable.

B. Panelboard Suppressors

Modular type suppression devices shall be installed, inside or adjacent to electrical panel and shall have the following features and accessories:

1. LED indication lights (Green & Red) for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.

3. One set of dry contacts rated at 5 Amp, 250 VAC, for remote monitoring of protection status.
4. The suppressor shall be capable of interrupting a 200 KA, short circuit current delivered from the AC power line.
5. Minimum single impulse current rating (L-N + L-G): 120,000 amps per phase for panelboard.
6. UL1449 3rd Edition (ANSI C62.41-2002) clamping voltage for local panel shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
120/208	700	700	700

C. Enclosures

NEMA 250, with type matching the enclosure of panel or device being protected, unless factory installed within equipment enclosure.

PART 3- EXECUTION

3.01 SERVICE ENTRANCE



- A. Install devices at service entrance on line side, with ground lead bonded to service entrance ground.
- B. Conductors between suppressor and point of attachment shall be at least #10 AWG stranded copper conductor or larger. The conductors shall be kept as short and straight as possible for best performance. Lead length of connecting conductors shall be within 36 inches.

3.02 LOCAL PANELS

- A. Install devices for panelboard with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

- B. A 20A overcurrent protection is required at the panel to protect the leads used to connect the surge protector to the panel.

3.03 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 and UL 486B.

3.04 FIELD QUALITY CONTROL

- A. Perform the following field quality-control testing:
1. Complete startup checks according to manufacturer's written instructions.
 2. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.
- B. Contractor shall engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
1. Certify that electrical wiring installation complies with manufacturer's installation requirements.

3.05 TRAINING

The Contractor shall arrange with the manufacturer of the equipment to instruct school personnel in the proper operation and care of the surge suppression system. In addition, the Contractor shall provide the following:

- A. A set of simple operating instructions for operation and maintenance of the equipment shall be delivered to the Authority.
- B. Training of Personnel shall be videotaped.

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
TRANSIENT VOLTAGE SURGE SUPPRESSION 16289		- 5

Product Data	_____	_____
Shop Drawings	_____	_____
Product Certificates	_____	_____
Certificate of compliance with Quality Assurance requirements	_____	_____
Certificate of compliance with field quality control	_____	_____
Warranty	_____	_____
Operation and Maintenance instructions	_____	_____
Training videotape	_____	_____

* * *

<u>UNIT PRICE SCHEDULE FOR SANDY SITE AND PARK LIGHTING - NORTH SIDE</u>				
DESCRIPTION OF WORK	QTY	UNIT	COST	TOTAL
<u>Sandy Site and Park Lighting-North Side</u>				
<u>Demolition work</u>				
			\$ -	\$ -
Tracing and identification of the existing to be disconnected and removed branch circuit wiring and identification of the load/branch circuit assignments.		LS	\$ -	\$ -
Provisions for Temporary lighting		LS	\$ -	\$ -
Provisions for continuous power supply for 24 Hour loads during construction.		LS	\$ -	\$ -
Condition checking of existing conduits, pull boxes, junction boxes and mounting hardware		LS	\$ -	\$ -
Disconnection and removal of the existing damaged conduits		LF	\$ -	\$ -
Excavation for removal of the existing damaged underground coduits		CY	\$ -	\$ -
Removal of pavement for excavation		SF	\$ -	\$ -
Cleaning of the existing conduits (in good condition) to remain		LS	\$ -	\$ -
Deinstallation and removal of the existing damaged hardware		LS	\$ -	\$ -
Deinstallation and removal of the existing damaged pull boxes and junction boxes		LS	\$ -	\$ -
Disconnection and removal of the existing wiring supplying riverside (perimeter) Pole Lighting Fixtures		CLF	\$ -	\$ -
Disconnection and removal of the existing In-Line Fuseholders and Fuses installed in existing to be rewired riverside perimeter lighting poles.		EA	\$ -	\$ -
Disconnection and removal of the existing riverside lighting pole mounted receptacles		EA	\$ -	\$ -
Deinstallation and removal of the existing damaged cable mounting hardware in existing electrical handholes		LS	\$ -	\$ -
Disconnection and removal of the existing grounding hardware in existing electrical handholes		LS	\$ -	\$ -
			\$ -	\$ -
			\$ -	\$ -
<u>Subtotal</u>				\$ -
<u>New Construction Work</u>				
			\$ -	\$ -

Replacement of the existing damaged conduits with new conduits		LF	\$ -	\$ -
Replacement of the existing damaged underground conduits with new conduits		LF	\$ -	\$ -
Backfill excavated areas		CY	\$ -	\$ -
Restoration of pavement		LF	\$ -	\$ -
New replacement In-Line Fuseholders and Fuses installed in existing to be rewired riverside perimeter lighting poles.		EA	\$ -	\$ -
New replacement stainless steel mounting hardware		LS	\$ -	\$ -
New replacement stainless steel pull boxes and junction boxes		EA	\$ -	\$ -
New replacement XHHW-2, 600V wiring		CLF	\$ -	\$ -
Installation of new stainless steel cable mounting hardware in existing electrical handholes		LS	\$ -	\$ -
New replacement riverside lighting pole mounted weatherproof in-use receptacles		EA	\$ -	\$ -
Installation of new grounding lugs on existing metal covers in existing electrical handholes		LS	\$ -	\$ -
Installation of new grounding hardware in existing electrical handholes		LS	\$ -	\$ -
Testing of the new electrical wiring		LS	\$ -	\$ -
Testing of the new grounding system		LS	\$ -	\$ -
Testing of the rewired riverside (perimeter) lighting systems.		LS	\$ -	\$ -
		LS	\$ -	\$ -
		LS	\$ -	\$ -
<u>Subtotal</u>				\$ -
Contingencies				
Unforseen items During Construction	1	LS	\$ 20,000.00	\$ 20,000.00
Work required for the removal of underground conduits found defective and installation of new replacement couduits.	1	LS	\$ 50,000.00	\$ 50,000.00
<u>Subtotal Contingencies</u>				\$ 70,000.00
Total (Demolition+New Construction Work)				