ADDENDUM 01

UM Campus Electrical Upgrades – North Electrical Loop
University of Maine

Date: June 9, 2025

To: Prospective Bidders

From: University of Maine System
5765 Service Building
Orono, ME 04469-5765

This Addendum forms a part of the Contract Documents and modifies the original Bid Documents and Specifications dated May 17th, 2025. Portions of the bid and contract documents not altered by this Addendum remain in full force.

Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of the following:

- **Questions** with ***Response***
- Specification Changes
- Drawing Changes
- Non-Mandatory Pre-Bid Attendance List

QUESTIONS with RESPONSE:

Question 01: Field adjustments, obviously, we are allowed to do to avoid trees / ornaments / things like that?

Response 01: The contractor will coordinate final location of structures, orientation and conduit routing with the University. Distance between manholes shall not exceed 500 feet.

Question 02: Lump sum job: restoration is incidental, right?

Response 02: It is expected that the contractor will stabilize the site against erosion and loam and seed all disturbed areas.

Question 03: Vaults shown on these plans; is that really the vault that the campus wants us to install?

Response 03: The project documents provide the basis of design manhole acceptable to the University. The contractor is expected to develop through precast supplier final shop drawings for approval.

Question 04: What's the proposed start date on this?

Response 04: It is expected that the contractor will provide a project schedule for completion by the substantial completion date shown in the project documents of August 15, 2026. The University will not allow work in the Hilltop parking lot during the academic year. The University understands that installation in 2025 may not be possible and expects the contractor to produce submittals, shop drawings, order material during 2025 for installation after commencement in 2026.

Question 05: Are we going to be able to work the Parking Lot areas during the busy season?

Response 05: The contract documents sheet C-100 state that work will not be allowed in the Hilltop parking lot during the academic year.

Question 06: Would it be a goal to get this done prior to the students coming back?

Response 06: The contract documents identify that substantial completion as August 14, 2026. Please note response to question 4 above.

Question 07: Is the trail by the rip-rap pile near exit row by E|F sign an active bike trail?

Response 07: No marked or unmarked trail is understood to exist in this area.

Question 08: Is this a Baba Project?

Response 08: This project is not subject to BABA requirements.

Question 09: Can we use compression fittings instead of exothermic welds?
"§260526.3.1.D. Conductor Terminations and Connections: // ..1. Underground Connections: Welded connectors except at test wells and as otherwise indicated. // ..2. Connections to Ground Rods at Test Wells: Bolted connectors."

Response 09: Compression fitting for grounding and bonding purposes may be utilized instead of exothermic weld provided fitting is irreversible type, UL-Listed, and rated for direct burial. Irreversible compression fittings shall be equal to Burndy, YGS28.

Question 10: Is the spacing of the warning planks to be 3' on center?
"§260543.3.5.B.16. Warning Planks: Bury warning planks approximately 12 inch above direct-buried duct, placing them 36 inch o.c. Align planks along width and along centerline of duct or duct bank. Provide additional plank for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional planks 12 inch apart, horizontally across width of ducts."

Response 10: Identification of the electrical tape shall be achieved via underground warning tape only as indicated in ductbank details. Specification section 260543 has been updated.

Question 11: Does this include the parts of the trench that will be filled with concrete.
"§260543.3.5.B.16. Warning Planks: Bury warning planks approximately 12 inch above direct-buried duct, placing them 36 inch o.c. Align planks along width and along centerline of duct or duct bank. Provide additional plank for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional planks 12 inch apart, horizontally across width of ducts."

Response 11: Identification of the electrical tape shall be achieved via underground warning tape only as indicated in ductbank details. Specification section 260543 has been updated.

Question 12: Is this project Tax exempt?

Response 12: The project is Tax Exempt see section 00 62 76.13

Question 13: Are Test Wells required anywhere other than inside the manholes. Not shown on plans
"§260526.3.1.D. Conductor Terminations and Connections: // ..1. Underground Connections: Welded connectors except at test wells and as otherwise indicated. // ..2. Connections to Ground Rods at Test Wells: Bolted connectors."
"§260526.3.3.C.1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor."

Response 13: Per specification section 260526, test wells are only required at grounding rods within new electrical structures. Contractor shall verify existing manholes within the scope of this project have test wells and notify University if this has not been provided.

Question 14: Is 2/0 copper to be run the entire length of the trench and along each split in trenches(forks)?

Response 14: Ductbank counterpoise shall be #4/0 AWG copper and shall run the entire length of the trench and along each split in trenches to bond to the grounding system associated with the electrical structures. See revised sheet C-501 details and specification section 260526 for conductor size clarification and location within ductbank.

Question 15: In addition to Duct Ground and Manhole Ground requirements?
"§260526.3.2. GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS // A. Comply with IEEE C2 grounding requirements. // B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, nonshrink grout. // C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits."

Response 15: Yes, ductbank counterpoise shall be provided in addition to the manhole ground requirements.

Question 16: Plan CU104 Shows a section of Duct bank as Detail 2 but calls out for Detail 1, please clarify.

Response 16: See revised sheet CU104.

Question 17: Plan CU101 References NL-EHH-1 as being part of Base bid. Would assume this includes the conduit from Existing EHH-2. However, the note 1 says that it is part of ALT#1. Please Clarify.

Response 17: Yes, the telecommunication ductbank run between existing EHH-2 and NL-EHH-1 shall be base bid. See revised sheet CU101 for clarification.

Question 18: Can we shift Manholes to avoid additional bends where not necessary?

Response 18: The contractor will coordinate final location of structures, orientation and conduit routing with the University. Distance between manholes shall not exceed 500 feet.

Question 19: Are the electric and communications manhole shown on sheet C-501 the correct size requested by the owner?

Response 19: The project documents provide the basis of design manhole acceptable to the University. The contractor is expected to develop through precast supplier final shop drawings for approval.

Question 20: Who are the General Contractors that were present at your pre bid walkthrough this week?

Response 20: See accompanying Pre-Bid Attendance Sheet.

Question 21: Is the intent of the unit prices to be used as a Schedule of Values?
It appears by the bid documents this is a lump sum project. If the intent is to compensate the contractor with the unit prices, then there should be some established quantities, so everyone is working off the same information. Also, additional pay items should be included to cover erosion control, administrative costs etc. If these costs are simply spread over the unit prices outlined in the bid documents, it will significantly inflate the p/unit price.

Response 21: The project bid is lump sum, and the unit prices identified may be utilized for any additional work.

Question 22: C501 detail 5, note 6; calls for the 4/0 ground that is run in the ductbank to enter the manhole. None of the ductbank details on this sheet show or call for a ground wire. 260526-3.1-B-2 says to provide where indicated. Please advise if it is required? If so, is it a separate ground wire for both the telecom and power, or is it 1 wire that can "Y" to the 2 manholes?

Response 22: See revised C-501 ductbank details showing #4/0 AWG counterpoise shall be run as (1) conductor centered over ductbank with a "Y" connection at ductbank locations where the telecommunications ductbank branches out to the telecommunication manhole.

Question 23: 260100 mentions temporary power; please advise what is required. I would anticipate that a "suitcase" generator would be sufficient for any task that might be required and this should be by the trade.

Response 23: The contractor is required to provide any temporary power required to complete the work of this project.

Question 24: 260513-2.5 indicated 200A Load-Break elbows; EP501 says a Dead-Break connections at the Rec Center Switch. Please confirm what is required.

Response 24: Terminations shall be Dead-Break connection at Rec Center Switch is correct. Please see revised specification section 260513.

Question 25: 260513-3.1-I Please confirm arc-proof taping is required in all the new manholes where only a single feeder is installed? Do we tape the 3 cables bundled together, or individually?

Response 25: Yes, arc-proof taping is required within all manholes even though there is a single circuit. Cables shall be taped individually to provide phase-to-phase protection.

Question 26: 260543-3.5-B-4 calls for expansion-deflection fittings at each manhole connection. Is this required? It has not been required on other recent projects.

Response 26: Yes, expansion-deflection fittings are required as indicated in specifications.

Question 27: The layout configuration of existing manholes/duct banks at the Rec Center does not match with the bid docs from the Athletic Fields project. Please confirm interface with this project; see snip below:

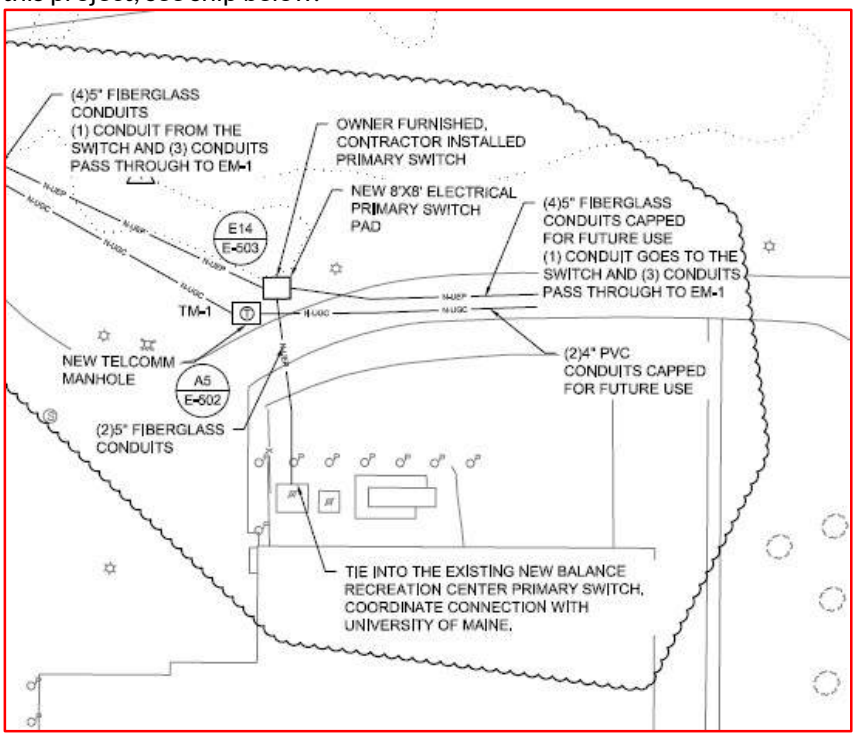

Figure 1 Snippet from 5100593 ES103 dated 2024-11-07 depicting infrastructure north of Rec Center.

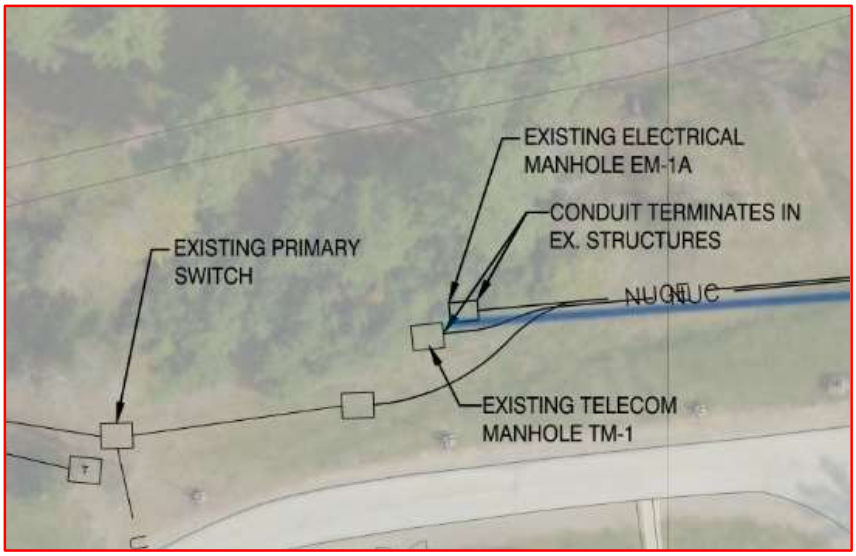

Figure 2 Snippet from 5100722NL CU104 dated 2025-05-17 depicting infrastructure north of Rec Center.

Response 27: The contractor will coordinate final location of structures, orientation and conduit routing with the University. Distance between manholes shall not exceed 500 feet.

Question 28: In regards to pulling the 350 cable, do you want us to pull all of the cable in one pipe? Or do you wish for us to pull one cable per pipe?

Response 28: All conductors associated with the circuit to the Rec Switch shall be pulled within same conduit. Remaining (3) conduits in ductbank are for future use.

Question 29: Specification 260513 3.1G references the use of "dead-front separable watertight connectors" for splices in manholes. Please confirm whether these will be accepted or if in-line splice kits should be utilized in the manholes.

Response 29: Please utilize in-line cold shrink type splices.

Question 30: Specification 260513 2.5 does not indicate whether dead-front terminals should be copper or aluminum. Please confirm if aluminum dead-break elbows rated at 600A would be acceptable or if the 900A copper dead-break elbows will be required.

Response 30: Dead-break connections shall be copper.

Question 31: Specification 260513 3.2A references multiple testing requirements, some of which aren't typically recommended by the testing agencies or required by the University (specifically DC High Potential testing and Dissipation Factor Testing). Please confirm if these testing requirements will be required as part of the project or if they will be provided by others. If they are to be part of the project, please confirm which tests will be required.

Response 31: Testing shall be provided as part of the project as indicated in specification 26 05 13 3.2A.

Question 32: Specification 260526 3.1B and Specification 270526 3.5A indicate that an external grounding conductor may be required as a part of the installation, but Drawing EP651 indicates that a #3 ground be installed with the 15kV cables inside the RTRC conduit. Past projects on campus have required a 4/0 external grounding conductor for the duct-bank installation and no internal grounding conductor. Please confirm the design on EP651 should be utilized and confirm that no external grounding conductors will be required.

Response 32: Provide both the #3 AWG ground conductor INTERNAL ground conductors associated with the feeder circuit and the #4/0 AWG EXTERNAL ground conductor (ductbank counterpoise) to ensure grounding connection between electrical structures.

SPECIFICATION CHANGES

- **Section 000110 — Table of Contents**
  - Delete from Project Manual dated 2025-05-17 and replace in entirety.
    i. Updated per Addendum 01.
- **Section 000115 — List Of Drawing Sheets**
  - Delete from Project Manual dated 2025-05-17 and replace in entirety.
    i. Updated per Addendum 01.
- **Section 260500 – Common Work Results for Electrical**
  - New specification section to be added to Project Manual.
- **Section 260513 – Medium-Voltage Cables**
  - Delete from Project Manual dated 2025-05-17 and replace in entirety.
    i. Revised connectors to dead-break connectors.
    ii. Added installation clarification on arc proofing tape.
- **Section 260526 – Grounding and Bonding for Electrical Systems**
  - Delete from Project Manual dated 2025-05-17 and replace in entirety.
    i. Revised ductbank grounding to #4/0 AWG.
- **Section 260543 – Underground Ducts and Raceways for Electrical Systems**
  - Delete from Project Manual dated 2025-05-17 and replace in entirety.
    i. Removed warning planks from identification and installation instructions.

DRAWING CHANGES

- **CU101 – Utilities Plan A**
  - Delete from Project Plans dated 2025-05-17 and replace in entirety.
    i. Revised General Notes.
    ii. Clarification of telecommunication ductbank between existing EHH-2 and NL-EHH-1.
- **CU102 – Utilities Plan B**
  - Delete from Project Plans dated 2025-05-17 and replace in entirety.
    i. Revised General Notes.
- **CU103 – Utilities Plan C**
  - Delete from Project Plans dated 2025-05-17 and replace in entirety.
    i. Revised General Notes.
- **CU104 – Utilities Plan D**
  - Delete from Project Plans dated 2025-05-17 and replace in entirety.
    i. Revised General Notes.
    ii. Revised Ductbank Callout.
- **C-501 – Site Details**
  - Delete from Project Plans dated 2025-05-17 and replace in entirety.
    i. Revised ductbank details to include ductbank counterpoise.

NON-MANDATORY PRE-BID ATTENDANCE LIST:

Non-Mandatory Pre-Bid Walkthrough Attendance List is attached.

SECTION 000110 - TABLE OF CONTENTS

(EDITED – ADDENDUM 01)

END OF SECTION 000110

DOCUMENT 000115 – LIST OF DRAWING SHEETS

(EDITED – ADDENDUM 01)

1.1 DRAWINGS

A. GI001 COVER SHEET
B. C-001 SITE NOTES & LEGENDS
C. C-100 CONTEXT PLAN
D. CE101 SITE EROSION AND SEDIMENTATION CONTROL PLAN A
E. CE102 SITE EROSION AND SEDIMENTATION CONTROL PLAN B
F. CE103 SITE EROSION AND SEDIMENTATION CONTROL PLAN C
G. CE104 SITE EROSION AND SEDIMENTATION CONTROL PLAN D
H. CP101 SITE LAYOUT PLAN
I. CU101 UTILITIES PLAN A **[Edited via Addendum 01]**
J. CU102 UTILITIES PLAN B **[Edited via Addendum 01]**
K. CU103 UTILITIES PLAN C **[Edited via Addendum 01]**
L. CU104 UTILITIES PLAN D **[Edited via Addendum 01]**
M. C-501 SITE DETAILS **[Edited via Addendum 01]**
N. C-502 SITE DETAILS
O. EP651 CAMPUS ONE-LINE DIAGRAM

END OF DOCUMENT 000115

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

1

(SECTION ADDED - ADDENDUM 01)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work. Do not use pitch-pocket type flashings.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

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

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION 260500

SECTION 260513 - MEDIUM-VOLTAGE CABLES

(EDITED – ADDENDUM 01)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cables.
2. Connectors.
3. Solid terminations.
4. Separable insulated connectors.
5. Splice kits.
6. Medium-voltage tapes.
7. Arc-proofing materials.
8. Fault indicators.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

B. Samples: 16 inch lengths for each type of cable specified.

C. Sustainable Design Submittals:

1. Product Data: For each conductor and cable indicating lead content.
2. Product Data: For solvents and adhesives, indicating VOC content.
3. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Indicate location of each cable, splice, and termination.

B. Material Certificates: For each type of cable and accessory.

C. Design Data: Cable pulling calculations, including conduit size and fill percentage, pulling tensions, cable sidewall pressure, jam probability, voltage drop, and ground wire sizing for each cable.

D. Source quality-control reports.

E. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with IEEE C2 and NFPA 70.

C. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Cable; Prysmian Group North America.
2. Hendrix Wire and Cable; Marmon Holdings, Inc.; Berkshire Hathaway Inc.
3. Kerite Power Cable; Marmon Holdings, Inc.; Berkshire Hathaway Inc.
4. Okonite Company (The).
5. Prysmian Cables and Systems; Prysmian Group North America.
6. Southwire Company, LLC.

B. Cable Type: Type MV 105.

C. Conductor Insulation: Ethylene-propylene rubber.

1. Voltage Rating: 15 kV.
2. Insulation Thickness: 133 percent insulation level.

D. Conductor: Copper .

E. Comply with UL 1072, AEIC CS8 , ICEA S-93-639/NEMA WC 74, and ICEA S-97-682 .

F. Conductor Stranding: Compact round, concentric lay, Class B .

G. Lead Content: Less than 300 parts per million.

H. Shielding: Copper tape , helically applied over semiconducting insulation shield.

I. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

J. Cable Jacket: Sunlight-resistant PVC .

K. Cables shall be ordered with both ends exposed on spools for testing at time of delivery.

2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.
2. ABB, Electrification Business.
3. Eaton.

B. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

C. Copper-Conductor Connectors: Copper barrel crimped connectors.

2.4 SOLID TERMINATIONS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.
2. ABB, Electrification Business.
3. G&W Electric Company.

B. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.

1. Compound-filled, cast-metal-body, metal-clad cable terminator for metal-clad cable with external plastic jacket.
2. Cold-shrink sheath seal kit with preformed sleeve openings sized for cable and insulated conductors.
3. Heat-shrink sheath seal kit with phase- and ground-conductor rejacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.
4. Cast-epoxy-resin sheath seal kit with wraparound mold and packaged, two-part, epoxy-resin casting material.

C. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations:
   a. Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.

b. Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
c. Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.

2.5 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB, Electrification Business.
2. Eaton.
3. Richards Manufacturing Co.

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~~*C. Load-Break Cable Terminators: Elbow-type units with 200 A load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.*~~

C. Dead-Break Cable Terminators: Elbow-type unit with 600a continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

1.1 SPLICE KITS

A. Description: For connecting medium voltage cables; type as recommended by cable or splicing kit manufacturer for the application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.
2. ABB, Electrification Business.
3. Eaton.
4. Richards Manufacturing Co.
5. DSG - CanUSA.

C. Standard: Comply with IEEE 404.

D. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, materials, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

1. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.

1.2 MEDIUM-VOLTAGE TAPES

A. Description: Electrical grade, insulating tape rated for medium voltage application.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M.
2. HellermannTyton.
3. Scapa Industrial; Scapa Group plc.

C. Ethylene/propylene rubber-based, 30 mil splicing tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

D. Silicone rubber-based, 12 mil self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inch wide.

E. Insulating-putty, 125 mil elastic filler tape. Minimum 1-1/2 inch wide.

1.3 ARC-PROOFING MATERIALS

A. Description: Fire retardant, providing arc flash protection.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 3M.

C. Tape for First Course on Metal Objects: 10 mil thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

D. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, and compatible with cable jacket.

E. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1 inch wide.

1.4 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 2 - EXECUTION

2.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inch on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.
2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.
4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route, around the entire perimeter at least once, from entry to exit; support cables at intervals adequate to prevent sag.

F. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

G. Install cable splices at pull points and elsewhere as indicated; use standard kits. Use dead-front separable watertight connectors in manholes and other locations subject to water infiltration.

H. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

I. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:

1. Clean cable sheath.
2. Wrap metallic cable components with 10 mil pipe-wrapping tape.
3. Smooth surface contours with electrical insulation putty.
4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
5. Band arc-proofing tape with two layers of 1 inch wide half-lapped, adhesive, glass-cloth tape at each end of the arc-proof tape.
6. ***Extend fireproofing 1 inch into conduit or duct.***

J. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

K. Ground shields of shielded cable at one point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

L. Identify cables according to Section 260553 "Identification for Electrical Systems." Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

2.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Test conductors on spools at time of delivery.
2. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
3. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
4. Perform direct-current High Potential test of each new conductor according to NETA ATS, Ch. 7.3.3. Do not exceed cable manufacturer's recommended maximum test voltage.
5. Perform Partial Discharge test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.
6. Perform Dissipation Factor test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

B. Medium-voltage cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 260513

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

(EDITED – ADDENDUM 01)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

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

B. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Product Data: For each conductor and cable indicating lead content.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:
   a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
      1) Test wells.
      2) Ground rods.
      3) Ground rings.
      4) Grounding arrangements and connections for separately derived systems.
   b. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS .
      1) Tests must determine if ground-resistance or impedance values remain within specified maximums, and instructions must recommend corrective action if values do not.
      2) Include recommended testing intervals.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

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

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Mechanical-Type Bus-Bar Connectors: Cast silicon bronze, solderless compression -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Compression-Type Bus-Bar Connectors: Copper or copper alloy, with two wire terminals.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

K. Straps: Solid copper, copper lugs. Rated for 600 A.

L. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

M. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.
   a. Material: Die-cast zinc alloy.
   b. Listed for direct burial.
2. U-bolt type with malleable-iron clamp and copper ground connector .

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel ; 3/4 inch by 10 ft. .

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. ~~2/0~~ **4/0** AWG minimum.

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1. Bury at least 30 inch below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

D. Conductor Terminations and Connections:

1. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
2. Connections to Ground Rods at Test Wells: Bolted connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.3 INSTALLATION

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

B. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for all below-grade connections.
3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.

1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
2. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal , at ground test wells , and at individual ground rods. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without 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.
   b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order,

and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

(EDITED – ADDENDUM 01)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type PVC raceways and fittings.
2. Type RTRC-BG raceways and fittings.
3. Fittings for conduit, tubing, and cable.
4. Threaded metal joint compound.
5. Solvent cements.
6. Duct accessories.
7. Handholes and boxes for exterior underground wiring.
8. Manholes for exterior underground wiring.
9. Utility structure accessories.
10. Duct sealing.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.

B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.

C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter in order to access the cables.

D. Manhole: An underground chamber containing electrical cables and equipment, sized to provide access with working space clearances.

E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site before installation of RTRC conduits.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Duct-bank materials, including spacers and miscellaneous components.
2. Ducts, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes.
4. Underground-line warning tape.
5. Warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Concrete Structures:
   a. Include plans, elevations, sections, and details, including attachments to other Work.
   b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
   c. Include reinforcement details.
   d. Include frame and cover design and manhole chimneys.
   e. Include ladder details.
   f. Include grounding details.
   g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
   h. Include joint details.
2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
   a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
   b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
   c. Include cover design.
   d. Include grounding details.
   e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Sustainable Design Submittals:

1. Product Data: For solvents and adhesives, indicating VOC content.
2. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates:

1. For concrete and steel used in precast concrete manholes , as required by ASTM C858.

B. Source Quality-Control Submittals:

1. Source quality-control reports.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Furnish to Owner spare parts necessary for repairing or adding more cables to manholes or handholes that are packaged with protective covering for storage and identified with labels describing contents.

1. Cable-Support Stanchions, Arms, Insulators, and Associated Fasteners: Five percent of quantity of each item installed.

1.7 REGULATORY AGENCY APPROVALS

A. Submit Shop Drawings for electric utility duct banks and structures for action by Architect prior to submitting for approval by electric utility.

PART 2 - PRODUCTS

2.1 TYPE PVC RACEWAYS AND FITTINGS

A. PVC Conduit shall be utilized for Communication ductbank only. All power ductbanks shall be RTRC conduit.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL CCN DZYR.

C. Schedule 40 Rigid PVC Conduit (PVC-80) and Fittings:

1. Dimensional Specifications: Schedule 80.
2. Options:
   a. Minimum Trade Size: Sizes as indicated on Drawings.
   b. Markings: For use with maximum 90 deg C wire.

2.2 TYPE RTRC-BG RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 2420 and UL CCN DZKT, for Type BG.

B. Low-Halogen, Belowground Reinforced Thermosetting Resin Conduit (RTRC-BG) and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Champion Fiberglass, Inc.
   b. FRE Composites.
   c. United Fiberglass of America (UFA).
2. Options:
   a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Metallic Fittings for Type PVC,Raceways:

1. General Characteristics: UL 514B and UL CCN DWTT.
2. Options:
   a. Material: Steel .
   b. Coupling Method: Compression coupling .
   c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
   d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

2.4 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

B. Solvent Cements for Type PVC Raceways and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Oatey.

2.5 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. ABB, Electrification Business.
   b. Allied Tube & Conduit; Atkore International.
   c. Cantex Inc.
   d. IPEX USA LLC.

B. Underground-Line Warning Tape: In accordance with Section 260553 "Identification for Electrical Systems."

C. Concrete Warning Planks: Nominal 12 by 24 by 3 inch in size, manufactured from 6000 psi concrete.

1. Color: Red dye added to concrete during batching.
2. Mark each plank with "ELECTRIC" in 2 inch high, 3/8 inch deep letters.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
   a. ASTM C858 for design and manufacturing processes.
   b. SCTE 77.

B. Source Quality Control:

1. Precast Concrete Utility Structures: Test and inspect in accordance with ASTM C1037.
2. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
   a. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.

C. Precast Concrete Handholes and Boxes :

1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Christy Concrete Products.
   b. Elmhurst-Chicago Stone Co.
   c. Oldcastle Infrastructure Inc.; CRH Americas.
3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Frame and Cover:
   a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
   b. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
   c. Cover Legend: Molded lettering, "ELECTRIC"or "COMMUNICATIONS" (as indicated on Drawings). .
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
   a. Extension must provide increased depth of 12 inch .
   b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
7. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
   a. Center window location.
   b. Knockout panels must be located no less than 6 inch from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
   c. Knockout panel opening must have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
   d. Knockout panels must be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
   e. Knockout panels must be 1-1/2 to 2 inch thick.
8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
   a. Type and size: Match fittings to duct to be terminated.
   b. Fittings must align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
   c. Provide minimum of one cast end-bell or duct-terminating fitting of each size provided in each wall.
9. Handholes 12 inch wide by 24 inch long and larger must have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 MANHOLES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:

a. ASTM C858 for design and manufacturing processes.
b. SCTE 77.

B. Precast Concrete Manholes:

1. Refer to Drawings for physical dimensions of utility structures.
2. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Concrete.
   b. Christy Concrete Products.
   c. Elmhurst-Chicago Stone Co.
   d. Oldcastle Infrastructure Inc.; CRH Americas.
   e. Utility Concrete Products, LLC.
   f. Utility Vault Co.
4. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
   a. Center window location.
   b. Knockout panels must be located no less than 6 inch from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
   c. Knockout panel opening must have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
   d. Knockout panel must be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
   e. Knockout panels must be 1-1/2 to 2 inch thick.
5. Ground Rod Sleeve: Provide 3 inch PVC sleeve in manhole floors 2 inch from wall adjacent to, but not underneath, duct entering structure.
6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
7. Source Quality Control: Test and inspect in accordance with ASTM C1037.

2.8 UTILITY STRUCTURE ACCESSORIES

A. Description: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application , and complying with the following local utility company requirements:

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. BILCO Company (The).
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Infrastructure Inc.; CRH Americas.
5. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.

6. Utility Concrete Products, LLC.

C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A48/A48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 29 inch.
   a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
   b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
2. Cover Legend: Cast in; selected to suit system.
   a. Legend:
      1) "ELECTRIC-HV" for duct systems with medium-voltage cables.
3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
   a. Seal joints watertight using preformed plastic or rubber complying with ASTM C990. Install sealing material in accordance with sealant manufacturers' published instructions.

D. Manhole Sump Frame and Grate: ASTM A48/A48M, Class 30B, gray cast iron.

E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2 inch diameter eye, and 1-by-4 inch bolt.

1. Working Load Embedded in 6 inch, 4000 psi Concrete: 13,000 lbf minimum tension.

F. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4 inch diameter eye, rated 2500 lbf minimum tension.

G. Pulling-in and Lifting Irons in Concrete Floors: 7/8 inch diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; fastened to reinforcing rod; and with exposed triangular opening.

1. Ultimate Yield Strength: 40,000 lbf shear and 60,000 lbf tension.

H. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2 inch ID by 2-3/4 inch deep, flared to 1-1/4 inch minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

I. Ground Rod Sleeve: 3 inch PVC sleeve in manhole floors 2 inch from wall adjacent to, but not underneath, ducts routed from facility.

J. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless steel expander clip with 1/2 inch bolt, 5300 lbf rated pullout strength, and minimum 6800 lbf rated shear strength.

K. Nonmetallic Cable Rack Assembly: Components fabricated from nonconductive, fiberglass-reinforced polymer.

1. Stanchions: Nominal 36 inch high by 4 inch wide, with provisions to connect to other sections to form continuous unit, with minimum of nine holes for arm attachment.
2. Arms: Arranged for secure, drop-in attachment in horizontal position at locations on cable stanchions, and capable of being locked in position. Arms must be available in lengths ranging from 3 inch with 450 lb minimum capacity to 20 inch with 250 lb minimum capacity. Top of arm must be nominally 4 inch wide, and arm must have slots along full length for cable ties.

L. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder and mounting brackets and braces must be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin .

M. Portable Manhole Ladders: UL-listed, heavy-duty fiberglass specifically designed for portable use for access to electrical manholes. Length must be not less than distance from deepest manhole floor to grade plus 36 inch. Two ladder(s) are required.

N. Cover Hooks: Heavy duty, designed for lifts 60 lbf and greater . Two ladders(s) are required.

2.9 DUCT SEALING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB, Electrification Business.
2. Gardner Bender.
3. Ideal Industries, Inc.
4. NSi Industries LLC.

B. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.

C. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain in accordance with Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication in accordance with Section 311000 "Site Clearing."

3.2 SELECTION OF UNDERGROUND DUCTS

A. Duct for Electrical Cables More Than 600 V: RTRC BG, concrete encased where installed under pavement or other locations subject to vehicular traffic.

B. Duct for Electrical Feeders 600 V and Less: ,

1. Secondaries (Between Transformer and Buildings): RTRC BG, concrete encased where installed under pavement or other locations subject to vehicular traffic.
2. Other Feeders:
   a. Under Pavement: PVC-80, concrete encased.
   b. All Other Locations: PVC-40, direct buried, unless otherwise indicated.

C. Duct for Electrical Branch Circuits: PVC-40 , direct buried unless otherwise indicated.

D. Underground Ducts Crossing Driveways : PVC-40 encased in reinforced concrete.

E. Underground Ducts Crossing Roadways : PVC-40, encased in reinforced concrete.

F. Stub-ups: Concrete encased, ERMC-S .

3.3 SELECTION OF UNDERGROUND ENCLOSURES

A. Handholes and Boxes:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-10 Precast concrete, AASHTO H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin , structurally tested in accordance with SCTE 77 with 3000 lbf vertical loading.
5. Cover design load must not exceed load rating of handhole or box.

B. Manholes: Precast concrete.

1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating in accordance with AASHTO HB 17.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating in accordance with AASHTO HB 17.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.

C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses."

E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Site Clearing."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
2. Steel raceway, bends, and fittings in single duct run or duct bank must be of same type.
3. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
4. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
5. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch.
6. Curves and Bends:
    a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch , both horizontally and vertically, at other locations unless otherwise indicated.

b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch . Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.

7. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.
   a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.
8. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F. Where environmental temperatures are calculated to rise above 104 deg F, and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F.
9. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.
   a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.
   b. Grout end bells into structure walls from both sides to provide watertight entrances.
10. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.
    a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.
11. Install manufactured steel raceway elbows for stub-ups at poles unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
    a. Couple steel elbows to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.
12. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
13. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
14. Concrete-Encased Ducts and Duct Bank:
    a. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes 6 inch or less in nominal diameter.
    b. Width: Excavate trench 12 inch wider than duct on each side.
    c. Depth: Install so top of duct envelope is at least 24 inch below finished grade in areas not subject to deliberate traffic, and at least 30 inch below finished grade in deliberate traffic paths for vehicles unless otherwise indicated. Install so top of duct envelope is below local frost line.
    d. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

e. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

f. Minimum Space between Ducts: 3 inch between edge of duct and exterior envelope wall, 2 inch between ducts for like services, and 4 inch between power and communications ducts.

g. Elbows:
   1) Use manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct run.

h. Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of equipment base.
   1) Stub-ups must be minimum 4 inch above finished floor and minimum 3 inchfrom conduit side to edge of slab.

i. Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of wall. Install insulated grounding bushings on terminations at equipment.
   1) Stub-ups must be minimum 4 inch above finished floor and no less than 3 inch from conduit side to edge of slab.

j. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

k. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

l. Concrete Cover: Install minimum of 3 inch of concrete cover between edge of duct to exterior envelope wall, 2 inch between duct of like services, and 4 inch between power and communications ducts.

m. Place minimum 6 inch of engineered fill above concrete encasement of duct.

n. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
   1) Start at one end and finish at other, allowing for expansion and contraction of duct as its temperature changes during and after pour. Use expansion fittings installed in accordance with manufacturer's published instructions, or use other specific measures to prevent expansion-contraction damage.
   2) If more than one pour is necessary, terminate each pour in vertical plane and install 3/4 inch reinforcing-rod dowels extending minimum of 18 inch into concrete on both sides of joint near corners of envelope.

o. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

15. Direct-Buried Duct and Duct Bank:

a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
b. Width: Excavate trench 3 inch wider than duct on each side.
c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
d. Set elevation of top of duct bank below frost line.
e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.
i. Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
j. Install manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct.
    1) Couple RNC duct to steel raceway with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete.
    2) Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of base. Install insulated grounding bushings on terminations at equipment.
        a) Stub-ups must be minimum 4 inch above finished base and minimum 3 inchfrom conduit side to edge of base.
    3) Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally on exterior of wall minimum of 60 inch from edge of wall. Install insulated grounding bushings on terminations at equipment.
    4) Stub-ups through interior floors must be minimum 4 inch above finished floor and no less than 3 inchfrom conduit side to edge of equipment pad or floor slab.
k. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inch over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

1

~~16. Warning Planks: Bury warning planks approximately 12 inch above direct buried duct, placing them 36 inch o.c. Align planks along width and along centerline of duct or duct bank. Provide additional plank for each 12 inch increment of duct bank width over~~

~~*nominal 18 inch. Space additional planks 12 inch apart, horizontally across width of ducts.*~~

17. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct banks and approximately 12 inch below grade. Align tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.
18. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Reference Standards:

1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Cast-in-Place Manholes:
   a. Finish interior surfaces with smooth-troweled finish.
   b. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inch thick, arranged as indicated.
   c. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.
2. Precast Concrete Handholes and Manholes:
   a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
   b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from 1 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
   c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
3. Elevations:
   a. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
   b. Install handholes with bottom below frost line, .
   c. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
   d. Where indicated, cast handhole cover frame integrally with handhole structure.
4. Manhole Access: Circular opening in manhole roof; sized to match cover size.
   a. Install chimney, constructed of cast-iron collars and rings, and cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight joints and waterproof grouting for frame and chimney.
5. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. . After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and

scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

6. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.
7. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, as required for installation and support of cables and conductors and as indicated.
8. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inch for manholes and 2 inch for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
9. Ground manholes, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Reference Standards:

1. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from 1/2 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
4. Install handholes and boxes with bottom below frost line, .
5. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
6. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
7. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour concrete ring encircling, and in contact with enclosure entry, and with top surface screeded to top of box cover frame. Bottom of ring must rest on compacted earth .
   a. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with troweled finish.
   b. Dimensions: 10 inch wide by 12 inch deep .
8. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Assemble and submit test and inspection reports.

D. Manufacturer Services:

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

3.9 CLEANING

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

B. Clean internal surfaces of manholes, including sump, and building interiors affected by Work.

1. Sweep floor, removing dirt and debris.
2. Remove foreign material.

END OF SECTION 260543


SHEET 102
SHEET 101
CONDUIT DUCTBANK 2 C-501
NEW COMMUNICATION HANDHOLE ALTERNATE #1 (NL-EHH-2) TOP OF FRAME =141.50+/- 5 C-501
5 C-501 ELECTRICAL MANHOLE (NL-EMH-2) TOP OF FRAME =141.00+/-
LOCATE MANHOLES OUTSIDE OF GRAVEL PATH
SAWCUT & REMOVE PAVEMENT. RESTORE TO CONDITION AFTER INSTALLATION OF CONDUITS.
ENCASED CONDUIT DUCTBANK 1 C-501 TYP.
7 C-501 PAVEMENT REPAIR @ TRENCH
CONDUIT DUCTBANK 2 C-501
5 C-501 NEW ELECTRICAL MANHOLE (NL-EMH-1) TOP OF COVER = 141.50+/-
5 C-501 NEW COMMUNICATION HANDHOLE (NL-EHH-1)(BASE BID) TOP OF COVER = 141.50+/-
ENCASED CONDUIT DUCTBANK 1 C-501 TYP.
COORDINATE CROSSING @ COMMUNICATIONS & ELECTRICAL SERVICES
NEW COMMUNICATION CONDUIT FROM SOUTHERN EXISTING ELECTRICAL HANDHOLE TO FIRST NEW COMMUNICATION MANHOLE TO BE BASE BID WORK.
COORDINATE CROSSING @ IRRIGATION/WATER LINE (TYP. ALL)
CONDUIT DUCTBANK 2 C-501 (TYP.)
NOTES: 1
1. PORTIONS OF NEW COMMUNICATION CONDUITS & HANDHOLES SHOWN ON THIS PLAN ARE ASSOCIATED WITH ALTERNATE #1 WORK. SEE PLAN FOR LOCATIONS.
2. CONTRACTOR SHALL LIMIT EXTENT OF CONDUIT TRENCH EXCAVATION TO WHAT CAN BE COMPLETED AND CLOSED IN ONE DAY.
3. MANHOLES CAN BE SHIFTED TO AVOID BENDS, EXISTING IMPROVEMENTS AND LEDGE IN COORDINATION WITH OWNER. CONDUIT RUNS BETWEEN MANHOLES SHALL NOT EXCEED 500 FT.
COORDINATE CROSSING @ ELECTRICAL LINE
ENCASED CONDUIT DUCTBANK 1 C-501 TYP.
REMOVE FENCE AS NEEDED FOR INSTALLATION OF PRIMARY DUCTS; COORDINATE POSTS WITH DUCTBANK & RESTORE TO EXISTING CONDITION. PROVIDE SUITABLE TEMPORARY CLOSURE WHILE FENCE CONDITION IS IMPACTED BY CONSTRUCTION
FIELD VERIFY WITH OWNER ON LOCATION OF EHH-2.
EMH-2
EHH-2
COORDINATE ACCESS & PROGRESS WITH SEPARATE CONTRACT ELECTRICAL UPGRADES WORK IN THESE AREAS
1 C-501 ENCASED CONDUIT DUCTBANK TYP.
CONDUIT TERMINATION IN MANHOLE/HANDHOLE. SEE DETAILS FOR REQUIREMENTS. FIELD VERIFY LOCATION OF MANHOLES/HANDHOLES BY OTHERS WITH OWNER (TYP.)
7 C-501 PAVEMENT REPAIR @ TRENCH
5|CU501
4|CU501
3|CU501
2|CU501, SEE 1|C501 FOR ENCASED CONDUIT
TYPICAL CONDUIT DUCTBANK LAYOUT @ MANHOLES
1/2" = 1'

MAINE

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72 Harlow Street
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1.877.700.7678
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STATE OF MAINE — LUKA ... NO. 13007 LICENSED PROFESSIONAL ENGINEER
LICENSED LANDSCAPE ARCHITECT — KENNETH DAVID COSTELLO — STATE OF MAINE

0 20' 40' 80' 120'

TRUE NORTH

#	Description	Date
1	ADDENDUM #1	6-9-25

ISSUED FOR BID

5-17-25

SHEET TITLE:

UTILITIES PLAN A

Original drawing is 36" x 24" - DO NOT SCALE CONTENTS OF THIS DRAWING.

SCALE:	1" = 40'	DESIGNED BY:	MAF
SMRT PROJECT #:	22184	DRAWN BY:	SLM

CU101

SHEET 103
SHEET 102

ENCASED CONDUIT DUCTBANK TYP. (1 / C-501)

SEE GRADING PLAN ENLARGEMENT THIS SHEET

CENTER ELECTRICAL MANHOLE ON EXTENDED PARKING LOT PAINT STRIP

FIELD COORDINATE DUCTBANK LOCATION WITH EXISTING LIGHTING CONDUIT

SEE ENLARGEMENT B - CROSSING PLAN THIS SHEET

COORDINATE CROSSING @ COMMUNICATIONS & ELECTRICAL SERVICES

REMOVE FENCE AS NEEDED FOR INSTALLATION OF PRIMARY DUCTS; RESTORE TO EXISTING CONDITION. COORDINATE POSTS WITH DUCTBANK.

ELECTRICAL MANHOLE (NL-EMH-3) TOP OF FRAME = 141.50+/- (5 / C-501)

5 / C-501 NEW COMMUNICATIONS HANDHOLE (NL-EHH-3) TOP OF FRAME = 141.50+/-

2 / C-501 CONDUIT DUCTBANK TYP.

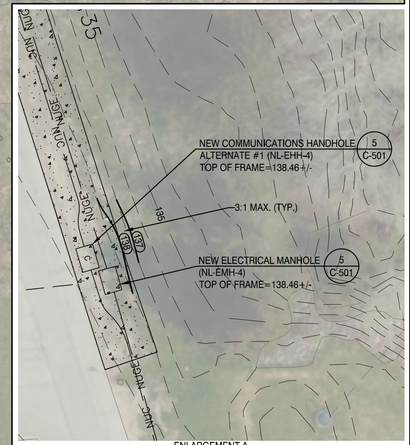
7 / C-501 PAVEMENT REPAIR @ TRENCH

ENCASED CONDUIT DUCTBANK TYP. (1 / C-501)

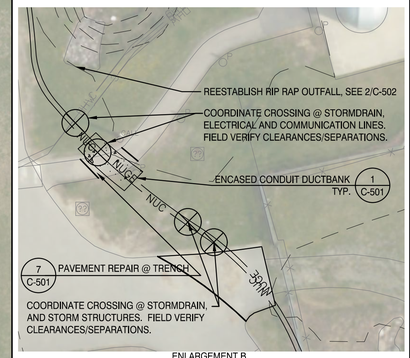
SHEET 102
SHEET 101

1

NOTES:
1. ALL NEW COMMUNICATION CONDUITS & HANDHOLES SHOWN ON THIS PLAN ARE ASSOCIATED WITH ALTERNATE #1 WORK. SEE PLAN FOR LOCATIONS.
2. CONTRACTOR SHALL LIMIT EXTENT OF CONDUIT TRENCH EXCAVATION TO WHAT CAN BE COMPLETED AND CLOSED IN ONE DAY.
3. MANHOLES CAN BE SHIFTED TO AVOID BENDS, EXISTING IMPROVEMENTS AND LEDGE IN COORDINATION WITH OWNER. CONDUIT RUNS BETWEEN MANHOLES SHALL NOT EXCEED 500 FT.



ENLARGEMENT A
GRADING PLAN
SCALE: 1" = 20'



ENLARGEMENT B
CROSSING PLAN
SCALE: 1" = 20'

0 20' 40' 80' 120'

TRUE NORTH

#	Description	Date
1	ADDENDUM #1	6-9-25

ISSUED FOR BID

5-17-25

SHEET TITLE:

UTILITIES PLAN B

Original drawing is 36" x 24" - DO NOT SCALE CONTENTS OF THIS DRAWING.

SCALE: 1" = 40' | DESIGNED BY: LW
SMRT PROJECT #: 22184 | DRAWN BY: SLM

CU102

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72 Harlow Street
Bangor, Maine 04401
1.877.700.7678
www.smrtinc.com

STATE OF MAINE — LURA WHITE — NO. 13007 — LICENSED PROFESSIONAL ENGINEER — 6/17/25

LICENSED LANDSCAPE ARCHITECT — KENNETH DAVID COSTELLO — No. 555 — STATE OF MAINE — 6/17/25

NOTES:
1. ALL NEW COMMUNICATION CONDUITS & HANDHOLES SHOWN ON THIS PLAN ARE ASSOCIATED WITH ALTERNATE #1 WORK. SEE PLAN FOR LOCATIONS.
2. CONTRACTOR TO FIELD VERIFY LOCATION OF EM-1A, TM-1 & SWITCH WORK BY OTHERS WITH OWNER.
3. CONTRACTOR SHALL LIMIT EXTENT OF CONDUIT TRENCH EXCAVATION TO WHAT CAN BE COMPLETED AND CLOSED IN ONE DAY.
3. MANHOLES CAN BE SHIFTED TO AVOID BENDS, EXISTING IMPROVEMENTS AND LEDGE IN COORDINATION WITH OWNER. CONDUIT RUNS BETWEEN MANHOLES SHALL NOT EXCEED 500 FT.

1

SHEET 104
SHEET 103

1
2 C-501 CONDUIT DUCTBANK (TYP.)

CONTRACTOR TO PROVIDE 12' WIDE, CENTERED ON DUCTBANK, CLEARED & GRUBBED PATH. WIDEN AS NEEDED @ MANHOLE LOCATIONS. FILL AREAS OUTSIDE OF OF CONDUIT TRENCH WITH GRAVEL BORROW. ALL DISTURBED AREAS TO RECEIVE 6" TOPSOIL & SEED (TYP.).

EXISTING UNDERGROUND ELECTRICAL PRIMARY BY OTHERS

EXISTING PRIMARY SWITCH

EXISTING ELECTRICAL MANHOLE EM-1A

CONDUIT TERMINATES IN EX. STRUCTURES

EXISTING TELECOM MANHOLE TM-1

DUCTBANK INSTALLATION ROUTE TO FOLLOW EXISTING CLEARED PATH

UGE

0 20' 40' 80' 120'

TRUE NORTH

1	ADDENDUM #1	6-9-25
#	Description	Date

ISSUED FOR BID

5-17-25

SHEET TITLE:

UTILITIES PLAN D

Original drawing is 36" x 24" - DO NOT SCALE CONTENTS OF THIS DRAWING.

SCALE: 1" = 40' | DESIGNED BY: MAF
SMRT PROJECT #: 22184 | DRAWN BY: SLM

CU104

UNIVERSITY OF MAINE
NORTH LOOP

ORONO, MAINE

SMRT
Architecture • Engineering • Planning
SMRT Architects and Engineers
72 Harlow Street
Bangor, Maine 04401
1.877.700.7678
www.smrtinc.com

STATE OF MAINE LURA WADE NO. 13007 LICENSED PROFESSIONAL ENGINEER 8/7/25

LICENSED LANDSCAPE ARCHITECT KENNETH DAVID COSTELLO No. 555 STATE OF MAINE 8/7/25

SHEET 104
SHEET 103

CONDUIT DUCTBANK (TYP.) — 2 / C-501

NOTE: ASSUME FINISH GRADE OF FUTURE ROAD TO BE 147.50

ENCASE CONDUIT IN CONCRETE UNDER FUTURE ROAD LOCATION FOR LENGTH OF 30', CENTERED ON FUTURE ROAD LOCATION

APPROXIMATE LOCATION OF FUTURE ROAD

CONTRACTOR TO PROVIDE 12' WIDE, CENTERED ON DUCTBANK, CLEARED & GRUBBED PATH. WIDEN AS NEEDED @ MANHOLE LOCATIONS. FILL AREAS OUTSIDE OF CONDUIT TRENCH WITH GRAVEL BORROW. ALL DISTURBED AREAS TO RECEIVE 6" TOPSOIL & SEED. (TYP.)

ELECTRICAL MANHOLE — 5 / C-501
TOP OF FRAME = 151.5+/-

ELECTRICAL MANHOLE (NL-EMH-6) — 5 / C-501
TOP OF FRAME =145.2+/-

NEW COMMUNICATIONS HANDHOLE — 5 / C-501
ALTERNATE #1 (NL-EHH-6)
TOP OF FRAME = 145.0+/-

NEW COMMUNICATIONS HANDHOLE — 5 / C-501
ALTERNATE #1 (NL-EHH-7)
TOP OF FRAME = 151.5+/-

DUCTBANK INSTALLATION ROUTE TO FOLLOW EXISTING CLEARED PATH

1 / C-501 ENCASE CONDUIT DUCTBANK IN CONCRETE UNDER ROAD EXTEND 5' BEYOND EDGES OF ROAD

REESTABLISH RIP RAP

CENTER ELECTRICAL MANHOLE ON EXTENDED PARKING LOT PAINT STRIPE

SEE GRADING PLAN ENLARGEMENT THIS SHEET

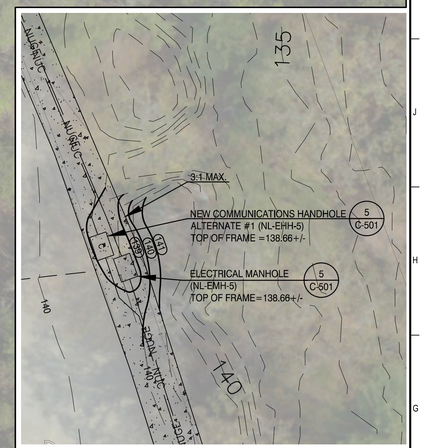
ENCASED CONDUIT DUCTBANK — 1 / C-501
TYP.

COORDINATE CROSSING @ STORMDRAIN. FIELD VERIFY CLEARANCES/SEPARATIONS.

SHEET 103
SHEET 102

1

NOTES:
1. ALL NEW COMMUNICATION CONDUITS & HANDHOLES SHOWN ON THIS PLAN ARE ASSOCIATED WITH ALTERNATE #1 WORK. SEE PLAN FOR LOCATIONS.
2. CONTRACTOR SHALL LIMIT EXTENT OF CONDUIT TRENCH EXCAVATION TO WHAT CAN BE COMPLETED AND CLOSED IN ONE DAY.
3. MANHOLES CAN BE SHIFTED TO AVOID BENDS, EXISTING IMPROVEMENTS AND LEDGE IN COORDINATION WITH OWNER. CONDUIT RUNS BETWEEN MANHOLES SHALL NOT EXCEED 500 FT.



ENLARGEMENT - GRADING PLAN
SCALE: 1" = 20'

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STATE OF MAINE — LURA A. WHITE — NO. 13007 — LICENSED PROFESSIONAL ENGINEER — 5/17/25

LICENSED LANDSCAPE ARCHITECT — KENNETH DAVID COSTELLO — No. 550 — STATE OF MAINE

0 20' 40' 80' 120'

TRUE NORTH

#	Description	Date
1	ADDENDUM #1	6-9-25

ISSUED FOR BID

5-17-25

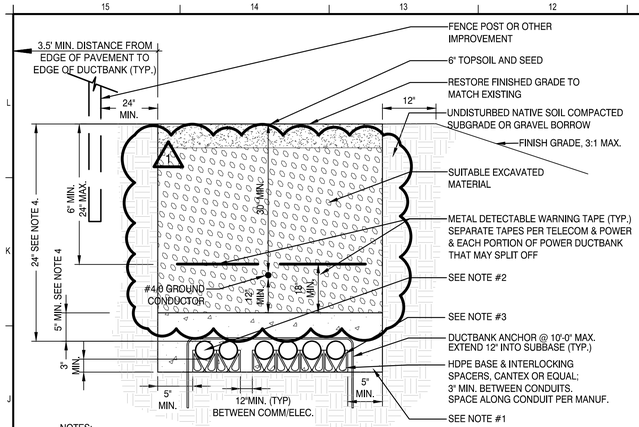
SHEET TITLE:

UTILITIES PLAN C

Original drawing is 36" x 24" - DO NOT SCALE CONTENTS OF THIS DRAWING.

SCALE: 1" = 40' | DESIGNED BY: MAF
SMRT PROJECT #: 22184 | DRAWN BY: SLM

CU103

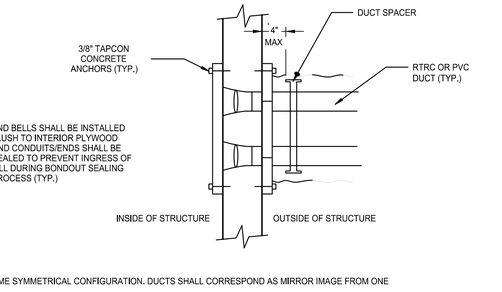


NOTES:

1. FLOWABLE FILL OR CONCRETE. FOR FLOWABLE FILL APPLICATION, INCLUDE DUCTBANK ANCHOR AS SHOWN. FOR CONCRETE ENCASEMENT, OMIT ANCHOR AND PROVIDE REBAR CAGE AS SHOWN IN ENCASEMENT DETAIL. SEE PLANS FOR ENCASEMENT DETAILS.
2. (2) 4" PVC CONDUITS FOR TELECOMMUNICATION CONDUITS.
3. (4) 5" FIBERGLASS (RTRC) CONDUITS FOR MEDIUM VOLTAGE CABLING.
4. WHEN COVERAGE CANNOT BE ACHIEVED DUE TO LEDGE OR OTHER CIRCUMSTANCES THEN DUCTBANK SHALL BE ENCASED IN CONCRETE & CAGED IN REBAR. IF TOP OF DUCTBANK IS EXPOSED TO FINISH GRADE, INCREASE CONCRETE COVERAGE TO 8".

8 CONDUIT DUCTBANK @ LEDGE

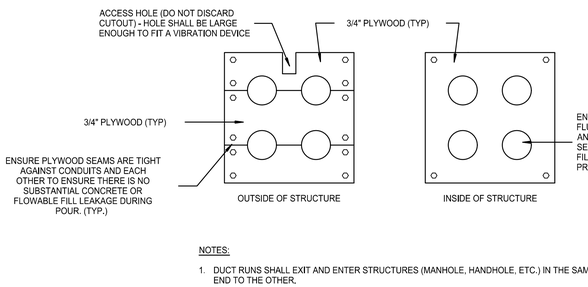
NOT TO SCALE



NOTES:
1. COORDINATE WITH OWNER IF THERE IS INSUFFICIENT EXISTING ASPHALT TO PROVIDE MILL AND PATCH DIMENSIONS.

7 PAVEMENT REPAIR @ TRENCH

NOT TO SCALE

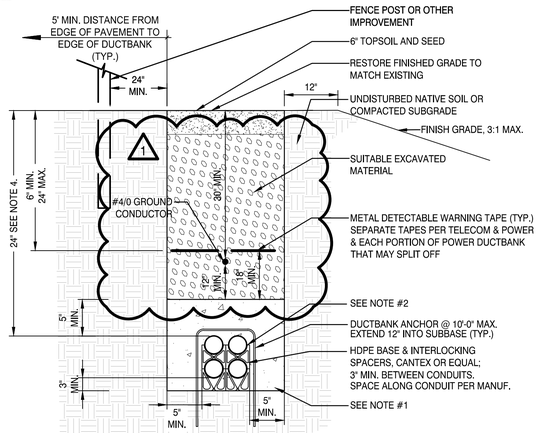


NOTES:

1. DUCT RUNS SHALL EXIT AND ENTER STRUCTURES (MANHOLE, HANDHOLE, ETC.) IN THE SAME SYMMETRICAL CONFIGURATION. DUCTS SHALL CORRESPOND AS MIRROR IMAGE FROM ONE END TO THE OTHER.
2. LOCATION OF DUCT BANKS ENTERING STRUCTURES SHALL BE AS INDICATED ON DRAWINGS. IF FIELD CONDITIONS PREVENT INSTALLATION AS SHOWN, NOTIFY ENGINEER AND UM FACILITIES FOR ADDITIONAL GUIDANCE.
3. ONCE FRAME IS IN PLACE AS DEPICTED ABOVE, ACCESS HOLE AT EXTERIOR SIDE OF STRUCTURE SHALL BE UTILIZED TO FILL BONDOUT AND VIBRATE FILL MATERIAL TO ENSURE ALL PROPER SETTLEMENT. DO NOT OVERVIBRATE FILL MATERIALS.
4. ACCESS HOLE SHALL BE RESEALED AFTER VIBRATION AND REMAINING FILL IN INSTALLED UNTIL MATERIAL HAS PROPERLY CURED.
5. ONCE BONDOUT FILL MATERIAL HAS CURED, REMOVE PLYWOOD FROM BOTH SIDES OF THE STRUCTURE AND INSPECT FOR CRACKS, VOIDS, OR OTHER DEFECTS. IF ANY DEFECTS ARE DETECTED, REPAIR WITH MORTAR OR GROUT. IF ANY FILL MATERIAL IS FOUND IN CONDUITS ONCE PLYWOOD IS REMOVED, REMOVE EXCESS MATERIAL IN ITS ENTIRETY.

6 CONDUIT INSTALLATION AT STRUCTURES

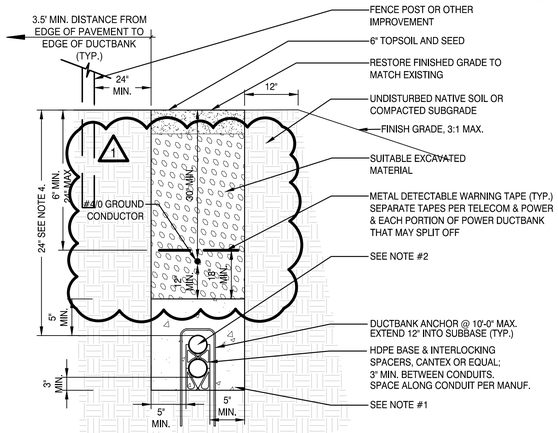
NOT TO SCALE



NOTES:
1. FLOWABLE FILL.
2. (4) 5" FIBERGLASS (RTRC) CONDUITS FOR MEDIUM VOLTAGE CABLING.
3. SEE DETAIL 8/C-501 FOR SHALLOW DEPTH OPTION FOR LEDGE LOCATIONS.
4. THIS DETAIL DIMENSIONS ARE TYPICAL IF ALTERNATE #1 IS NOT SELECTED. SUBSTITUE FLOWABLE FILL AND ANCHOR WITH REBAR CAGE AND CONCRETE FOR ENCASEMENT LOCATIONS. RE: 1/C-501.

4 ELECTRICAL DUCTBANK

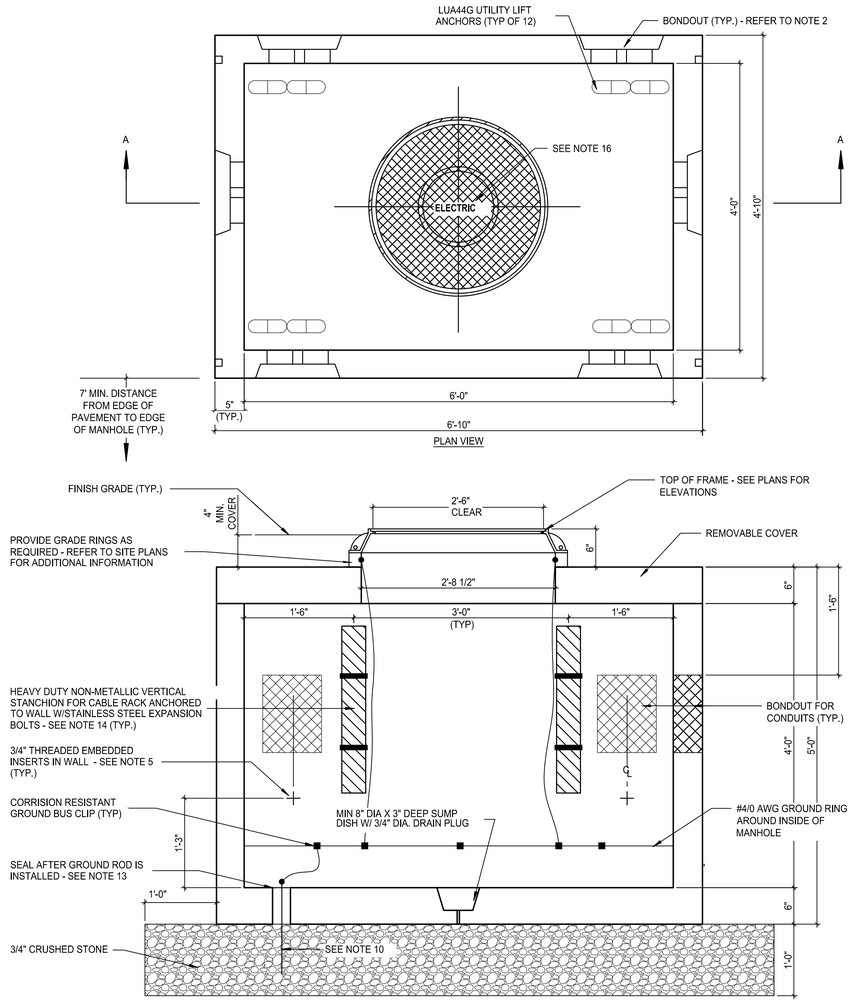
NOT TO SCALE



NOTES:
1. FLOWABLE FILL
2. (2) 4" PVC CONDUITS FOR TELECOMMUNICATION CONDUITS.
3. SEE DETAIL 8/C-501 FOR SHALLOW DEPTH OPTION FOR LEDGE LOCATIONS.
4. SUBSTITUE FLOWABLE FILL AND ANCHOR WITH REBAR CAGE AND CONCRETE FOR ENCASEMENT LOCATIONS. RE: 1/C-501.

3 COMMUNICATIONS DUCTBANK

NOT TO SCALE



5 ELECTRICAL MANHOLE & COMMUNICATIONS HANDHOLE

1"=1'

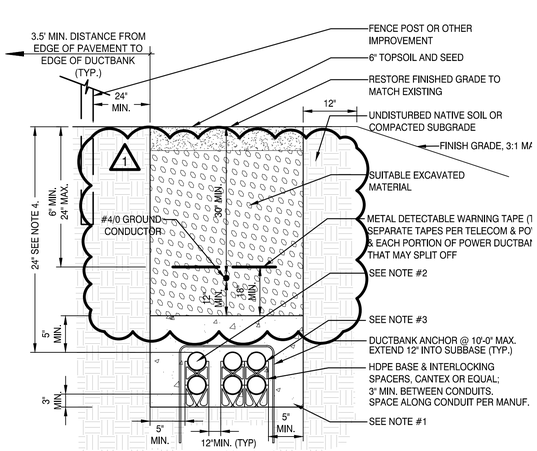
GENERAL HANDHOLE NOTES:

BASIS OF DESIGN: AMERICAN CONCRETE

1. RECESSED LIFTING SLOTS (4) W/ STEEL BARS FOR LIFTING COVER.
2. CABLE BONDOUTS AS REQUIRED FOR INSTALLATION OF CONDUITS AS SHOWN ON PLANS. BONDOUTS SHALL BE A MINIMUM OF 12" X 12" TO ACCOMDATE A 2 X 2 CONDUIT ARRANGEMENT.
3. CONCRETE TO BE 5000 P.S.I FOR 28 DAY TEST W/ MAXIMUM 3/4" BROKEN STONE.
4. REINFORCEMENT SHALL BE 4" X 12" REINFORCEMENT WIRE MESH W/ #4 VERTICAL WIRE & #9 HORIZONTAL WIRE.
5. 3/4" ANCHORS FOR 3/4" EYE BOLTS (TYP. OF 6) SHALL BE INSTALLED OPPOSITE EACH BONDOUT FOR CABLE PULLING.
6. #4/0 AWG GROUND WIRE (COUNTERPOISE) INSTALLED WITHIN DUCTBANK SHALL EXTEND THROUGH CONDUIT BONDOUT AND CONNECT TO GROUND RING WITHIN MANHOLE.
7. PROVIDE 6" MINIMUM ENGINEERED FILL AROUND ENTIRE STRUCTURE.
8. CONDUITS MUST HAVE END BELLS USED AT TERMINATION IN FOUNDATION. RE: 6/C-501
9. PROVIDE 15' MINIMUM SLACK FOR EACH CABLE IN MANHOLE.
10. FURNISH AND INSTALL 3/4" X 10' COPPER CLAD GROUND ROD W/ AN 8' MINIMUM #4 STR. BARE COPPER PIGTAIL.
11. MANHOLE SHALL BE DESIGNED FOR H20 WHEEL LOAD RATING.
12. GROUT AROUND GROUND RODS WITH EXPANDING POLYURETHANE CHEMICAL GROUP ("SIKAFIX" BY SIKA CORP. OR EQUAL) TO PREVENT WATER INTRUSIONS.
13. EXPANSION ANCHOR BOLTS ASSOCIATED WITH CABLE RACKING SHALL BE 1/2" X 4 1/2" STAINLESS STEEL BOLT INSTALLED A MAXIMUM OF 8" APART.
14. OVERALL CONSTRUCTION AND RACKING SHALL BE THE SAME FOR BOTH TELECOMMUNICATION AND MEDIUM VOLTAGE POWER MANHOLES, UNLESS SPECIFICALLY NOTED OTHERWISE.
15. MANHOLES SHALL BE PROVIDED WITH DIAMOND COVER DESIGN WITH THE FOLLOWING LABELS:
    POWER (MV)
    TELECOMM (FIBER)
16. MANHOLES SHALL BE INSTALLED PARALLEL TO DUCTBANK UNLESS SPECIFICALLY NOTED OTHERWISE
17. PROVIDE MINIMUM OF 5' BETWEEN MANHOLES.

2 CONDUIT DUCTBANK

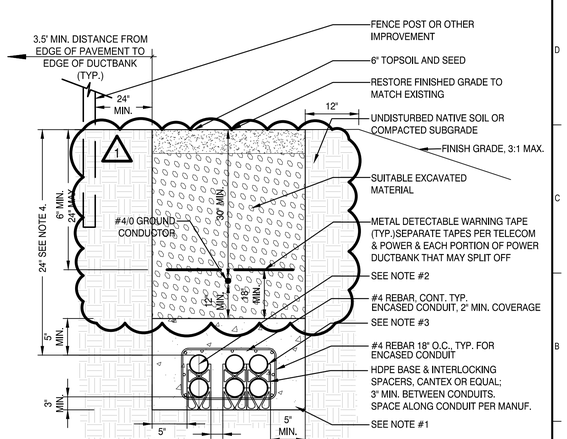
NOT TO SCALE



NOTES:
1. FLOWABLE FILL
2. (2) 4" PVC CONDUITS FOR TELECOMMUNICATION CONDUITS.
3. (4) 5" FIBERGLASS (RTRC) CONDUITS FOR MEDIUM VOLTAGE CABLING.
4. SEE DETAIL 8/C-501 FOR SHALLOW DEPTH OPTION FOR LEDGE LOCATIONS.

1 ENCASED CONDUIT DUCTBANK

N.T.S.



NOTES:
1. REFER TO DRAWINGS FOR LIMITS OF CONCRETE ENCASEMENT.
2. (2) 4" PVC CONDUITS FOR TELECOMMUNICATION CONDUITS.
3. (4) 5" FIBERGLASS (RTRC) CONDUITS FOR MEDIUM VOLTAGE CABLING.
4. SEE DETAIL 8/C-501 FOR SHALLOW DEPTH OPTION FOR LEDGE LOCATIONS.

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STATE OF MAINE — LURA WHITE — NO. 13007 — LICENSED PROFESSIONAL ENGINEER — 05/7/25

LICENSED LANDSCAPE ARCHITECT — KENNETH DAVID COSTELLO — No. 555 — STATE OF MAINE

0 1/2" 1" 2" 3"

#	Description	Date
1	ADDENDUM #1	5-9-25

ISSUED FOR BID

5-17-25

SHEET TITLE:

SITE DETAILS

Original drawing is 36" x 24" - DO NOT SCALE CONTENTS OF THIS DRAWING.

SCALE:	AS NOTED	DESIGNED BY:	LW
SMRT PROJECT #:	22184	DRAWN BY:	SLM

C-501

UM Campus Electrical Upgrades NL

North Electrical Loop

Non-Mandatory Pre-Bid Attendance List

Wednesday May 28th, 2025 10L00 a.m.

Meet at east entrance to Versant Astronomy Center

	Firm Name	Attendee Name Role	Contact Phone	Contact Email
0	University of Maine System	Jonathan Dow Project Manager	207-852-7765	jonathan.dow@maine.edu
1	Sargent Electric	Chancellor Burris	207-399-1207	chancellor.burris@sargentelectric.com
2	R.L. Todd & Son Inc. Electrical	Tim Todd	207-496-1671	tim@RLTodd.com
3	Sargent Electric	Dave Preble	207-827-4435	dpreble@sargent.us
4	Sargent Electric	D.J.Perry	207-800-7071	dperry@sargentelectric.com
5	Sargent	Richard Gushue	207-478-0012	Rgushue@sargent.us
6	SMC	Glenn House	207-401-9168	ghouse@smcinc.net
7	C+C Lynch Excavation	Cam Lynch	207-632-7159	Cameron@cclynchxc.com
8	Whitcomb Contracting	Greg Whitcomb	207-323-1055	lgwhitcomblandscaping@mgmail.com

END OF ADDENDUM 01