

**ADDENDUM NO. 11**

**DELAWARE STATE UNIVERSITY (OWNER)  
OPTICAL SCIENCE CENTER FOR APPLIED RESEARCH  
Contract Nos.:  
PC-2014-006B-OSCARIT (I.T. Cabling)  
1220 N. DuPont Highway  
Dover, DE 19901**

**THE WHITING-TURNER CONTRACTING COMPANY  
(CONSTRUCTION MANAGER)  
1200 N. DuPont Highway  
Dover, DE 19901  
302-857-6883 (phone)**

**BIDS DUE: JUNE 27, 2013 at 10:00 AM**

**LOCATION: Delaware State University  
Whiting-Turner Contracting Company Jobsite Trailer  
1200 N. DuPont Highway  
Dover, DE 19901**

**NOTICE TO ALL BIDDERS**

**1.0 GENERAL NOTES**

- 1.1 Bidders are hereby notified that this Addendum shall be and hereby becomes part of their Contract Documents and shall be attached to the Project Manual for this project. All bidders shall acknowledge this addendum on the Bid Form.
- 1.2 The following items are intended to revise and clarify the drawings and Project Manual and shall be included by the Bidder in their proposal.
- 1.3 Bidders shall verify that their Sub-Bidders are in full receipt of the information contained herein.
- 1.4 CAD files will not be provided for bidding purposes. CAD files will be made available as requested to awarded Contractors.
- 1.5 The cost to purchase drawings, specifications and any addenda should be included in the bid.
- 1.6 The due date for **Bid Package 16B – I.T. Cabling** is **Friday June 27, 2014 at 10 AM**.
- 1.7 The fiber optic wiring shall be brought into the building as part of a separate contract with the Owner by others. As part of this bid package, this Contractor shall bring 25-pair copper cable to room A112 in the new OSCAR building from the existing IDF closet in the ETV building. The route for this is shown on the revised es1.1 drawing issued in this addendum.
- 1.8 Scope reviews with the winning bidder of the **16B – I.T. Cabling** shall be held on **Monday June 30, 2014 at 10 AM**.

2.0 CHANGES TO DIVISIONS 00 & 01

2.1 SECTION 01020 – BID PACKAGE 16B – I.T. CABLING **(REVISED)**

2.2 SECTION 16740 – STRUCTURED CABLING SYSTEM **(REVISED)**

3.0 DRAWINGS ISSUED

3.1 E4.5 Riser Diagrams Telecom **(REVISED)**

3.2 E5.2 Details **(REVISED)**

3.3 ES1.1 Site Plan New **(REVISED)**

SECTION 01020 – BID PACKAGE 16B – I.T. CABLING (REVISED ADDENDUM 11)

- A. The provisions outlined in the General Scope of Work shall apply to all items of this section. All work shall be in accordance with the schedule.
- B. This work shall include all labor, supervision, material, tools, equipment, shop drawings, submittals, layout, unloading, scaffolding, ladders, hoisting, transportation, taxes, permits, engineering, support functions, insurance, bonds and any other items or services necessary for and reasonably incidental to the proper execution and completion of the work, whether temporary or permanent, in accordance with all drawings, specifications, addenda, general conditions, requirements and other related documents as indicated herein. The scope of work shall include but not be limited to the following specific scope of work: (All work shall be furnished and installed unless noted otherwise herein.)

**SPECIFICATION SECTIONS**

The Contractor is fully responsible for all of the information contained in all sections of the technical specification manual as it applies to their trade. For specifications listed below as “In Its Entirety”, it is this trades full responsibility for all work included in that section. For sections listed below “As Applicable”, other units of work, as defined by the Scope, may also have some responsibility for that particular section. Bidding Requirements, Contract Requirements and Supplementary Conditions apply to all of the Individual Units of Work.

<b>SECTION</b>	<b>DESCRIPTION</b>	<b>RESPONSIBILITY</b>
DIVISION 00	CONTRACT REQUIREMENTS	IN ITS ENTIRETY
DIVISION 01	GENERAL REQUIREMENTS	IN ITS ENTIRETY
DIVISION 02	SITE CONSTRUCTION	AS APPLICABLE
DIVISION 03	CONCRETE	AS APPLICABLE
DIVISION 04	MASONRY	AS APPLICABLE
DIVISION 05	METALS	AS APPLICABLE
DIVISION 06	WOOD AND PLASTICS	AS APPLICABLE
DIVISION 07	THERMAL AND MOISTURE PROTECTION	AS APPLICABLE
DIVISION 08	DOORS AND WINDOWS	AS APPLICABLE
DIVISION 09	FINISHES	AS APPLICABLE
DIVISION 10	SPECIALTIES	AS APPLICABLE
DIVISION 11	EQUIPMENT	AS APPLICABLE
DIVISION 12	FURNISHINGS	AS APPLICABLE
DIVISION 14	CONVEYING SYSTEMS	AS APPLICABLE
DIVISION 15	HEATING, VENTILATION, AIR CONDITIONING, PLUMBING	AS APPLICABLE
DIVISION 16	ELECTRICAL	AS APPLICABLE
16740	STRUCTURED CABLING SYSTEM	IN ITS ENTIRETY
DIVISION 17	INSTRUMENTATION AND CONTROL FOR HVAC	AS APPLICABLE
APPENDICES		IN ITS ENTIRETY

### **I.T. CABLING SCOPE ITEMS**

1. Furnish and install all voice and data systems complete. Switches for data system shall be purchased ~~via allowance to be included in the bid~~ at a later date in construction. **ADDENDUM 11**
2. Furnish and install a complete area of refuge communication system including all call boxes, base station, power supplies, wiring, etc.
3. Furnish and install all wiring, cable, ~~optical fiber~~, terminations, termination devices, interfaces, face plates, connectors, patch panels, enclosures, racks, equipment housings, power supplies and grounding of equipment installed under this contract. **ADDENDUM 11**
4. Conduit, raceways, cable trays and ladder trays are being installed by the 16A Electrical contractor except those shown on e4.5. All sleeves, conduit, raceways and all fire stopping required for work shown on e4.5 shall be by this Contractor.
5. **Core drilling shall not be permitted.** This Contractor shall be responsible to lay out all slab penetrations and furnish sleeves to 03A Concrete contractor for installation prior to slab pours. Refer to the project schedule Section 01780.
6. Furnish and install J-hooks where cable trays are not shown.
7. All wiring shall be need and bundled with plenum rated Velcro brand One-Wrap or equivalent cable ties as specified.
8. Provide identification and/or labeling of all wiring and devices.
9. Provide all required tests including but not limited to copper certification ~~and optical fiber OTDR tests.~~ **ADDENDUM 11**
10. Provide warranty service as detailed in section 16740, 1.07. Pay particular attention to required time frames for repairing equipment in section C.
11. Furnish and install fire stopping material inside of all sleeves after installation of wiring.
12. Furnish and install any required miscellaneous framing and support for devices installed under this Contract.
13. Review all drawings to verify layout, coordination and scope to ensure that the system is complete and functional. Submit all discrepancies in writing prior to the RFI deadline. Submit all assumptions as RFI's.
14. ~~Telecom~~ **New 25-pair copper wire** is to be fed from **ETV Building through new and existing raceways existing manhole** as shown on es1.1. It is suggested that bidders request a site visit to investigate the condition and contents of this manhole. It will be the responsibility of this Contractor to provide any coordination required with the Owner and will own any work required to tie into the existing campus systems. **The path of the new copper wiring shall originate in the existing IDF room in the ETV building and be routed through existing conduit to an existing manhole to the northwest of the ETV building. It will then be routed through new conduit/innerduct southward to a new junction well just north of the new OSCAR building. From that point it will continue through new conduit/innerduct to Room A112 in the new OSCAR building. The new raceway work and junction well described in this line item shall be by others. The fiber optic wiring shall be installed under a separate purchase order through the Owner by others from Grossley Hall into the new OSCAR building Room A112 and is NOT part of this bid package. Disregard section 1.04E of specification section 16740 as this work is by others.** **ADDENDUM 11**
15. Submit all substitution requests by the substitution request deadline. No substitutions shall be permitted after the bid.
16. Provide an as-built BIM model after all work has been completed and accepted. This model shall include all cable back bone runs, panels and switches. The BIM parameters can be found in section 01315. It shall be this Contractor's responsibility to review the model prior to installation of any

materials or devices for coordination with other trades. The model can be viewed for free using Navisworks Freedom.

17. **Provide three (3) data jacks and associated data wiring at each device (i.e. FB1, FB3, PT-2, AV1, etc) except where noted otherwise. Provide one (1) data jack at camera locations. ADDENDUM**

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**ALLOWANCES**

Add to the base bid price, the following ALLOWANCES. Overhead and profit should not be included on top of these allowances in the base bid cost. They will be billed against on a time and material basis during the project with labor rates and unit prices that will include the allowable overhead and profit. Any unused portion will be credited from the Contract. Any monies spent against these allowances are to be approved by WT via signed extra work tickets. The allowances can be used for another purpose at the discretion of the CM at any time:

Allowance #1 – Include in the bid, a lump sum of \$25,000 for any data, security, access, audio and visual equipment, wiring or for any other work as directed by the Construction Manager or the Owner.

END OF SECTION 01020

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16740 - STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Equipment, materials, labor, and services to provide telecommunications and special systems distribution systems including, but not limited to:
  - 1. Voice and Data cable, terminations and testing.
  - 2. Area-of-refuge communications system
  - 3. Fiber optic and copper building feeders and terminations.
  - 4. Telecommunications outlets.
  - 5. Cross-connect systems, patch cords and patch panels.
  - 6. Equipment racks and cable management.
  - 7. Documentation and submissions.
- B. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.
- C. Work not included in this section:
  - 1. Off-site services.
  - 2. Providing 120V wiring and outlets.
  - 3. Providing data concentrators, telecommunications, servers, computers, and other active devices.
  - 4. Providing conduit, and back-boxes.
  - 5. Painting.
  - 6. Plywood mounting board.

1.02 REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code®), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
  - 1. ANSI/TIA/EIA-568-C -- Commercial Building Telecommunications Wiring Standards
  - 2. ANSI/TIA/EIA-569-C -- Commercial Building Standard for Telecommunications

Pathways and Spaces

3. ANSI/TIA/EIA-606-B -- Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
  4. ANSI/TIA/EIA-607-B -- Commercial Building Grounding and Bonding Requirements for Telecommunications
  5. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  6. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
  7. ANSI/TIA/EIA-758(B) -- Customer-Owned Outside Plant Telecommunications Cabling Standard
  8. ANSI/NFPA 70 -- National Electrical Code
  9. ANSI/NFPA 99 -- Healthcare Facilities
  10. ANSI/NFPA 101 -- Life Safety Code
  11. The Facility Guidelines Institute -- Guidelines for Design and Construction of Health Care Facilities -- 2010 Edition
- B. Install cabling in accordance with the most recent edition of BICSI® publications:
1. BICSI -- Telecommunications Distribution Methods Manual
  2. BICSI - Cabling Installation Manual
  3. BICSI - LAN Design Manual
  4. BICSI -- Customer-Owned Outside Plant Design Manual
- C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

1.03 PERMITS, FEES AND CERTIFICATES OF APPROVAL

- A. The owner or Construction Manager will make application and pay for building permit.
- B. As prerequisite to final acceptance, supply to the owner certificates of inspection from an inspection agency acceptable to the owner and approved by local municipality and utility company serving the project.

1.04 SYSTEM DESCRIPTION

- A. The telecommunications cabling system generally consists of copper and fiber optic backbone cable, one or more telecommunications outlets at each workstation, wall telephones in common and mechanical areas, Telecommunications Rooms (TR) located on each upper floor, and a Main Telecommunications Room (MTR) located on the first floor. All workstation horizontal cables shall terminate in a telecommunications room on the same floor.
- B. The typical work area outlet consists of a four-port single-gang face plate containing four-pair Category-6E data/voice cables in quantities shown on drawings, installed from work area outlet to the TR that is located on the same floor. Terminate all cables on rack mounted modular patch panels located in the appropriate rack as identified on the drawings. Where outlets are mounted in metallic raceway, see detail drawings for plate, adapter or bezel type. Raceway-mounted outlets are typically of the Keystone type.
- C. Wireless access outlets contain a double gang box and single-gang two-port faceplate with two (2) four-pair Category-6E cables installed from work area outlet to the appropriate rack mounted modular patch panel in the nearest TR.
- D. Voice copper backbone cabling consists of ~~50 50 pair~~ category-3 unshielded twisted-pair installed from the modular patch panel in each TR to the horizontal cross-connect modular patch panel in the MTR. **Reference documents for quantity and location.**
- E. Data backbone cabling consists of single mode optical fiber cable installed from a rack-mounted optical fiber panel in each TR to rack-mounted optical fiber panels in the MTR and from rack-mounted optical fiber panels in the MTR to rack-mounted optical fiber panels in Price via the Administration building and to the ETV building as shown on the riser drawing.
- F. All horizontal cable between work area and the Telecommunications Rooms shall be installed in cable ladder tray. Where cable tray is not available, cables shall be supported by J-Hooks in open ceiling space, every three to five feet. Within telecommunications rooms, horizontal cables shall be routed to the rack-mounted patch panels via overhead cable tray, which shall be shared with riser cables, which will be segregated to one side of the tray and tied in a bundle. Patch cords that travel from rack to rack shall utilize rack-mounted horizontal wire managers, not the overhead cable tray.

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#### 1.05 SUBMITTALS

- A. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog information), and samples required by the contract documents. Submit shop drawings, product data, and samples with such promptness and in such sequence as to cause no delay in the work or in the activities of separate contractors. The engineer/designer will indicate approval of shop drawings, product data, and samples submitted to the engineer by stamping such submittals "APPROVED" with a stamp. Submitted shop drawings shall be initialed or signed by the contractor, showing the date and the contractor's legitimate firm name.
  - 1. By submitting shop drawings, product data, and samples, the contractor represents that he or she has carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. It also represents that the contractor has checked, coordinated, and verified that information contained within shop drawings, product data, and samples conform to the requirements of the work and of the contract documents. The engineer/designer remains responsible for the design concept expressed in the

contract documents as defined herein.

2. The engineer's/designer's approval of shop drawings, product data, and samples submitted by the contractor shall not relieve the contractor of responsibility for deviations from requirements of the contract documents, unless the contractor has specifically informed the engineer/designer in writing of such deviation at time of submittal, and the engineer/designer has given written approval of the specific deviation. The contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the contractor in writing, and specifically approved by the engineer in writing.
  3. The engineer's/designer's approval of shop drawings, product data, and samples shall not relieve the contractor of responsibility for errors or omissions in such shop drawings, product data, and samples.
  4. The engineer's/designer's review and approval, or other appropriate action upon shop drawings, product data, and samples, is for the limited purpose of checking for conformance with information given and design concept expressed in the contract documents. The engineer's/designer's review of such submittals is not conducted for the purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the contractor as required by the contract documents. The review shall not constitute approval of safety precautions or of construction means, methods, techniques, sequences, or procedures. The engineer's/designer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- B. Perform no portion of the work requiring submittal and review of shop drawings, product data, or samples, until the engineer/designer has approved the respective submittal. Such work shall be in accordance with approved submittals.
- C. Submit shop drawings, product data, and samples as a complete set within thirty (30) days of award of contract.
1. For initial submission and for resubmission required for approval, submit five (5) copies of each item. The engineer/designer will only return two copies. Make reproductions as required for your use and distribution to subcontractors.
  2. Illegible submittals will not be checked by the engineer.
- D. General: Submit the following:
1. Bill of materials, noting long lead time items.
  2. Optical loss budget calculations for each optical fiber run.
- E. Shop drawings: Fabrication drawings for custom-built equipment.
- F. Product Data: Provide catalog cut sheets and information for the following:
1. Wire, cable, and optical fiber.
  2. Outlets, jacks, faceplates, and connectors.

3. All metallic and nonmetallic raceways, including surface raceways, outlet boxes, and fittings.
  4. Copper and fiber optic patch panels.
  5. Enclosures, racks, and equipment housings.
  6. Copper and fiber optic patch cords.
- G. Project record drawings:
1. Submit project record drawings at conclusion of the project and include:
    - a. Approved shop drawings.
    - b. Plan drawings indicating locations and identification of work area outlets, nodes, TRs, and backbone (riser) cable runs.
    - c. Telecommunications room layout details.
    - d. Cross-connect schedules including entrance point, main cross-connects, intermediate cross-connects, and horizontal cross-connects.
    - e. Labeling and administration documentation.
    - f. Warranty documents for equipment.
    - g. Copper certification test result printouts and disks.
    - h. Optical fiber OTDR test results.

#### 1.06 QUALITY ASSURANCE

- A. The following manufacturer's cabling systems are approved for the work of this section:
1. Siemon
  2. Hubbell
  3. Panduit
  4. Mohawk
  5. BerkTek
- B. The contractor shall be an authorized Siemon, Hubbell or Panduit cabling system installer.
- C. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
- D. Upon request by the Construction Manager, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.
- E. Equipment and materials of the type for which there are independent standard testing requirements, listings, and labels, shall be listed and labeled by the independent testing laboratory.
- F. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA - National Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with standards.
- G. Material and equipment shall be new, and conform to grade, quality, and standards

specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.

- H. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the owner and engineer/designer.

#### 1.07 WARRANTY

- A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and workmanship for a period of not less than twenty (20) years from date of acceptance by the owner.
- B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve you of these obligations.
- C. Effect replacement or substitutions of equipment within 24 hours of first notification. Complete repairs to equipment within 72 hours. If repairs cannot be completed during this time period, or if ordering of parts is required, forward to the owner every 72 hours, documentation of progress of repairs. This repair capability is mandatory. Include costs anticipated to comply with this requirement in the bid.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the construction manager for secure storage of equipment and materials. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.

#### 1.09 SEQUENCE AND SCHEDULING

- A. Submit to Construction Manager a schedule for installation of equipment and cabling. Indicate delivery, installation, and testing for conformance to specific job completion dates. As a minimum, dates are to be provided for bid award, installation start date, completion of station cabling, completion of riser cabling, completion of testing and labeling, cutover, and completion of the final punch list.

#### 1.10 USE OF THE SITE

- A. Use of the site shall be at the Construction Manager's direction in matters in which the manager deems it necessary to place restriction.
- B. Access to building wherein the work is performed shall be as directed by the Construction Manager.
- C. Proceed with the work without interfering with ordinary use of streets, aisles, passages, exits, and operations of the other trades.

#### 1.11 CONTINUITY OF SERVICES

- A. Take no action that will interfere with, or interrupt, existing building services unless

previous arrangements have been made with the owner's representative. Arrange the work to minimize shutdown time.

- B. Owner's personnel will perform shutdown of operating systems. The contractor shall give three (3) days' advance notice for systems shutdown.
- C. Should services be inadvertently interrupted, immediately furnish labor, including overtime, material, and equipment necessary for prompt restoration of interrupted service.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Provide products of manufacturers as named in individual articles.
- B. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.

### 2.02 FABRICATION

- A. Fabrication of custom-made equipment shall not be done without prior approval of the Owner.
- B. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installation.

### 2.03 SUITABILITY

- A. Provide products that are suitable for intended use, including, but not limited to environmental, regulatory, and electrical.

### 2.04 VOICE/DATA TELECOMMUNICATIONS SERVICE BACKBONE CABLE

- A. Voice: Solid copper, 24 AWG, Category 3, 100  $\Omega$  balanced unshielded twisted-pair (UTP) plenum rated backbone cable, in sizes as indicated on the drawings, with mechanical and transmission performance specifications that meet or exceed ANSI/TIA/EIA-568-B.2 standards. Cat-3 Power Sum, manufactured by Mohawk or equivalent.
- B. Data
  - 1. Inter-Building: Connections from the first floor MTR and other buildings: indoor/outdoor, single mode, interlock armored, plenum rated optical fiber with strand counts as indicated on riser drawings, with mechanical and transmission performance specifications that exceed ANSI/TIA/EIA-568-C. Mohawk VersaLite M9W215 or equivalent.
  - 2. Intra-Building: Connections from the first floor MTR and the upper TRs: single mode interlock armored, riser rated optical fiber with strand counts as indicated on riser drawings, with mechanical and transmission performance specifications that exceed ANSI/TIA/EIA-568-C. Mohawk ArmorLite M9W232 or equivalent.

### 2.05 VOICE / DATA TELECOMMUNICATIONS STATION CABLE

- A. Data: Solid copper, 23 AWG, 100  $\Omega$  balanced twisted-pair (UTP) Category-6E cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/ EIA-568-B.2-1 up to 750 MHz. Category-6E GigaLAN, part numbers M57419 riser and M57414 plenum as manufactured by Mohawk, 9C6R4-E4-06 riser and 9C6P4-E4-06 plenum as manufactured by Siemon or 10167477 riser and 10163780 plenum as manufactured by BerkTek. No substitutions.

#### 2.06 VOICE / DATA / CATV WORK AREA OUTLETS

- A. Single-gang, 4-port mounting plate containing the following devices:
  - 1. Voice/Data Outlets - 8-pin modular, Category 6E, unkeyed jacks pinned to T568-B standards. MX6-Fxx and MX6-Kxx as manufactured by Siemon or equivalent.

#### 2.07 WALL VOICE OUTLETS

- A. Single-gang stainless steel faceplate with six-conductor jack and wall telephone mounting lugs by Siemon.

#### 2.08 DATA ONLY WIRELESS ACCESS OUTLET

- A. Data Outlet - Double-gang box with above-ceiling-mounted, single-gang two port faceplate containing two (2) 8-pin modular, Category 6E, unkeyed jacks pinned to T568-B standards. MX6-Fxx and MX6-Kxx as manufactured by Siemon or equivalent.

#### 2.09 WORK AREA FACE PLATES

- A. Four port faceplates. MX-FP-S-04-xx, manufactured by Siemon or equivalent.

#### 2.10 COPPER PATCH PANELS

- A. 19 in. rack mountable, 48-port patch panel. HD6-48 manufactured by Siemon or equivalent.

#### 2.11 RACK MOUNTED OPTICAL FIBER TERMINATION PANEL

- A. 19 in. rack mounted, fiber connect panel with cable management bracket and adapter panels.
  - 1. FCP3-RACK or RIC3-72-01 as shown on rack elevation drawings manufactured by Siemon or equivalent.
  - 2. RIC-F-LC24-01 flat adapter plates manufactured by Siemon at all inter- and intra-building riser panel locations, or equivalent.

#### 2.12 OPTICAL FIBER CONNECTORS

- A. Ceramic tipped field installed single mode LC connectors manufactured by Siemon or equivalent.

#### 2.13 OPTICAL FIBER JUMPERS

- A. LC single mode Blade Patch optical fiber jumper cable, two per pair of fiber, 2 m long with duplex LC optical fiber connectors on each end. FBP-LCULCUL-02 manufactured by

Siemon or equivalent.

2.14 EQUIPMENT RACK AND CABLE MANAGEMENT

- A. Open frame, 19 in. equipment rack, 7 foot overall height with flange base, mounting rails drilled front and back and tapped to EIA standards, 6" wide Z-Channels and hinged covers. Next Frame CS1976H manufactured by Panduit.
- B. Horizontal cable managers. HC219CR3N manufactured by Hubbell or equivalent.
- C. Ladder rack bracket. NFLRB manufactured by Panduit.

2.15 CABLE TIES

- A. TRADITIONAL PLASTIC CABLE TIES ARE NOT ACCEPTABLE. Install plenum rated Velcro brand One-Wrap or equivalent cable ties in accordance with TIA/EIA-568-B.1.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION SITE SURVEY

- A. Prior to start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.

3.02 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. Be responsible for safekeeping of your own and your subcontractors' property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of above named property against fire, theft, and environmental conditions.

3.03 PROTECTION OF OWNER'S FACILITIES

- A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
- B. Remove protection at completion of the work.

3.04 INSTALLATION

- A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having

jurisdiction, and National Electrical Code® (NEC) and with manufacturer's printed instructions.

- C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
  - 1. Where manufacturer does not provide bending radii information, minimum-bending radius shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.
- D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing a firestopping assembly approved for that application.
- E. Install station cabling to the nearest telecommunications room IDF, unless otherwise noted.
- F. Installation shall conform to the following basic guidelines:
  - 1. Use of approved wire, cable, and wiring devices
  - 2. Neat and uncluttered wire termination
- G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings.
- H. Install adequate support structures for 10 foot of service slack at each riser cable end.
- I. Support riser cables every three (3) floors and at top of run with cable grips.  
Limit number of four-pair data riser cables per grip to fifty (50)
- J. Install cables in one continuous piece. Splices shall not be allowed.
- K. Provide over-voltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.

### 3.05 GROUNDING

- A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code®, and manufacturer's grounding requirements as minimum.
- B. Bond and ground equipment racks, housings, messenger cables, conduits and raceways.
- C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 AWG green insulated copper grounding conductor.

### 3.06 LABELING

- A. Labeling shall conform to ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
  - B. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high

characters.

- C. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:
  - 1. Inside receptacle box at the work area.
  - 2. Behind the communication closet patch panel or punch block.
- D. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.
- E. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-606(A) standard color codes for termination blocks.
- F. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
- G. Label cables, outlets, patch panels, and punch blocks with room number in which outlet is located, followed by a single letter suffix to indicate particular outlet within room. Indicate riser cables by an R then pair or cable number.
- H. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.
- I. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner in magnetic media form (compact disks) and utilizing CAD software that is acceptable to the owner. The magnetic media shall be delivered to the owner within six (6) weeks of acceptance of project by owner.

### 3.07 TESTING

- A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using level IIe or higher field testers.
- B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
  - 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.1 requirements.
  - 2. If copper backbone cable contains more than one (1) percent bad pairs, remove and replace entire cable.
  - 3. If horizontal cable contains bad conductors or shield, remove and replace cable.
- C. Initially test inside optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-7: OFSTP--7 Optical Power Loss Measurements of Installed Single Mode Fiber Cable Plant. Measured results shall be plus/minus 1 dB of submitted loss budget calculations. If loss figures are outside this range, test cable with

optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

1. Cables shall be tested at 1310 and 1550nm for single mode optical fiber cables.
  2. Testing procedures shall utilize "Method B" – One jumper reference.
  3. Bi-directional testing of optical fibers is required.
- D. Perform optical time domain reflectometer (OTDR) testing on each outside fiber optic cable conductor. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
1. Submit printout for each cable tested.
  2. Submit compact disks with test results and program to view results.
- E. Where any portion of system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.

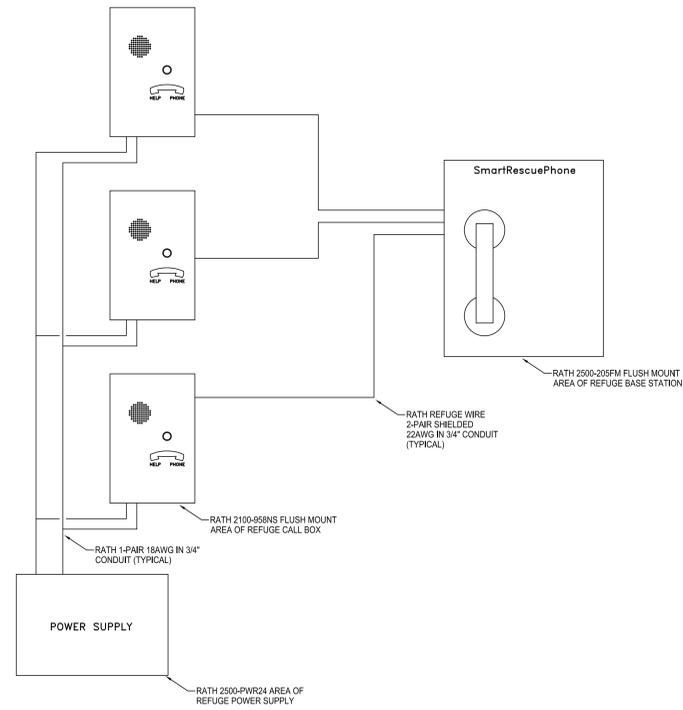
### 3.08 FIELD QUALITY CONTROL

- A. Employ job superintendent or project manager during the course of the installation to provide coordination of work of this specification and of other trades, and provide technical information when requested by other trades. This person shall maintain current RCDD® (Registered Communications Distribution Designer) registration and shall be responsible for quality control during installation, equipment set-up, and testing.
- B. At least 30 percent of installation personnel shall be BICSI Registered Telecommunications Installers. Of that number, at least 15 percent shall be registered at the Technician Level, at least 40 percent shall be registered at the Installer Level 2, and the balance shall be registered at the Installer Level 1.
- C. Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

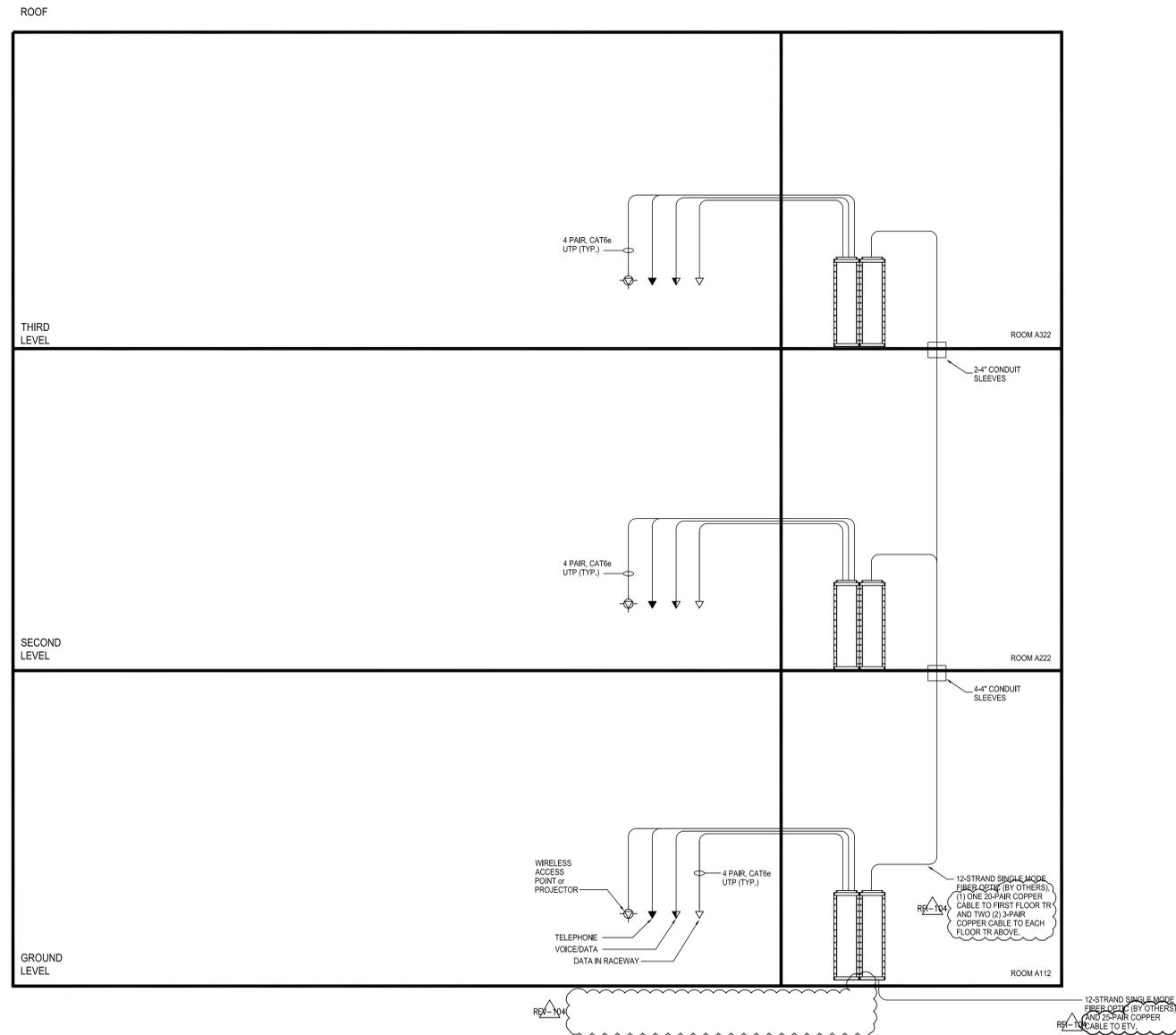
+ + END OF SECTION + +

**GENERAL NOTES:**

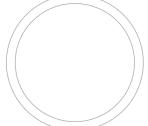
1. REFER TO DWG E0.1 and E0.2 FOR SYMBOLS, ABBREVIATIONS AND GENERAL NOTES.



N.T.S. **2** RISER DIAGRAM  
AREA OF REFUGE COMMUNICATION SYSTEM



N.T.S. **1** RISER DIAGRAM  
INSIDE AND OUTSIDE CABLE PLANT

ADD-3	addendum 03 11/14/13		<b>richard + bauer</b> in association with becker morgan group
PK-01	Project request PR-01 IT Cabling 04/10/2014		
REV-104	REV 104 6/24/2014		

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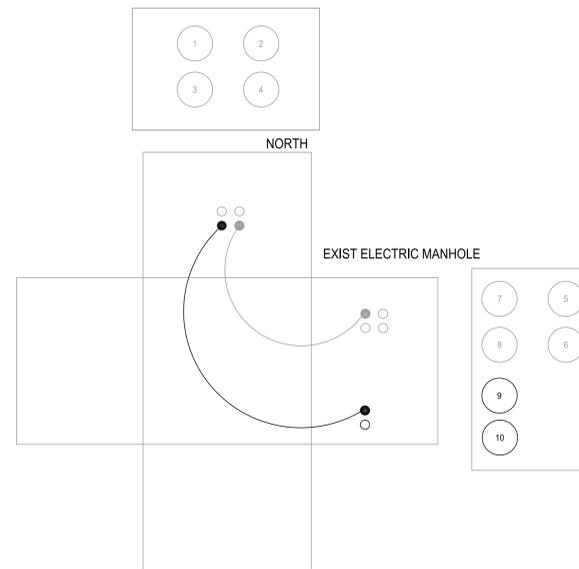
**delaware state university**  
optical science center for applied research

**IT cabling**  
10 april 2014

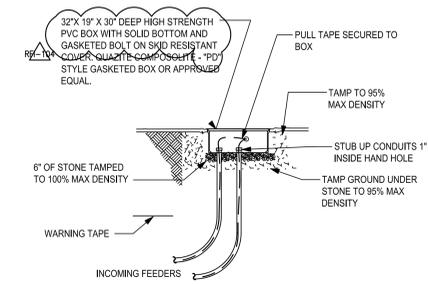
**e4.5** riser diagrams  
telecomm



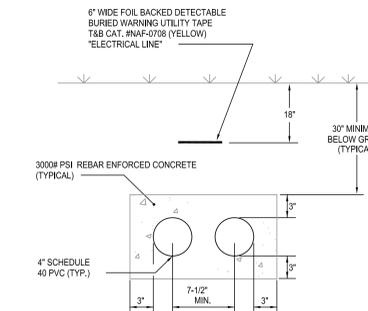
CONDUIT NUMBER	CONDUIT SIZE	CABLE SIZE	REMARKS
1	4"	SPARE	
2	4"	SPARE	
3	4"	2014, 3-2/0, MV-105, 15KV, 1/0 GND	FIRE WRAP EACH CABLE IN MANHOLE
4	4"	2077, 3-2/0, MV-105, 15KV, 1/0 GND	EXISTING
5	4"	SPARE	
6	4"	SPARE	
7	4"	2077, 3-2/0, MV-105, 15KV, 1/0 GND	EXISTING
8	4"	SPARE	
9	4"	2014, 3-2/0, MV-105, 15KV, 1/0 GND	FIRE WRAP EACH CABLE IN MANHOLE
10	4"	SPARE	



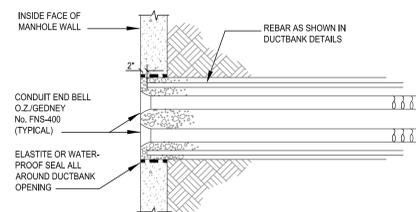
N.T.S. 7 ELECTRIC MANHOLE DIAGRAM



N.T.S. 4 IN-GROUND SPLICE BOX



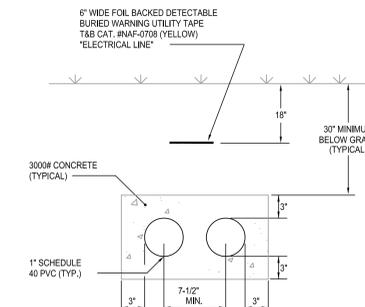
N.T.S. 3 DUCTBANK SECTION T-T ENCASED CONCRETE



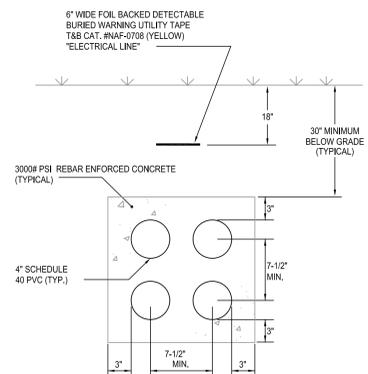
- NOTES:
1. PROVIDE A PULLWIRE IN ALL SPARE DUCTS FOR FUTURE USE.
  2. ALL SPARE DUCTS SHALL BE PLUGGED WITH 2. PHILLIP PRODUCTS, CATALOG No. 1898 UNIVERSAL TAPERED PLUG OR EQUAL.

NOTE:  
CABLE SHEATH PROTECTORS SHOULD BE PLACED IN DUCT MOUTH AFTER CABLE IS INSTALLED

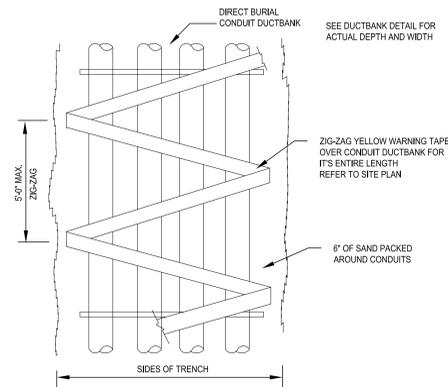
N.T.S. 9 CONDUIT ENBELLS AT MANHOLE



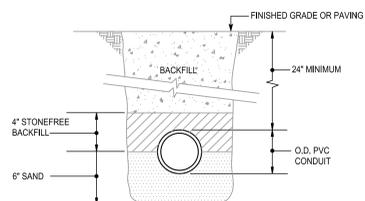
N.T.S. 6 DUCTBANK SECTION B1-B1 ENCASED CONCRETE



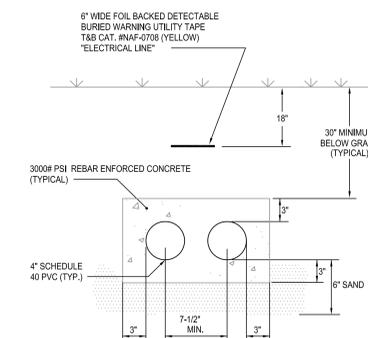
N.T.S. 2 DUCTBANK SECTION E-E ENCASED CONCRETE



N.T.S. 8 UNDERGROUND DUCTBANK MARKER



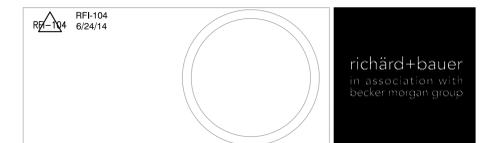
N.T.S. 5 DUCTBANK SECTION B-B



N.T.S. 1 DUCTBANK SECTION N-N ENCASED CONCRETE

GENERAL NOTES:

1. FOR SYMBOLS AND ABBREVIATIONS REFER TO DRAWING E0.1 AND E0.2.



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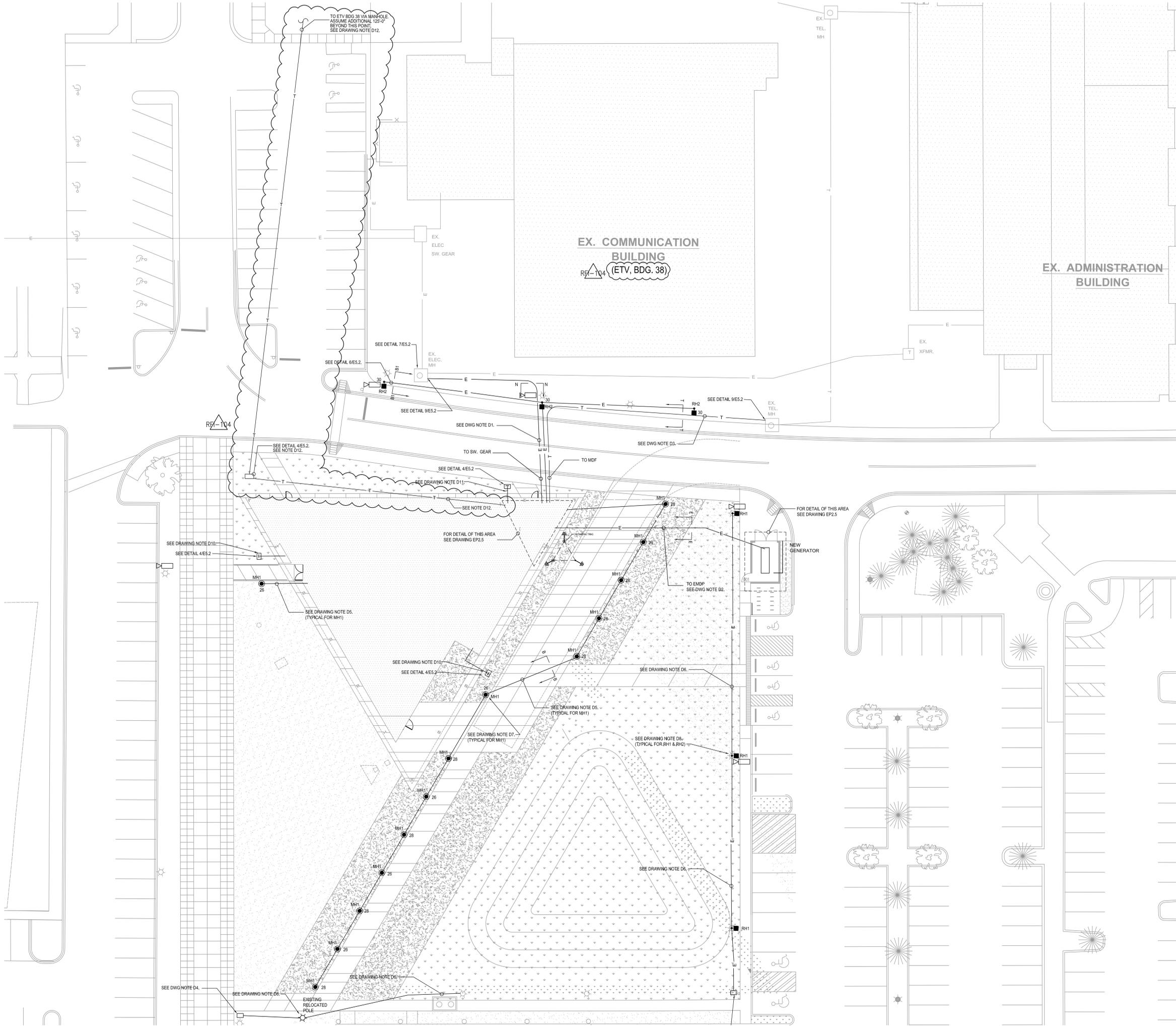
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100% construction documents  
4 october 2013

e5.2 details





- GENERAL NOTES :**
- FOR SYMBOLS AND ABBREVIATIONS REFER TO DRAWING E001 AND E002.
  - FOR CONCEPTUAL SITE LIGHTING LUMINAIRES AND LOCATIONS REFER TO ARCHITECTURAL DRAWINGS.
  - UNLESS OTHERWISE NOTED ALL LIGHT FIXTURES SHALL BE POWERED FROM PANEL LP-A1 LOCATED IN FIRST FLOOR ELECTRICAL ROOM.
- DRAWING NOTES :**
- PROVIDE 2-4" CONDUITS IN DUCTBANK FOR NORMAL POWER FEED TO BUILDING. SEE DETAIL 1/E5.2.
  - PROVIDE 4-4" CONDUITS IN DUCTBANK FOR EMERGENCY POWER FEED TO BUILDING. SEE DETAIL 2/E5.2.
  - PROVIDE 2-4" CONDUITS IN DUCTBANK FOR TELECOM FEED TO BUILDING. SEE DETAIL 3/E5.2.
  - PROVIDE AN INGRADE HANDHOLE, INTERCEPT, SPLICE, AND EXTEND EXISTING UNDERGROUND ELECTRICAL CONNECTION TO LIGHT FIXTURE NEW LOCATION. SEE DETAILS 4&5E5.2.
  - PROVIDE #10 & 1#12G IN 1-1" UNDERGROUND CONDUIT. SEE DETAIL 4/E5.2.
  - PROVIDE 1-1" CONDUIT IN DUCTBANK FOR POWER TO SITE LIGHT LIGHTING CROSSING UNDER ROADWAY. SEE DETAIL 6 DRAWING E5.2.
  - SITE BOLLARD. REFER TO DETAIL 7/E5.0 FOR BOLLARD BASE MOUNTING.
  - SITE POLE. REFER TO DETAIL 11/E5.0 FOR POLE BASE MOUNTING.
  - MATCH EXISTING WIRE TYPE, SIZE, AND QUANTITY. INTERCEPT SPLICE AND EXTEND EXISTING CIRCUITING TO NEW SITE POLES. SEE DETAIL 4/E5.2.
  - PROVIDE 3-2" CONDUIT STUBOUTS FOR FUTURE WORK FROM HANDHOLE AT GRADE, UNDERSLAB AND CONCEALED THROUGH NEAREST WALL INSIDE BUILDING TO ACCESSIBLE CEILING SPACE. PROVIDE NYLON BUSHING AT CONDUIT END INSIDE BUILDING. EXTEND CONDUITS TO 5'-0" FROM BUILDING FACE. CAP CONDUIT IN HANDHOLE. PROVIDE PULLSTRING IN ALL EMPTY CONDUITS.
  - PROVIDE 3-2" CONDUIT STUBOUTS FOR FUTURE WORK FROM HANDHOLE AT GRADE AND UNDERSLAB TO 6" ABOVE SLAB IN BUILDING FIRST FLOOR ELECTRICAL ROOM. AT EXTERIOR EXTEND CONDUITS TO 5'-0" FROM BUILDING FACE. CAP CONDUITS AT BOTH ENDS. PROVIDE PULLSTRING IN ALL EMPTY CONDUITS.
  - PROVIDE 1-3" DIA. SCHEDULE 80 PVC RIGID NONMETALLIC CONDUIT (RNC CARLON OR APPROVED EQUAL) WITH 4-1.25" DIA. CORRUGATED INNERDUCT (HDPE CARLON OR APPROVED EQUAL) FROM INSIDE OF BUILDING (ROOM A112) ROUTED AS INDICATED.

- plan legend**
- E— NEW ELECTRICAL
  - E— ELECTRICAL TO REMAIN
  - T— NEW TELECOM
  - T— TELECOM TO REMAIN

ADD-1 Bidding - addendum 01 10/25/13  
 ADD-3 Bidding - addendum 03 11/14/13  
 PR-01 Project request PR-01 IT Cabling 04/10/2014  
 RF1-104 RF1-104 6/24/14  
 RF1-104



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