To: Architects, Consultants, and Contractors  
Re: Use of Johns Hopkins Cable Plant Design and Construction Specification  
Date: June 8, 2005

Intended Use

This is a general specification for use in designing and installing the information transport systems infrastructure for the Johns Hopkins Institutions. The specification as presented here includes all possible elements for an ITS installation. Designers and Architects will need to select and modify sections of this specification as required for their project. Not all divisions and sections will apply to every project. Not all paragraphs of any given section may apply to a given project. Designers and architects need to edit this specification accordingly. Several sections include blanks spaces to be completed during specification development. System variables (e.g. copper pair counts, fiber backbone size) may be displayed as an example within this general specification.

When generating a project specification:

- Designers and Architects will need to submit specifications based on this document to the appropriate Johns Hopkins group for approval of options selected from this specification.
- Designers and Architects shall not add language to this specification when generating a project-specific specification without approval of Johns Hopkins. Added language shall be sent to Plant Operations for possible inclusion into the general specification.

Errors and omissions within this document shall be reported to Plant Operations for correction in the general specification.

Installers may submit preferred products not listed in the general specification for evaluation. Installers are encouraged to submit opinions on the products listed in the general specification with respect to ease of installation, availability of products, durability, etc.

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Prepared by:  Reviewed by:

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Cable Plant Project Manager Operations Manager Network Project Manager
Homewood Plant Operations IT@JH-Telecommunications IT@JH-Enterprise Networking
SECTION 00 0101

PROJECT TITLE PAGE

ENTERPRISE DIVISIONS

ZNAVYL KRIEGER SCHOOL OF ARTS AND SCIENCES
G.W.C. WHITING SCHOOL OF ENGINEERING
SCHOOL OF PROFESSIONAL STUDIES IN BUSINESS AND EDUCATION
THE SHERIDAN LIBRARIES
JOHNS HOPKINS HOSPITAL AND HEALTH SYSTEM
BLOOMBERG SCHOOL OF PUBLIC HEALTH
SCHOOL OF MEDICINE
SCHOOL OF NURSING
PEABODY INSTITUTE
PAUL H. NITZE SCHOOL OF ADVANCED INTERNATIONAL STUDIES
APPLIED PHYSICS LABORATORY
INSTITUTE FOR POLICY STUDIES

ENTERPRISE LOCATIONS

HOMEWOOD CAMPUS
EASTERN CAMPUS
MEDICAL CAMPUS
WASHINGTON CAMPUS
MONTGOMERY COUNTY CAMPUS
DOWNTOWN CENTER
PEABODY CAMPUS
MT. WASHINGTON CAMPUS
BAYVIEW CAMPUS
APPLIED PHYSICS LABORATORY CAMPUS

DEVELOPED BY HOMEWOOD PLANT OPERATIONS & INFORMATION TECHNOLOGY @ JOHNS HOPKINS

END OF PROJECT TITLE PAGE
### SECTION 00 0110

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29 D. 33 8213 - Copper Communications Distribution Cabling
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32 G. 33 8223.13 - Optical Fiber Splicing and Terminations
33 H. 33 8243 - Grounding and Bonding for Communications Distribution
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<td>T0-BL  Site backbone - all media logical schematic</td>
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<tr>
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<td>T0-BP  Site backbone - all media site plan</td>
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<tr>
<td>D</td>
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<td>E</td>
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<td>F</td>
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<td>G</td>
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<td>I</td>
<td>T0-LL  Site backbone - legacy logical schematic</td>
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<td>T1-PL  Building - pathway logical schematic</td>
</tr>
<tr>
<td>AD</td>
<td>T1-PPxx Building floor xx - pathway floor plan</td>
</tr>
</tbody>
</table>
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02  AF. T1-VL Building - video service logical schematic
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04  AH. T1-XPxx Building floor xx - coax floor plan
05  AI. T2-xyy Building floor xx, service zone y- all media floor plan
06  AJ. T2-CLy Building - service zone y- copper logical schematic
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08  AL. T3-xyy.z Network room xxy detail plans
09  AM. T4-SYM Symbols
10  AN. T5-xyy Schedules by network room
11  AO. TS-1 Specifications
12     1.  xx = floor designator, two digits
13         a.  01, 02 ...(floor number)
14         b.  BT (basement)
15         c.  GD (ground)
16         d.  MZ (mezzanine)
17         e.  PH (penthouse)
18         f.  TR (terrace)
19     2.  y = service area, consecutive lettering (e.g. A, B, C...)
20     3.  z = numeric sequence
21     1.02 Not all drawings may be present in a design set or may be required from shop drawings.
22     PART 2 PRODUCTS - NOT USED
23     PART 3 EXECUTION - NOT USED
24     END OF LIST OF DRAWINGS
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LIST OF SCHEDULES

PART 1  GENERAL

1.01 See drawing(s) T5-xx y Schedules by network room, where xx y is a network room
designator.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF LIST OF SCHEDULES
SECTION 00 1113

ADVERTISEMENT FOR BIDS

FROM:

1.01 The Owner (hereinafter referred to as Johns Hopkins Institutions):

1.02 DATE: ........

1.03 TO: POTENTIAL BIDDERS

A. Your firm is invited to submit an offer under seal to Johns Hopkins Institutions for construction of an information transport system located at the above address before __________ am local standard time on the _____ day of ______, ___, for the following project:

B. All bidders are required to prequalify to the requirements described in Document 00 2113 - Instructions to Bidders

C. Project Description:

D. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

E. Your offer will be required to be submitted under a condition of irrevocability for a period of 30 days after submission.

F. The Owner reserves the right to accept or reject any or all offers.

1.04 SIGNATURE

A. For: .................

B. By: ...................

1. Signed: _______________________________

2. (Authorized signing officer)

ENCL.

END OF BID SOLICITATION
SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 RELATED DOCUMENTS

A. Document 00 4301 - Bid Form Supplements Cover Sheet.
B. Document 00 4322 - Unit Prices Form.
C. Document 00 4323 - Alternates Form.
D. Document 00 4327 - Separate Prices Break-Out Form.
E. Document 00 4333 - Proposed Products Form.
F. Document 00 7300 - Supplementary Conditions:

INVITATION

2.01 BID SUBMISSION

A. Bids signed, executed, and dated will be received at the office of the Johns Hopkins Institutions at ______ before ________ a.m. local standard time on the ____ day of _________.
B. Offers submitted after the above time may be returned to the bidder unopened.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete an information transport system located at ________ for a Stipulated Sum contract, in accordance with the Contract Documents.

2.03 CONTRACT TIME

A. Perform the Work within the time stated in Section 01 1000 - Summary.
B. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date in the Agreement shall be the Contract Time added to the commencement date. The bidder may suggest a revision to the Contract Time with a specific adjustment to the Bid Amount.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

A. Bid Documents: Contract Documents supplemented with Invitation To Bid, Instructions to Bidders, Information Available to Bidders, Bid Form Supplements To Bid Forms and Appendices identified.

3.02 AVAILABILITY

A. Bid Documents may be obtained at the office of Johns Hopkins Institutions which is located at ________.
B. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.03 INQUIRIES/ADDENDA

A. Direct questions to ________, telephone __________.
B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing not less than 3 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to all bidders.

3.04 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Substitute products will be considered if submitted as an attachment to the Bid Form. Approval to submit substitutions prior to submission of bids is not required.

B. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the Work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.

C. The submission shall provide sufficient information to determine acceptability of such products.

D. Provide complete information on required revisions to other work to accommodate each proposed substitution.

E. Provide products as specified unless substitutions are submitted in this manner and accepted.

SITE ASSESSMENT

4.01 SITE EXAMINATION

A. Examine the project site before submitting a bid.

B. A visit to the project site has been arranged for bidders as follows: ________

4.02 PREBID CONFERENCE

A. A bidders conference has been scheduled for ________ a.m. on the ______ day of ________ at the location of ________.

B. All general contract bidders and suppliers are required to attend.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of previous experience, license to perform work in the State, manufacturers’ certifications, and installer qualifications and certifications.

5.02 PREQUALIFICATION

A. Bidders shall be pre-qualified by Johns Hopkins Institutions.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

B. Double Envelope: Insert a closed and sealed Bid Form envelope, in a large opaque envelope and label this envelope.

6.02 BID INELIGIBILITY
A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Johns Hopkins Institutions, be declared unacceptable.

B. Bid Forms, Appendices, and enclosures which are improperly prepared may, at the discretion of Johns Hopkins Institutions, be declared unacceptable.

C. Bids are by invitation, only from selected bidders. Bids from unsolicited bidders may be returned.

BID ENCLOSURES/REQUIREMENTS

7.01 AGREEMENT TO BOND

A. Submit with the Bid.

7.02 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance and Payment bond________.

B. Include the cost of performance assurance bonds in the Bid Amount and identify the cost on the Bid Form.

7.03 INSURANCE

A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company stating their intention to provide insurance to the bidder in accordance with the insurance requirements of the Contract Documents.

7.04 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

7.05 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:

1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature.

2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature.

3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.

4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

7.06 ADDITIONAL BID INFORMATION

A. Submit the following Supplements concurrent with bid submission:

1. Document 00 4336 - Proposed Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.
2. Document 00 4322 - Unit Prices: Include a listing of unit prices specifically requested by the Contract Documents.

3. Document 00 4323 - Alternates: Include the cost variation to the Bid Amount applicable to the Work described in Section ________.

4. Document 00 4327 - Separate Prices: Include a listing of separate prices as specifically requested in the Contract Documents.

5. Document 00 4333 - Proposed Products.

7.07 SELECTION AND AWARD OF ALTERNATIVES

A. Bids will be evaluated on the total of the base bid price and all of the alternatives. After determination of the successful bidder, consideration will be given to which alternatives will be included in the Work.

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

A. Johns Hopkins Institutions reserves the right to accept or reject any or all offers.

END OF INSTRUCTIONS TO BIDDERS
SECTION 00 3126.23

EXISTING LEAD INFORMATION

PART 1  GENERAL

1.01 PROJECT CONDITIONS

A. Some cables at the Homewood campus are encased in lead.
B. Some splice cases at the Homewood campus have been coated in lead.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.01 Any soldering or heating of lead jacketed cables or splice case should be conducted using proper procedures for working with lead. Contractors shall provide proper safety equipment and shall follow proper procedures for lead exposure.

3.02 Any lead-containing waste shall be disposed of as required by federal, state/district, and local requirements.

3.03 The Contractor shall contact the Johns Hopkins Office of Health, Safety & Environment (Safety Office) prior to working with lead cables and splice cases for any additional requirement.

END OF SECTION
SECTION 00 3126.26

EXISTING ASBESTOS INFORMATION

PART 1 GENERAL

1.01 PROJECT CONDITIONS

A. IMPORTANT NOTICE: Many areas at the Homewood campus have asbestos present. This includes tiles, floor adhesive, pipe insulation, sprayed-on fire-proofing, and other sources. Designers and Contractors SHALL NOT assume an area is free from hazard. Significant costs are associated with working around existing asbestos and must be anticipated either in the form of abatement costs or in alternate routing to avoid contamination.

B. Asbestos survey documents for Homewood buildings are available for review. These documents are not complete and in no way waive the responsibility of the Contractor to determine the presence or absence of asbestos.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

3.01 Designers and Contractors SHALL NOT move ceiling tiles unless the area has been confirmed to be free of asbestos above drop ceilings by JHU Safety officers.

3.02 The Contractor shall contact the Johns Hopkins Office of Health, Safety & Environment (Safety Office) prior to entering known asbestos areas.

3.03 The Contractor shall contact the Johns Hopkins Office of Health, Safety & Environment (Safety Office) prior to any abatement procedures. All abatement MUST be coordinated with the Safety Office well in advance of the start of abatement.

END OF SECTION
SECTION 00 4100

BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:
A. Johns Hopkins Institutions

1.02 FOR:
A. __________________________

1.03 DATE: ______________ (Bidder to enter date)

1.04 SUBMITTED BY: (Bidder to enter name and address)
A. Bidder's Full Name _________________________
1. Address _________________________
2. City, State, Zip_________________________

1.05 OFFER
A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by ________ for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. __________________________________________ dollars

1.06 ACCEPTANCE
A. This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.
B. If this bid is accepted by Johns Hopkins Institutions within the time period stated above, we will:
1. Execute the Agreement within seven days of receipt of Notice of Award.
2. Furnish the required bonds within seven days of receipt of Notice of Award.
3. Commence work within seven days after written Notice to Proceed of this bid.

1.07 CONTRACT TIME
A. If this Bid is accepted, we will:
B. Complete the Work by the _________ day of ________, _____. (Bidder to enter day, month, and year.)

1.08 BID FORM SUPPLEMENTS
A. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
1. Document 00 4336 - Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.
2. Document 00 4322 - Unit Prices: Include a listing of unit prices specifically requested by the Contract Documents.
3. Document 00 4323 - Alternatives: Include the cost variations to the Bid Sum applicable to the Work as described in Section ________.
4. Document 00 4327 - Separate Prices: Include a listing of separate prices as specifically requested in the Contract Documents.

5. Document 00 4333 - Proposed Products.

B. We agree to submit the following Supplements to Bid Forms within 24 hours after submission of this bid for additional bid information:

1. Document 00 4336 - Subcontractors: Include the names of all Subcontractors and the portions of the Work they will perform.

2. Document 00 4322 - Unit Prices: Include a listing of unit prices specifically requested by the Contract Documents.

3. Document 00 4323 - Alternatives: Include the cost variations to the Bid Price applicable to the Work as described in Section ________.

4. Document 00 4327 - Separate Prices: Include a listing of separate prices as specifically requested in the Contract Documents.

5. Document 00 4333 - Proposed Products.

1.09 BID FORM SIGNATURE(S)

A. ____________________________________________

B. (Bidder please print the full name of your Proprietorship, Partnership, or Corporation)

C. ____________________________________________

D. (Authorized signing officer, Title)

1.10 If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF BID FORM
SECTION 00 4301

BID FORM SUPPLEMENTS COVER SHEET

PARTICULARS

1.01 TO: ............

1.02 Project: .................

1.03 Date: ____________

1.04 Submitted by: (Bidder to insert full name and address)

A. ______________________________

B. ______________________________

C. ______________________________

D. ______________________________

E. In accordance with Document 00 2113 Instructions to Bidders and Document 00 4100 - Bid Form, we include the Supplements To Bid Form listed below. The information provided shall be considered an integral part of the Bid Form.

1.05 SUPPLEMENTS TO BID FORM

A. Section 00 4322 - Unit Prices Form

B. Section 00 4323 - Alternates Form

C. Section 00 4327 - Separate Prices Break-Out Form

D. Section 00 4333 - Proposed Products Form

E. Section 00 4336 - Proposed Subcontractors Form

SIGNATURE(S)

2.01 _____________________________________________________

2.02 (Bidder please print the full name of your Proprietorship, Partnership, or Corporation)

2.03 _____________________________________________________

2.04 (Authorized signing officer Title)

END OF SUPPLEMENTS TO BID FORM
PARTICULARS

1.01 (Bidder) ________________________________
1.02 TO (Owner) ...................................
1.03 dated _________________ and which is an integral part of the Bid Form.
1.04 The following are Unit Prices for specific portions of the Work as listed, and are applicable to authorized variations from the Contract Documents.

UNIT PRICE LIST

2.01 ITEM DESCRIPTION -------- UNIT QUANTITY------UNIT VALUE

Attach Unit pricing

END OF SUPPLEMENT
PARTICULARS

The following is the list of Alternatives referenced in the bid submitted by:

(Bidder) _______________________________

TO (Owner) ................................

Dated ________________ and which is an integral part of the Bid Form.

ALTERNATIVES LIST

The following amounts shall be added to or deducted from the Bid Amount. Refer to Section 01 2300 - Alternatives: Schedule of Alternatives.

Alternative # 1: (Add) (Deduct) $ ________________________

Alternative # 2: (Add) (Deduct) $ ________________________

Alternative # 3: (Add) (Deduct) $ ________________________

Alternative # 4: (Add) (Deduct) $ ________________________

Alternative # 5: (Add) (Deduct) $ ________________________

Alternative # 6: (Add) (Deduct) $ ________________________

Alternative # 7: (Add) (Deduct) $ ________________________

Alternative # 8: (Add) (Deduct) $ ________________________

END OF SUPPLEMENT
SEPARATE PRICES BREAK-OUT FORM

PARTICULARS

1.01 The following is the list of Separate Prices referenced in the bid submitted by:

(Bidder) _________________________________

TO (Owner)

Dated __________ and which is an integral part of the Bid Form.

1.02 JH reserves the right to split the project between multiple vendors. In this event, the pricing below shall reflect full costs for each segment. Typical separation may include, but not be limited to, inside cable plant, outside cable plant, interior pathways (e.g. conduit, cable tray), and grounding infrastructure. Large jobs may be split to meet required time frame.

ITEM DESCRIPTIONS

2.01 Separate Price # 1:

A. Description: .....................

B. Value: $_____________________

END OF SUPPLEMENT D
SECTION 00 4333

PROPOSED PRODUCTS FORM

PARTICULARS

1.01 The following is the List of Equipment referenced in the bid submitted by:

(Bidder) ________________________________

TO (Owner) dated _________________ and which is an integral part of the Bid Form.

LIST

2.01 COMPONENT OR ITEM -------------- MANUFACTURER ---------------- QUANTITY

Attach proposed product cut-sheets for products proposed as substitutions or for which a specific part number is not listed in this specification.

END OF SUPPLEMENT
**PARTICULARS**

1.01 Herewith is the list of Subcontractors referenced in the bid submitted by:

(Bidder) ____________________________________

To (Owner)

Dated _________________ and which is an integral part of the Bid Form.

1.02 The following work will be performed (or provided) by Subcontractors and coordinated by us:

**LIST OF SUBCONTRACTORS**

2.01 WORK SUBJECT.............SUBCONTRACTOR NAME

| 2.02 | ........................................................................................................ |
| 2.03 | ........................................................................................................ |
| 2.04 | ........................................................................................................ |
| 2.05 | ........................................................................................................ |
| 2.06 | ........................................................................................................ |
| 2.07 | ........................................................................................................ |

END OF SUPPLEMENT
FORM OF AGREEMENT

1.01 AIA Document B727, Standard Form of Agreement Between Owner and Architect


1.03 University Purchase Order

1.04 Terms and conditions of the agreement form shall supercede any terms and conditions of this document. Conflicts between the agreement form and this document shall be resolved by Johns Hopkins Institutions.

AMENDMENTS TO AGREEMENT FORM

END OF AGREEMENT
PART 1 GENERAL

1.01 PROJECT

A. Project Name: ______________________.
B. Owner's Name: Johns Hopkins Institutions.
C. Architect's Name: ______________________.
D. The Project consists of the construction of _______________.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings and specified in Section 02 4100.
B. Scope of alterations work is shown on drawings.
C. Renovate the following areas, complete including operational mechanical and electrical work and finishes:
D. Communications: Alter existing system and add new construction, keeping existing in operation.
E. Johns Hopkins Institutions will remove the following items before start of work:
   1. Network Electronics.
   2. Telephone units.
   3. ________.
   4. ________.
F. Contractor shall remove and deliver the following to Johns Hopkins Institutions prior to start of work:
   1. ________.
   2. ________.
   3. ________.
   4. ________.
G. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor:
   1. ________.
   2. ________.
   3. ________.
   4. ________.
1.04 WORK BY OWNER

A. Johns Hopkins Institutions will award a contract for supply and installation of an information transport system infrastructure which will commence on ________.

B. Existing Building Demolition: Johns Hopkins Institutions will contract for demolition of the existing infrastructure on site.

C. Items noted NIC (Not in Contract) will be supplied and installed by Johns Hopkins Institutions before Substantial Completion. Some items include:

1. Network electronics.
2. Voice electronics.

D. Johns Hopkins Institutions will supply the following for installation by Contractor:

1. Emergency telephone units, sirens, and strobes.

1.05 OWNER OCCUPANCY

A. Johns Hopkins Institutions may intend to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Johns Hopkins Institutions may intends to occupy the Project upon Substantial Completion.

C. Johns Hopkins Institutions may intend to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Cooperate with Johns Hopkins Institutions to minimize conflict and to facilitate Johns Hopkins Institutions's operations.

E. Schedule the Work to accommodate Johns Hopkins Institutions occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:

1. Johns Hopkins Institutions occupancy.
2. Work by Others.
4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Johns Hopkins Institutions:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

2. Do not obstruct roadways, sidewalks, or other public ways without permission from Johns Hopkins University Security Department.

D. Existing building spaces may not be used for storage unless approved by Johns Hopkins University.

E. Time Restrictions:

1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of 9 AM - 8 PM, unless otherwise required by the City of Baltimore.

2. Limit conduct of especially noisy interior work to the hours of 7 AM - 8 PM.
3. Conduct may be further limited in housing or medical facilities.

F. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the building is unoccupied.

2. Do not disrupt or shut down life safety systems, including but not limited to service to the fire alarm system, elevators, or other security or life safety systems, without 7 days notice to Johns Hopkins Institutions and authorities having jurisdiction.

3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

A. Coordinate construction schedule and operations with Johns Hopkins Institutions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.02 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Present required information in typewritten form.

C. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.

D. Execute certification by signature of authorized officer.

E. Submit three copies of each Application for Payment.

F. Include the following with the application:

1. Construction progress schedule, revised and current as specified in Section 01 3000.

1.03 MODIFICATION PROCEDURES

A. Construction Change Directive: Architect may issue a document, signed by Johns Hopkins Institutions, instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.

2. Promptly execute the change in Work.

B. Proposal Request: Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.

C. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

D. Computation of Change in Contract Amount:

1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
01 E. Substantiation of Costs: Provide full information required for evaluation.

02 1. On request, provide following data:

03 a. Quantities of products, labor, and equipment.


05 c. Credit for deletions from Contract, similarly documented.

06 2. Support each claim for additional costs with additional information:

07 a. Origin and date of claim.

08 b. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

09 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

10 1.04 APPLICATION FOR FINAL PAYMENT

11 A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

12 B. Application for Final Payment will not be considered until the following have been accomplished:

13 1. All closeout procedures specified in Section 01 7000.

14 2. Receipt of all warranty documentation from manufacturer acknowledging successful submission and subsequent activation of all warranties.

15 PART 2 PRODUCTS - NOT USED

16 PART 3 EXECUTION - NOT USED

17 END OF SECTION
SECTION 01 2200

UNIT PRICES

PART 1  GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.
B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit sum/price.
B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products placed beyond the lines and levels of the required Work.
   4. Products remaining on hand after completion of the Work.
   5. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.
B. If, in the opinion of Johns Hopkins Institutions, it is not practical to remove and replace the Work, Johns Hopkins Institutions will direct one of the following remedies:
   1. The defective Work will be partially repaired to the instructions of the Johns Hopkins Institutions, and the unit sum/price will be adjusted to a new sum/price at the discretion of Johns Hopkins Institutions.
C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of Johns Hopkins Institutions to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 2300

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Alternative submission procedures.

1.02 RELATED SECTIONS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.
B. Document 00 4323 - Alternates Form: List of alternatives as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATIVES

A. Alternatives quoted on Bid Forms will be reviewed and accepted or rejected at Johns Hopkins Institutions's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.
B. Coordinate related work and modify surrounding work to integrate the Work of each alternative.

1.04 SCHEDULE OF ALTERNATIVES

A. Alternative No. ____ - ______________:
B. Alternative No. ____ - ______________:
C. Alternative No. ____ - ______________:
D. Alternative No. ____ - ______________:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.
B. Progress meetings.
C. Construction progress schedule.
D. Submittals for review, information, and project closeout.
E. Submittal procedures.

1.02 PROJECT COORDINATION

A. Project Coordinator: Construction Manager.
B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices
   and sheds, for ________ access, traffic, and parking facilities.
C. During construction, coordinate use of site and facilities through the Project Coordinator.
D. Comply with Project Coordinator's procedures for intra-project communications; submittals,
   reports and records, schedules, coordination drawings, and recommendations; and resolution of
   ambiguities and conflicts.
E. Comply with instructions of the Project Coordinator for use of temporary utilities and
   construction facilities.
F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Johns Hopkins Institutions will schedule a meeting after Notice of Award.
B. Attendance Required:
01 2. Architect, if applicable.
02 3. Contractor.
03
04 C. Agenda:
05 1. Designation of personnel representing the parties to Contract, _______, and Architect.
06 2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
07 3. Scheduling.
08 D. Record minutes and distribute copies within two days after meeting to participants, with ____ copies to Architect, Johns Hopkins Institutions, participants, and those affected by decisions made.

11 3.02 PROGRESS MEETINGS
12 A. Schedule and administer meetings throughout progress of the Work at maximum bi-weekly intervals.
13 B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
14 C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Johns Hopkins Institutions, Architect, as appropriate to agenda topics for each meeting.
15 D. Agenda:
16 1. Review minutes of previous meetings.
17 2. Review of Work progress.
18 3. Field observations, problems, and decisions.
19 4. Identification of problems which impede planned progress.
20 5. Review of submittals schedule and status of submittals.
21 6. Corrective measures to regain projected schedules.
22 7. Planned progress during succeeding work period.
23 8. Effect of proposed changes on progress schedule and coordination.
25 E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Johns Hopkins Institutions, participants, and those affected by decisions made. Distribute minutes electronically as PDF-formatted e-mail attachments.

31 3.03 CONSTRUCTION PROGRESS SCHEDULE
32 A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
33 B. Within 10 days after joint review, submit complete schedule.
34 C. Submit updated schedule with each Application for Payment.

36 3.04 PROGRESS PHOTOGRAPHS
37 A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Johns Hopkins University.
B. Take photographs on date for each application for a payment and as follows:
   1. Excavations.
   2. OSP ductbank construction.
   3. ISP pathways in concealed spaces (e.g. above drop ceilings, in utility shafts, etc.)
   4. All firestop assemblies and locations

C. Views:
   1. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

D. Prints: Full color; one prints of each view.
   1. Prints may be submitted as JPEG or TIFF format digital files. Digital quality shall be maximized over file size compression.

E. Deliver prints within three days after exposure with transmittal letter specified in this Section.

3.05 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

3.06 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   5. Other types as indicated.

B. Submit for Johns Hopkins Institutions's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches (215 x 280 mm): Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect.

2. Larger Sheets, Not Larger Than 36 x 48 inches (910 x 1220 mm): Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect.

B. Documents for Information: Submit two copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

3.09 SUBMITTAL PROCEDURES

A. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Deliver submittals to Construction Manager at business address.

E. Schedule submittals to expedite the Project, and coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Architect review stamps.

I. When revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

END OF SECTION
SECTION 01 3323

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.02 DESIGN AND AS-BUILT DRAWING REQUIREMENTS

A. Designs shall conform to the layer and drawing requirements for submittals as detailed in this section.

B. Designers shall submit electronic files as a required submittal from the designer. File formats shall conform to the requirements for submittals as detailed in this section.

C. As-built drawings shall be submitted as electronic CAD Files.

1. As-built drawings shall be in Autodesk AutoCAD 2000 DWG format, using architectural drawings provided by Johns Hopkins as external references.

2. As-built drawings may use Johns Hopkins-provided templates.

3. Architectural drawings shall not altered in any way and shall not be bound to the shop drawings.

4. As-built drawings shall ONLY use the following layers,

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<th>Color</th>
<th>Description</th>
</tr>
</thead>
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</table>
5. Not all drawings layers need be used.
6. Shop drawings shall conform to the Johns Hopkins Institutions standard drawing list. See
   Section 00 0115 - List of Drawing Sheets.
7. Not all drawings may be present in a design set or may be required from shop drawings.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 01 3523

OWNER SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 REFERENCES

A. Johns Hopkins Safety Manual, PERMIT-REQUIRED CONFINED SPACE ENTRY, Policy Number HSE 020, Effective Date 05_01_01

1.02 DESIGN REQUIREMENTS

A. Safety requirements for specific sections are included within those sections.

B. Confined space entries must follow Johns Hopkins confined space procedures.

C. Owner safety requirements are set by the Johns Hopkins Office of Health, Safety & Environment (Safety Office).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 3553

SECURITY PROCEDURES

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.02 OWNER SECURITY AUTHORITY

A. Johns Hopkins Security Department - Homewood Campus
B. Johns Hopkins Medical Institutions Security, Parking & Transportation Services - Medical Campus, Bayview Campus

1.03 SECURITY PROGRAM

A. Protect Work, existing premises and Johns Hopkins Institutions's operations from theft, vandalism, and unauthorized entry.
B. Initiate program at project mobilization.
C. Maintain program throughout construction period until Johns Hopkins Institutions acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

A. Johns Hopkins Institutions will control entrance of persons and vehicles related to Johns Hopkins Institutions's operations.

1.05 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.
B. Badge To Include: Personal photograph, name, expiration date and employer.
C. Maintain a list of accredited persons, submit copy to Johns Hopkins Institutions on request.
D. Require return of badges at expiration of their employment on the Work.

1.06 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by approval of Johns Hopkins Institutions.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 01 4000

QUALITY REQUIREMENTS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Control of installation.
B. Testing and inspection services.

1.02 REFERENCES

See Section 01 4219 - Reference Standards

1.03 REFERENCES AND STANDARDS - See Section 01 4219

1.04 TESTING AND INSPECTION AGENCIES

A. Johns Hopkins Institutions reserves the right to employ and pay for services of an independent
testing agency to perform specified testing.
B. Employment of agency in no way relieves Contractor of obligation to perform Work in
accordance with requirements of Contract Documents.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and
workmanship, to produce Work of specified quality.
B. Comply with manufacturers' instructions, including each step in sequence.
C. Should manufacturers' instructions conflict with Contract Documents, request clarification from
Architect before proceeding.
D. Comply with specified standards as minimum quality for the Work except where more stringent
tolerances, codes, or specified requirements indicate higher standards or more precise
workmanship.
E. Have Work performed by persons qualified to produce required and specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the
manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand
pressures, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

A. See individual specification sections for testing required.

3.03 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.
B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will
direct an appropriate remedy or adjust payment.

END OF SECTION
SECTION 01 4219

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements relating to referenced standards.
B. Reference standards full title and edition date.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 JOHNS HOPKINS INSTITUTIONS DOCUMENTS

CITY OF BALTIMORE

Department of Public Works standards documents, as applicable.
Department of Transportation standards documents, as applicable.

JOHNS HOPKINS INSTITUTIONS DOCUMENTS

Johns Hopkins Safety Manual, PERMIT-REQUIRED CONFINED SPACE ENTRY, Policy Number HSE 020, Effective Date 05_01_01.

PART 3 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

3.01 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

A. AASHTO H-20 Load Rating

3.02 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE


3.03 ASTM A Series -- AMERICAN SOCIETY FOR TESTING AND MATERIALS


3.04 ASTM C Series -- AMERICAN SOCIETY FOR TESTING AND MATERIALS

3.05 ASTM D Series -- AMERICAN SOCIETY FOR TESTING AND MATERIALS
A. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (2,700 kN m/m³)); 2002.

3.06 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION

3.07 BICSI -- BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
A. Customer-Owned Outside Plant Design Manual, the current version as published by BICSI: A Telecommunications Association, and all subsequent addendums.
B. BICSI Technician Workbook, the current version as published by BICSI: A Telecommunications Association, and all subsequent addendums.
C. BICSI Telecommunications Distribution Methods Manual, the current version as published by BICSI: A Telecommunications Association, and all subsequent addendums.

3.08 City, County, District, or State Ordinances, as applicable to location.

3.09 FM -- FACTORY MUTUAL RESEARCH CORPORATION

3.10 IAEA -- INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS

3.11 IEEE -- INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS

3.12 ISO -- INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
A. ISO/IEC 11801 - Information Technology - Generic Cabling for Customer Premises; Ed.2:2002

3.13 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
A. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; 2003.

3.14 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION
3.15 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

3.16 TIA -- TELECOMMUNICATIONS INDUSTRY ASSOCIATION
   C. TIA/EIA-568 - Commercial Building Telecommunications Cabling Standard; Rev B, 2001, and latest addenda. (consists of 3 Parts, listed below)
   I. TIA J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications; Rev A, 2002.

3.17 UL -- UNDERWRITERS LABORATORIES INC.
   B. UL 797 - Electrical Metallic Tubing - Steel; current edition.

PART 4 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

4.01 FCC -- FEDERAL COMMUNICATIONS COMMISSION
   B. FCC Part-68 - Connection of Terminal Equipment to the Telephone Network.

4.02 MIL -- MILITARY SPECIFICATIONS AND STANDARDS
   A. MIL-D-3134 - Deck Covering Materials; Revision J; Amendment 1, 1989.

END OF SECTION
SECTION 01 5500

VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.
B. Parking.
C. Construction parking controls.
D. Flag persons.
E. Flares and lights.
F. Traffic signs and signals.
G. Maintenance.
H. Removal, repair.

PART 2 PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

A. Automatic Traffic Control Signals: As approved by local jurisdictions.
B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
C. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 ACCESS ROADS

A. Use of designated existing on-site streets and driveways for construction traffic is permitted.
B. Tracked vehicles not allowed on paved areas.
C. Extend and relocate as Work progress requires, provide detours as necessary for unimpeded traffic flow.
D. Location as approved by Architect.
E. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.
F. Provide and maintain access to fire hydrants free of obstructions.

3.02 PARKING

A. Use of existing parking facilities by construction personnel is permitted.
B. Do not allow heavy vehicles or construction equipment in parking areas.
C. Arrange for temporary parking areas to accommodate use of construction personnel.

3.03 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
01 3.04 FLAG PERSONS
02   A. Provide trained and equipped flag persons to regulate traffic when construction operations or
03     traffic encroach on public traffic lanes.
04   B. Use of flag persons on public roads shall be as required by local jurisdictions.
05 3.05 FLARES AND LIGHTS
06   A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
07   B. Use of flares and lights on public roads shall be as required by local jurisdictions.
08 3.06 TRAFFIC SIGNS AND SIGNALS
09   A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere
10     as needed to direct construction and affected public traffic.
11   B. Install and operate automatic traffic control signals to direct and maintain orderly flow of traffic in
12     areas under Contractor's control, and areas affected by Contractor's operations.
13   C. Relocate as Work progresses, to maintain effective traffic control.
14   D. The use of traffic signs and signals on public road shall be as required by local jurisdictions.
15 3.07 MAINTENANCE
16   A. Maintain traffic and parking areas in a sound condition free of excavated material, construction
17     equipment, Products, mud, snow, and ice.
18   B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low
19     areas, standing water, and other deficiencies, to maintain paving and drainage in original, or
20     specified, condition.
21 3.08 REMOVAL, REPAIR
22   A. Repair existing facilities damaged by use, to original condition.
23   B. Remove equipment and devices when no longer required.
24   C. Repair damage caused by installation.
25   D. Remove post settings to a depth of 2 feet (600 mm).
26   E. Removal and repair on public roads shall be as required by local jurisdictions.
27
      END OF SECTION
SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations and procedures.
E. Procedures for Johns Hopkins Institutions-supplied products.
F. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Document 00 2113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Johns Hopkins Institutions, or otherwise indicated as to remain the property of the Johns Hopkins Institutions, become the property of the Contractor; remove from site, unless otherwise indicated by Johns Hopkins Institutions.
C. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.
B. Do not use products having any of the following characteristics:

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Johns Hopkins Institutions.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

E. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Johns Hopkins Institutions's Responsibilities:

1. Arrange and pay for product delivery to site.

2. On delivery, inspect products jointly with Contractor.

3. Submit claims for transportation damage and replace damaged, defective, or deficient items.

B. Contractor's Responsibilities:

1. Receive and unload products at site; inspect for completeness or damage jointly with Johns Hopkins Institutions.

2. Handle, store, install and finish products.
3. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer’s instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers’ instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
B. Pre-installation meetings.
C. Cutting and patching.
D. Closeout procedures, except payment procedures.

1.02 PROJECT CONDITIONS

A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
E. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.03 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.
B. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
C. Coordinate completion and clean-up of work of separate sections.
D. After Johns Hopkins Institutions occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Johns Hopkins Institutions's activities.

PART 2  PRODUCTS

PART 3  EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Johns Hopkins Institutions, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer’s instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.
B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
C. Services (Including but not limited to Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Provide temporary connections as required to maintain existing systems in service.
   3. Verify that abandoned services serve only abandoned facilities.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.
E. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
F. Do not begin new construction in alterations areas before demolition is complete.
G. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
D. Restore work with new products in accordance with requirements of Contract Documents.
E. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

G. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage. Cover all exposed connectors.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.10 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

1. Clean areas to be occupied by Johns Hopkins Institutions prior to final completion before Johns Hopkins Institutions occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean dirt and debris resulting from information transport systems installation. In general construction environments, the Contractor shall clean that dirt and debris caused by ITS installation.

1. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

2. Clean debris from roofs, gutters, downspouts, and drainage systems.

3. Clean site; sweep paved areas, rake clean landscaped surfaces.
D. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Johns Hopkins Institutions.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Substantial Completion.

D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Johns Hopkins Institutions-occupied areas.

F. Notify Architect when work is considered finally complete.

G. Complete items of work determined by Architect's final inspection.

END OF SECTION
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Johns Hopkins Institutions requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood: May be used as blocking or furring.
   5. Land clearing debris, including brush, branches, logs, and stumps: See Section 31 1000 for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

E. Johns Hopkins Institutions has made arrangements for salvage of the following materials by others:
   1. John Hopkins Recycling: Recipient will provide containers and pick up.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues.

G. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS - NOT USED

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:

1. Relative amount of waste produced, compared to specified product.

2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.


PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. The Contractor shall recycle all cable scraps, cable "shorts" not to be used by the Contractor on other projects, grounding conductor scraps, and cable removed from the project under demolition.


C. The Contractor shall prevent trash from being placed in recycling drums and shall remove and properly dispose of non-cable trash.

D. The Contractor shall place optical fiber, copper or optical fiber connectors, termination blocks, or other materials into recycling drums other than copper cable.

E. The Contractor will be responsible for the proper disposal of hazardous materials, including but not limited to lead-lined cables and splice cases. The Contractor shall adhere to all federal, state/district, and local rules and requirements for the disposal of hazardous materials.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Johns Hopkins Institutions, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal.
   1. Provide containers as required. Johns Hopkins Recycling will provide empty drums for this.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION
SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Project Record Documents.
B. Warranties and bonds.

1.02 RELATED SECTIONS
A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
B. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS
A. Project Record Documents: Submit documents to Architect and Johns Hopkins Institutions.
B. Warranties and Bonds:
   1. Make submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS
A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Manufacturer's instruction for assembly, installation, and adjusting.
B. Ensure entries are complete and accurate, enabling future reference by Johns Hopkins Institutions.
C. Record information concurrent with construction progress.
D. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.02 WARRANTIES AND BONDS
A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Johns Hopkins Institutions' permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
B. Submit all required paperwork for manufacturers' warranties. Make sure all manufacturers’ warranties are in the name of Johns Hopkins Institutions
C. Co-execute submittals when required.
D. Retain warranties and bonds until time specified for submittal.
SECTION 07 7100

ROOF SPECIALTIES

PART 1 GENERAL

1.01 DESIGN REQUIREMENTS

A. Roof Penetrations

1. Roof penetrations should be considered for all new buildings, and as a retrofit for existing buildings. Roof penetrations will be primarily used to provide a pathway for wireless (dish, GPS, antenna, etc.) locations, and shall be coordinated with Johns Hopkins.

2. Provide one 3” penetration for smaller buildings, and at least two 3” penetrations for larger buildings. These penetrations shall have a pathway to the nearest network room for wireless equipment.

3. Roof penetrations shall be a gooseneck conduit to prevent water infiltration. The penetration shall be properly sealed with a waterproofing material.

4. Roof penetrations may be horizontal from penthouse areas to surrounding flat roof spaces. The penetrations shall be angled downward towards the exterior providing a minimum 0.5 inch pitch. The penetration shall be properly sealed with a waterproofing material.

5. Roof penetrations and sealing shall be made by a Certified roofing contractor. The contractor shall follow the latest edition of the NRCA manual.

6. Roof penetrations shall not compromise existing roof warranties. Installation requires may need to be modified to adhere to the roof warranty.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Roof penetrations shall not compromise existing roof warranties. Installation requires may need to be modified to adhere to the roof warranty.

END OF SECTION
SECTION 07 8400

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping materials.
B. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED SECTIONS

A. Section 27 0528 - Interior Pathways for Communications Systems.
B. Section 27 0553 - Identification for Communications Systems.

1.03 REFERENCES


1.04 DESIGN REQUIREMENTS

A. Johns Hopkins requires designers to reestablish the integrity of fire-rated walls, floors, ceilings, etc. when these barriers are either partially or fully penetrated by cables, conduit, and other penetrating elements. In many cases, fire stop penetration seals may be required to perform other safety or security functions (e.g. environmental protection seals).
B. All fire stopping associated with the structured cable system shall comply with all NFPA Life Safety Code #101, 6-2.3.6, "Penetrations and Miscellaneous Openings and Fire Barriers" and the NEC 300.21, "Fire Stopping" regulation and standards.
C. IMPORTANT: Firestopping at the Johns Hopkins Hospital is done by the owner. All conduits must be installed per JHH Standard Specification so the owner, not the contractor, can perform the firestopping.
D. All vertical penetrations consisting of conduit, sleeves, slots, or chases shall be fire stopped at the bottom of the penetration, or as specified by a UL-tested assembly by the manufacturer.
E. All horizontal penetrations consisting of conduit, sleeves, slots, etc. shall be fire stopped at both sides of the penetration, or as specified by a UL-tested assembly by the manufacturer.
F. Designers shall incorporate the use of STI EZ-Path products for all cable penetrations of 8 or more cables for new penetrations.
G. Individual cable penetrations into plenum air return areas not enclosed in conduit shall be firestopped.
H. Openings made in concrete floors shall be fire stopped using a tested system. Thickness or depth of fire stop materials shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.
I. Plenum air return ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrate and level of protection required.
J. The methods of fire stopping any roof penetrations shall be the same as those for floor and ceiling assemblies.

K. All metal conduits with or without wire/cable inside shall be firestopped.

L. Designers shall not specify a firestop system by UL reference, as installers will have to determine the appropriate system per manufacturer’s field guide. The designer shall specify the firestop manufacturer per this specification.

M. Any disturbance of an existing firestop system shall require the complete replacement of the firestop system per manufacturer’s specifications. Designers shall account for this requirement in determining pathways and cost estimates.

1.05 PROJECT CONDITIONS

A. Firestopping at the Johns Hopkins Hospital is done by the owner. All conduits must be installed per JHH Standard Specification so the owner, not the contractor, can perform the firestopping.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.07 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs which provide the specified fire ratings when tested in accordance with methods indicated.

B. Installer Qualifications: Company specializing in performing the work of this section and:

1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:

2. With minimum 3 years documented experience installing work of this type.

3. Able to show at least 5 satisfactorily completed projects of comparable size and type.

4. Licensed by authority having jurisdiction, when applicable.

5. Approved by firestopping manufacturer.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Comply with firestopping manufacturer’s recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING ASSEMBLIES

A. Firestopping: Any material meeting requirements.
1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating of 1/2 hour and that meets all other specified requirements.

2.02 MATERIALS

A. Any material types required by the manufacturer for the firestop conditions, such as sealants, mortar, compound, putty, sheets, sprays, intumescent wrap, collars, pillows, and forming material.

B. Any materials required for the proper installation of listed firestop assemblies, such as retaining collars, wire mesh, metal sheets, etc.

C. Manufacturers

1. Specified Technologies, Inc
   a. EZ-Path firestop assemblies
   b. SpecSeal Intumescent Composite Sheets
   c. SpecSeal firestop products

2. Nelson Firestop Products

3. Hilti USA

4. Other acceptable manufacturers offering equivalent products, pre-approved by Johns Hopkins

D. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

3.02 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings. The Contractor shall provide and install firestop material as specified by the current manufacturer field manual or by manufacturer-provided engineered solutions.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labelling per Section 27 0553. Labels shall be pre-printed and include 1) name of installer of firestopping material & company name, 2) UL System ID, 3) F and T ratings, 4) date of firestopping installation, 5) number and cable-type description of cables in pathway, if applicable, 6) Nelson/STI/Hilti detail number, and JH identifier. One location may have multiple labels (e.g. firestop around sleeve penetration and firestop within sleeve around cables).

D. Contractors shall provide and install STI EZ-Path products for all cable penetrations of 8 or more cables. Contractors may not split cable bundles to avoid this requirement.

E. Cable bundles planned to penetrate a fire-rated wall and entering the same space within 10 feet of each other shall be consolidated in to a single penetration, unless one or both penetrations are membrane penetrations (one side of the wall partition only).
F. All floor penetrations shall be firestopped. All hallway sleeves shall be firestopped. All conduits
einding at a hallway cable tray shall be firestopped. All wall penetrations by cable tray shall be
firestopped. Penetrations into and within the utility tunnels shall be firestopped. All other
penetrations determined by the AHJ as needing firestopping shall be firestopped.

G. The Contractor shall use only personnel certified by the manufacturer for installation of firestop
products. The Contractor shall submit the name(s) of certified firestop installers with copies of
documentation verifying the training with the bid documents. The Contractor shall, at their
expense, replace entirely any firestop system installed by an uncertified installer.

H. The Contractor shall contact a manufacturer to address configurations not in the field manual.
(Specified Technologies, 800-992-1180; Hilti USA, 800-879-8000; Nelson Firestop
800-331-7325) The Contractor shall provide written documentation for all engineered solutions
not found in the manufacturer’s field manual.

I. The Contractor shall correct any firestop systems determined to be incorrectly installed by JHU,
third-party inspectors, or the local AHJ as specified by the manufacturer.

J. The Contractor, at their expense, shall replace up to 6 fire stop locations removed by JHU for
installation inspection. The Contractor shall repair/replace any firestop material removed to
restore the integrity of the system (pliable firestop putty and mineral wool may be reused if
removed intact and if indistinguishable from new material).

K. All conduits at the entrance facility entering from the OSP may be firestopped. Conduits in
maintenance holes and handboxes do not need to be firestopped but shall be plugged by
previously described means.

L. Firestop material shall be installed per the manufacturer’s specifications.

M. Contractors shall use the appropriate firestop system given the nature of the penetration,
materials involved, and annular space.

N. Contractors shall completely remove and restore any firestop material disturbed by pulling new
cables through existing firestopped openings. Restoration shall be with new, unused material.
Mineral wool may be reused if removed intact without impacting the physical characteristics of
the material.

END OF SECTION
SECTION 08 7411

ELECTRICAL LOCKING CONTROL

PART 1    GENERAL

1.01 SECTION INCLUDES

A. Electric strikes.
B. Switches and actuators.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including installation instructions.

PART 2    PRODUCTS

2.01 MANUFACTURERS

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. General Requirements: Provide devices suitable for door type, lock type, frame type, dimensions and overall operation.
   1. Coordinate with doors, frames, and hardware specified in other sections.
   2. Provide all brackets, spacers, shims, lip extensions, strike boxes, and other accessory parts necessary to complete the installation.
   3. Power Supplies or Transformers: Provide all necessary components to supply power to devices from building power distribution system.
B. Electric Strikes for Fire-Rated Doors: ANSI/BHMA A156.5 Grade 1 and UL 1034 burglary resistant, fail-locked, mortise style for locks without dead bolts; HES Model 1006.
   1. Voltage: 24 V DC, continuous duty (silent).
   2. Face Plate Finish: Stainless steel.
C. Electric Strikes for Rim Exit Devices: Fail locked, ANSI/BHMA A156.5 Grade 1 and UL 1034 Grade 2; HES Model 7000.
   1. Voltage: 24 V DC, continuous duty (silent).
   2. Finish: As determined by Architect.
D. Fail-Locked Electric Strikes for Other Non-Fire-Rated Doors:
   1. Grade: ANSI/BHMA A156.5 Grade 1 and UL 1034 Grade 1; HES Model 1006 or others.
   2. Voltage: 24 V DC, continuous duty (silent).
   3. Face Plate Finish: As determined by Architect.
E. Keypads:
   1. Provided by Johns Hopkins Institutions
F. Entrance/Exit Pushbuttons: Mushroom style with wall plate.
   1. Entry: Blue cap and handicapped symbol.
   2. Exit: Red cap and word "Exit".
   4. Size to fit standard single-gang electrical box.

G. Emergency Release: 1-3/4 inch (44 mm) diameter mushroom button with red cap and key switch to reset and 20 gage, 0.037 inch (0.95 mm) stainless steel wall plate; RCI Model 920.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Do not begin installation until substrates have been properly prepared.
   B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Coordinate with installers of other door hardware.
   C. Adjust installed items to operate properly without interfering with operation of door and other hardware.
   D. Test for proper operation with building power energized; coordinate with startup procedures of other installers.

END OF SECTION
01 SECTION 09 6716
02 FLOOR COATINGS
03
04 PART 1 GENERAL
05 1.01 SECTION INCLUDES
06 A. Epoxy-based floor resurfacing system.
07 B. Compounds and accessories needed for a complete installation.
08 1.02 REFERENCES
10 B. MIL-D-3134 - Deck Covering Materials
11 C. See Section 01 4219 Reference Standards
12 1.03 SUBMITTALS
13 A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
14 B. Product Data: Manufacturer's data sheets on each product to be used, including:
15 1. Preparation instructions and recommendations.
16 2. Storage and handling requirements and recommendations.
17 3. Installation methods.
18 1.04 DELIVERY, STORAGE, AND HANDLING
19 A. Deliver materials to project site in clean, unopened factory-labeled containers.
20 B. Store materials in manufacturer's unopened packaging until ready for installation. Store in a dry, protected area, and maintain temperature of storage area between 60 and 90 degrees F (15 to 32 degrees C).
21 C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
22 1.05 PROJECT CONDITIONS
23 A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
24 1.06 WARRANTY
25 A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
26
27 PART 2 PRODUCTS
28 2.01 MANUFACTURERS
29 A. Acceptable Manufacturer:
30 1. Dur-A-Flex, Inc; 95 Goodwin Street, East Hartford, CT 06108. Tel: (860) 528-9838 or (800) 253-3539 (toll free). Fax 860-528-2802. e-mail info@dur-a-flex.com. Web site: www.dur-a-flex.com.
2.02 MATERIALS

A. Floor coating-
   1. Heavy duty epoxy
   2. VOC
      a. Low VOC - unoccupied within or adjacent to construction area
      b. Zero VOC - occupied within or adjacent to construction area
   3. Surface Finish: Standard Slip Resistant
   4. Cured thickness: 16+ Mil
   5. Hardness: 75-80 per ASTM D-2240
   6. Indentation: No chipping or cracking per MIL-D-3134
   7. Color: As selected by Architect from manufacturer's standard colors. Light tan or ivory, if not otherwise specified by the Architect.
   8. products:
      b. PolyMax PM-400 zero VOC, epoxy coating
      c. Primers and topcoats as required by the manufacturer

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that surface is dry and perfectly clean, free of all oil, grease, detergent, and other contaminants.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Thoroughly rout and vacuum clean moving cracks and joints; fill with manufacturer's recommended flexible filler material.

C. Repair non-moving surface deviations with manufacturer's recommended patching compound.

3.03 INSTALLATION

A. Install flooring system in strict accordance with manufacturer's instructions.

B. Mix components on site with manufacturer-supplied mix and measure apparatus to ensure timely, accurate mix ratios and to minimize waste.

C. Prime substrate with manufacturer's recommended primer, if required by the manufacturer, and proceed with installation of flooring system as instructed.
D. Apply flooring system in number of coats and to thickness recommended by manufacturer.
   Follow manufacturer's recommendations for multiple coats.

1. Key in all drains, edges, and transition points according to manufacturer's instructions.

E. Apply topcoat in number of coats recommended by manufacturer and allow to cure.

3.04 PROTECTION

A. Protect installed flooring until completion of project.

B. Touch-up, repair or replace damaged flooring system after Substantial Completion.

END OF SECTION
PART 1 GENERAL

1.01 DESIGN REQUIREMENTS

A. Raised floors may be installed. The use of raised floors is preferred to in-floor conduits.

B. Specify cable supports every two feet, when not continuous cable tray.

C. Specify the use of cable tray under raised floor panels. All cables shall be routed in cable tray or other support structured designed for use with raised floors.

D. In large computer rooms, raised floors should be used to routed power to computer equipment. Overhead cable tray provides a more manageable solution for the low voltage cabling.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product literature and materials list.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Johns Hopkins Institutions’s name and registered with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Netfloor, Inc.; Taiwan; www.net-floor.com; Represented by Multilink Broadband, 580 Ternes Ave - Elyria, Ohio 44035 - (440) 366-6966. www.multilinkbroadband.com- low height access flooring

B. Tate Access Floors Inc; 7510 Montevideo Rd.Jessup, MD 20794-9321; Tel: 800-231-7788. www.tateaccessfloors.com- medium and high height access flooring

C. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. All cables shall be installed in cable tray or other support structured installed for use with medium and high height raised floors.

END OF SECTION
PART 1 GENERAL

1.01 Purpose

A. This specification is intended to define the standards, criteria and assumptions to be used in the
design, documentation and specification of a network infrastructure to support the Johns
Hopkins enterprise. This specification shall form the basis for the design.

B. This specification is based on NFPA 70 (NEC), IEEE C2 (NESC), ANSI/TIA/EIA
Telecommunication Standards, and BICSI methodologies (TDMM and CO-OSP). The
requirements within those documents are not superseded by this document unless specifically
stated. As required, NEC and NESC code requirements cannot be superseded by this
document at any time. ANSI/TIA/EIA standards and BICSI methodologies may be superseded,
as specified, or may be made stricter by this document. Not all codes, standards, and
methodologies are specifically addressed by this document. The absence of a specific
reference to an element of these codes, standards, and methodologies does not relinquish
compliance with those elements.

C. Unauthorized deviations from this specification may require re-design, re-construction, or
re-installation of ISP/OSP elements at the Designers'/Contractors' expense. Designers and
Contractors shall get prior approval to deviate from this specification or from ANSI/TIA/EIA
standards and BICSI methodologies. Contractors cannot deviate from NEC and NESC
requirements.

D. "Codes" refer to the NFPA 70 (National Electrical Code) and IEEE C2 (National Electric Safety
Code). "Standards" refer to ANSI, ASTM, and UL standards. "Methodologies" refers to BISCI
manuals for telecommunications design and CO-OSP. "Specifications" refers to Johns Hopkins
documents for installations. This is stated for clarification and not as all-inclusive definitions.

E. Like standards and codes, this document uses the word "shall" to indicate mandatory
requirements and "may" or "should" to indicate optional components. Conflicts within this
document are to be resolved by JH Networking, Telecommunications, and/or Plant Operations
prior to application of the specification by a Contractor.

F. While the ANSI/TIA/EIA standards and BICSI methodologies may refer to "telecommunications
network", this specification will refer to Information Transport System as defined below.

1.02 SECTION INCLUDES

A. Section 27 0100 : Operation and Maintenance of Communications Systems.

B. Section 27 0500 : Common Work Results for Communications.

C. Section 27 0501 : Minor - Communications Demolition

D. Section 27 0526 : Grounding and Bonding for - Communications Systems

E. Section 27 0528 : Interior Pathways for - Communications Systems
   1. Section 27 0528.01 : Undercarpet Cables
   2. Section 27 0528.02 : Systems Furniture
   3. Section 27 0528.10 : Conduit
   4. Section 27 0528.11 : Surface Metallic Raceways
   5. Section 27 0528.12 : Surface Nonmetallic Raceways
7. Section 27 0528.14 : Cable Trays for - Communications
8. Section 27 0528.15 : Boxes
9. Section 27 0528.16 : Underfloor Ducts
10. Section 27 0528.29 : Hangers and Supports for - Communications
F. Section 27 0543 : Underground Ducts and Raceways for - Communications
G. Section 27 0553 : Identification for - Communications Systems

1.03 RELATED SECTIONS
A. Section 27 1000 : Structured Cabling.
   1. Section 27 1100 : Communications Equipment Room
   2. Section 27 1113 : Communications Entrance Protection
   3. Section 27 1116 : Communications Cabinets, Racks, Frames, and Enclosure
   4. Section 27 1119 : Communications Termination Blocks and Patch Panels
   5. Section 27 1123 : Communications Cable Management and Ladder Rack
   6. Section 27 1126 : Communications Rack Mount Power Protection and Power Strips
   7. Section 27 1313 : Communications Copper Backbone Cabling
      a. Section 27 1313.13 : Communications Copper Cable Splicing and Terminations
   8. Section 27 1323 : Communications Optical Fiber Backbone Cabling
      a. Section 27 1323.13 : Communications Optical Fiber Splicing and Terminations
   9. Section 27 1500 : Communications Horizontal Cabling
   10. Section 27 1513 : Communications Copper Horizontal Cabling
   11. Section 27 1523 : Communications Optical Fiber Horizontal Cabling
   12. Section 27 1533 : Communications Coaxial Horizontal Cabling
   13. Section 27 1543 : Communications Work Areas, Faceplates, and Connectors
   14. Section 27 1619 : Communications Station Cords, Patch Cords, and Cross Connect Wire
   15. Section 27 1800 : Communications Testing
B. Section 27 2000 : Data Communications.
   1. Section 27 2129 : Data - Communications Switches and Hubs
   2. Section 27 2133 : Data - Communications Wireless Access Points
C. Section 27 3000 : Voice Communications.
   1. Section 27 3213 : Telephone Sets
   2. Section 27 3223 : Elevator Telephones
   3. Section 27 3226 : Exterior Emergency Telephones

1.04 REFERENCES
A. ANSI/TIA/EIA standards referenced below may include multiple components which apply to JH projects. In all cases, the current versions or succeeding documents for the codes, standards, and methodologies listed above shall be used.

B. Should conflicts exist within the standards, then JH Networking, Telecommunications, and/or Plant Operations staff shall resolve the conflict.

C. See Section 01 4219: Reference Standards

1.05 DEFINITIONS

A. Cable Plant Infrastructure Elements

1. Information Transport System: Any copper cabling or optical fiber whose purpose is to move any type of information on the campus. This may include data, video, voice, fire alarm, security, access control, and other low-voltage networks. The Information Transport System is not limited to Johns Hopkins-owned cabling, but includes copper and optical fiber, and equipment owned by outside providers carrying Johns Hopkins information. Pathways are not limited by Johns Hopkins ownership, but include those owned by the City of Baltimore and other third parties. The Information Transport System may be referred to as “the network” within this document. Elements of the Information Transport System to be handled uniquely within the overall Information Transport System will be specifically addressed (e.g. fire alarm cabling). This term replaces telecommunication network in any code, standard, or methodology.

2. Inside Cable Plant: That part of the Information Transport System running within a building. This document does apply to Inside Cable Plant elements passing through any element of the outside cable plant pathway. It includes the workstation outlet assembly, cabling to the workstation from the network rooms, backbone cabling within a building, backbone cabling running between physically contiguous buildings that does not pass through Outside Cable Plant elements, network racks and hardware (routers, switches, hubs, firewalls, etc.), patch panels, any punch blocks not terminating cable from outside the building, fiber distribution panels not terminating optical fiber from outside the building, patch cords, and cross-connect cables/wires. The Inside Cable Plant will be referred to as “ISP” within this document. The ISP is managed by the Enterprise Network Architecture & Design and Telecommunication groups.

3. Outside Cable Plant: That part of the Information Transport System running between buildings, from a building to a definable exterior point, between definable exterior points, or from a non-Johns Hopkins building to a Johns Hopkins building or definable exterior point. It includes the termination hardware at both ends of the cable, including protection modules, telecommunication punch blocks, fiber distribution panels, interior splices for outside to inside optical fiber transition, and any other initial device into which an outside cable attaches. The Outside Cable Plant does not include backbone cable running between physically contiguous buildings unless the cabling enters and OSP pathway element (e.g. OSP conduits, maintenance holes, etc.). The Outside Cable Plant includes underground cabling and aerial cabling. The Outside Cable Plant may be referred to as “OSP” within this document and the phrase and abbreviation are used interchangeably. The OSP at Homewood is managed by Homewood Plant Operations.

B. Homewood Campus Controlling Interests.

2. Networking: Networking refers to the Enterprise Network Architecture & Design group of Information Technology @ JHU. This group manages the data network hardware/software. Networking sets installation standards for data cabling within buildings.

3. Telecommunications: Telecommunications refers to the Telecommunication group of Information Technology @ JHU. This group manages the voice network hardware/software. Telecommunications sets installation standards for voice cabling within buildings.

4. Other entities have controlling interest at other Johns Hopkins campuses and should be consulted prior to design and installation of cabling infrastructure.

C. Specific Elements.

1. cable: An assembly of one or more insulated conductors or optical fibers, within an enveloping sheath.

2. campus: Includes all buildings owned or leased by Johns Hopkins with a direct physical cable connection to the contiguous campus through Johns Hopkins-owned or leased conduits, including those pathways.

3. dead pairs: Unused copper pairs terminating within a splice case, but without being spliced to an outgoing cable.

4. grounding electrode: A conductor, usually a rod, pipe or plate (or group of conductors) in direct contact with the earth for the purpose of providing a low-impedance connection to the earth.

5. grounding electrode conductor: The conductor used to connect the grounding electrode to the equipment grounding conductor, or to the grounded conductor of the circuit at the service equipment, or at the source of a separately derived system.

6. handbox: A rectangular or square underground pathway element similar to a small maintenance hole, which cannot be fully entered, that allows for a pulling point or splice point in a pathway.

7. handhole: A round underground pathway element similar to a handbox, which cannot be fully entered, that allows for a pulling point in a pathway.

8. identifier: An item of information that links a specific element of the Information Transport System infrastructure with its corresponding record.

9. infrastructure (Information Transport System): A collection of those Information Transport System components, excluding equipment, that together provides the basic support for the distribution of all information within a building or campus.

10. linkage: A connection between a record and an identifier or between records.

11. maintenance holes: An underground pathway element large enough for a person to fully enter and work, used to provide access to underground cables to pull, splice, and maintain. Former known as a manhole.

12. media (Information Transport System): Wire, cable, or conductors used for the Information Transport System.

13. outlet box: A metallic or nonmetallic box used to hold Information Transport System outlets/connectors or transition devices.

14. outlet/connector (Information Transport System): A connecting device in the work area on which horizontal cable or outlet cable terminates.
15. pathway: A facility for the placement of Information Transport System cable.
17. report: A presentation of a collection of information from the various records.
18. space (Information Transport System): An area used for housing the installation and termination of Information Transport System equipment and cable, e.g., equipment rooms, network rooms, work areas, and maintenance holes/handboxes/handholes.
19. splice: A joining of conductors in a splice closure, meant to be permanent.
20. splice box: A box, located in a pathway run, intended to house a cable splice.
21. splice closure: A device used to protect a splice.
22. termination position: A discrete element of termination hardware where Information Transport System conductors are terminated.
23. work area (work station): A building space where the occupants interact with Information Transport System terminal equipment.

1.06 ACRONYMS AND ABBREVIATIONS

A. ACR : Attenuation-to-Crosstalk Ratio
B. ADA : Americans with Disabilities Act
C. AFF : Above finished floor
D. ANSI : American National Standards Institute
E. ASTM : American Society for Testing and Materials (ASTM International)
F. AWG : American Wire Gauge
G. BD : Building distributor (replacing main-cross connect and MDF as "building service" room identifiers)
I. BTU : British Thermal Unit
J. CATV : Community Antenna Television (cable television)
K. CD : Campus distributor (replacing main-cross connect and MDF as "campus-wide service" room identifiers)
L. dB : Decibel
M. EF : Entrance Facility
N. EIA : Electronic Industries Alliance
O. ELFEXT : Equal Level Far-End Crosstalk
P. EMC : Electromagnetic Compatibility
Q. EMI : Electromagnetic Interference
R. ER : Equipment Room
S. FCC : Federal Communications Commission
T. FD : Floor distributor (replacing network room, intermediate and horizontal cross-connect, and telecommunications as "building service" room identifiers)
U. FDDI : Fiber Distribution Data Interface
V. FEXT : Far-End Crosstalk
W. FOTP : Fiber Optic Test Procedure
X. Freq. : Frequency
Y. GE : Grounding equalizer (replacing TBBIBC)
Z. Gnd : Ground
AA. HB : Handbox
AB. HC : Horizontal Cross-Connect (replaced by floor distributor "FD")
AC. HH : Handhole
AD. HVAC : Heating, Ventilation, and Air Conditioning
AE. Hz : Hertz
AF. IC : Intermediate Cross-Connect (replaced by building distributor "BD")
AG. IDC : Insulation Displacement Connectors
AH. IDF : Intermediate Distribution Frame (replaced by "BD" or "FD")
AI. IEEE : Institute of Electrical and Electronics Engineers
AJ. ISO : International Organization for Standardization
AK. ISP : Inside Cable Plant
AM. JHU : Johns Hopkins University
AN. Mbps : Megabits per second
AO. MC : Main Cross-Connect (replaced by campus distributor "CD")
AP. MDF : Main Distribution Frame (replaced by "CD" or "BD")
AQ. MH : Maintenance Hole
AR. MHz : Megahertz
AS. NEC : National Electrical Code, NFPA 70
AU. NFPA : National Fire Protection Association
AV. NR : Network Room
AW. OSHA : Occupational Safety and Health Administration
AX. OSP : Outside Cable Plant
1.07 UNITS OF MEASURE

A. dB: Decibel
B. ft: Foot or feet
C. in: Inch(es)
D. nm: Nanometer

1.08 SYSTEM DESCRIPTION

A. This specification addresses network pathways, spaces, media, grounding, and identification requirements to support the network infrastructure.

B. Specific areas covered by this specification are:

1. Definition of the inter-building pathway and cabling requirements necessary to connect the project building(s) to the incoming service facilities as well as each other.

2. Definition of an intra-building pathway and space system to house the network cabling system and associated electronic transport equipment. This pathway and space system shall be designed to support the known and anticipated systems and cables that may be utilized within the spaces.

3. Definition of backbone cables and its distribution and termination methods.

4. Definition of horizontal distribution cables and work area outlet configuration. This definition will also include termination methods to be utilized.

5. Definition of patch cables and their requirements.

6. Definition of the network grounding infrastructure.

7. Definition of the administration and labeling system.
C. Cable Plant

1. Any exception to this specification must be approved by Plant Operations, Networking, and/or Telecommunications prior to installation. Any deviation from this specification must be approved by Plant Operations, Networking, and/or Telecommunications prior to installation. Any questions on interpretation shall be resolved by Plant Operations, Networking, and/or Telecommunications prior to installation.

2. Designers shall design an Information Transport System with approved cable/connectivity hardware and cables. The SCS shall be capable of providing a minimum 20-year written Manufacturer Performance Warranty.

3. Designers shall prepare all drawings and specifications to allow for competitive bids by two ITS manufacturers for inside cable plant. Specifications shall be written in such a way as to provide a Belden/CDT or Berk-Tek/Ortronics solution. A Contractor shall use a single manufacturer’s copper or fiber solution (cables and components) for any given installation. The Contractor shall determine which solution shall be bid based on costs and availability of the competing product lines.

4. In renovations areas, the designer may specify a single product line consistent with other products in the existing network rooms servicing the area.

1.09 DESIGN REQUIREMENTS

A. Major building renovations should include improvement to the building network infrastructure as detailed by the Information Network Infrastructure Master Plan for Outside Copper and Fiber Cable Plant Implementation Plan for the Homewood Campus. Improvements to entrance facilities are addressed by this plan. When needed to provide service to a renovated area, renovations to entrance facilities may be necessary prior to the planned renovation under the above plan.

B. In many buildings, OSP cable is placed in violation of current codes, standards, methodologies, and specifications. Renovations of a part of a building may require correcting these violations and may add substantially to the cabling portion of the renovation in cost and effort.

1.10 SUBMITTALS

A. See Section 01 3000: Administrative Requirements, for submittal procedures.

1.11 QUALITY ASSURANCE

A. The Contractor shall have extensive experience (3+ years) with the specified manufacturers’ hardware and cabling.

B. All installers shall have had experience with the specified manufacturers’ hardware and cabling. BICSI Installer Level I experience may be limited to class-based training using the manufacturers’ hardware and cabling.

C. All installers shall be BICSI registered installers. Seventy-five percent or more of installers shall be BICSI Installer Level II. Up to twenty-five percent of installers may be BICSI Installer Level I. Workers not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not have to be registered.

D. All team leads shall be BICSI registered Technicians. The Contractor shall provide statements in the bid documents of experience for all proposed team leads. The statements shall include industry-specific training and certifications (with dates verifying active status on registrations/certifications), project experience, experience with Category 6 and shielded cabling, and experience as a team lead. The Contractor may provide additional material.
E. Only installers trained and certified by the manufacturer shall be allowed to install copper products. Installers must possess the highest level of certification available by the manufacturer for the specific structured cable solution being installed.

F. Only installers trained and certified by the manufacturer shall be allowed to install firestop products. Firestopping at the Johns Hopkins Hospital is done by the owner.

G. Only installers trained and certified by the manufacturer shall be allowed to terminate and test optical fiber. Others specified above may pull/place optical fiber cable under the supervision of an installer trained and certified by the manufacturer.

H. The Contractor may provide proof of registration/certification of planned installers in bid documents. If not included in the bid documents, the Contractor shall provide a narrative on the levels of registration/certification of their installers within the bid documents. The Contractor shall provide proof of registration/certification for the final list of installers prior to the start of work.

I. Johns Hopkins reserves the right to reject any unregistered or uncertified installers performing work for which they are not registered/certified. The Contractor shall be responsible for any loss of work, delays in schedules, or extra costs as a result of the use of unregistered/uncertified workers. Additional effort on the part of the Contractor to maintain the installation schedule as a result of the above mentioned loss time shall be the Contractor’s responsibility and at the Contractor’s additional expense.

J. The Contractor shall provide to Johns Hopkins the above required documentation for any worker on this project brought in after the submittal of initial documentation on installers. Johns Hopkins shall periodically check installer identification and registrations/certifications during the installation.

1.12 PROJECT CONDITIONS

A. Worker safety at Johns Hopkins is controlled by the Johns Hopkins Office of Health, Safety & Environment (Safety Office). Safety officers have final authority over working conditions, required permits, and required equipment and its proper use. Contractors shall be responsible to coordinate their activities with the Safety Office.

B. Johns Hopkins shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors. Delays enforced by the Safety Office caused by unforeseen environmental conditions in the work area may be out of Contractors’ control. Contractors shall contact the Johns Hopkins primary project manager immediately if delays are incurred for safety reasons.

C. Johns Hopkins facilities are health care, administrative, research, and educational facilities. As such, activities in all buildings are critical to the objectives of Johns Hopkins, its administration, faculty, staff, and student body. These objectives shall not be interrupted by the Contractor’s work activities. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. Unusually circumstances (e.g. voice cutovers) can occur and shall be declared and scheduled with as much notice as possible. Service disruptions, if needed, shall be at JH’s convenience and schedule.

D. Access within student housing is restricted to the immediate work areas. Contractors shall not enter other areas of the building without JHU escort, including hallways, loading dock areas, or other common areas. The Contractor shall coordinate access to work areas in which students reside with JHU and its housing office. Designers and Contractors may be required to have additional Contractor supervision and/or JHU supervision when working in student residences. Work in residential buildings that produces noise likely to be heard beyond the work area shall not take place prior to 8 AM. During exam periods, noise likely to be heard beyond the work area shall not be permitted.
E. Access within the medical campus is restricted. Contractors and designers shall coordinate all activities within health care areas with Johns Hopkins. Designers and Contractors may be required to have additional supervision and/or JHU supervision when working in health care residences. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. All Contractors shall be prepared at all times to conduct emergency repairs to the cable plant in case of accidental disruption of the cable plant.

F. Asbestos

1. IMPORTANT NOTICE: Many areas at the Homewood campus have asbestos present. This includes tiles, floor adhesive, pipe insulation, sprayed-on fire-proofing, and other sources. Designers and Contractors SHALL NOT assume an area is free from hazard. Designers and Contractors SHALL NOT move ceiling tiles unless the area has been confirmed to be free of asbestos above drop ceilings by JHU Safety officers. Significant costs are associated with working around existing asbestos and must be anticipated either in the form of abatement costs or in alternate routing to avoid contamination.

G. Lead Cables/Splices

1. IMPORTANT NOTICE: Older voice backbone cables may be lead-encased. Splice cases may be coated in lead. The Contractor shall adhere to all federal, state, district, and local requirements for the handling of lead. Demolition of lead cables and splice cases shall produce hazardous lead waste that must be handled by the Contractor.

H. IMPORTANT NOTICE: Contractors must adhere to confined space requirements at the Homewood campus. All Contractors found to be in violation of confined space procedures will be ordered to stop all work until proper procedure can be followed. In addition, Johns Hopkins University may restrict contractors in violation of confined space procedures from all future work involving confined space.

I. Security at Johns Hopkins is controlled by the Johns Hopkins Security Department (Security). Security officers have final authority over access and security at work areas.

J. Contractors may require parking spaces to be cordoned off in advance of work to access maintenance holes, handholes, handboxes, utility poles and/or underground spaces and pathways. Contractors shall contact the Parking Office or Security to arrange for this.

K. Contractors shall provide traffic control, signage, etc. as needed to maintain a safe working environment. All work area access, road closures, parking space closures, and work outside of normal Johns Hopkins operating hours and days shall be coordinated by Contractors as far in advance as possible with Johns Hopkins Security Department at 410-516-4600. Johns Hopkins Security shall determine if closures of roads or spaces are possible at proposed dates and times. Work at any location may be restricted by day or time, depending on the location of the area, the need for road closures/traffic control, and/or concurrent events in the area or on campus. Contractors should contact Security well in advance to determine scheduling of access to work areas.

L. Work outside of normal Johns Hopkins operating hours and days shall be coordinated with Johns Hopkins Security Department at 410-516-4600.

M. Johns Hopkins Security Department emergency line is 410-516-7777 or 6-7777 from any Homewood campus telephone. Emergency calls should be placed through the Security Department for 911 response. Security escorts City emergency vehicles through the Homewood campus.
N. Emergency procedures are detailed in the appendix for confined space emergencies. When speaking with Security or a 911 operator from a cellular telephone, inform the dispatcher that a confined space emergency exists and request Rescue Company 1 be dispatched.

1.13 WARRANTY

A. The Contractor shall adhere to the warranty requirement for all installations.

B. The Contractor shall install all copper components of the installed manufacturer's system-wide solution to the specifications and requirements needed to extend the longest and most extensive performance warranty available under the installed solution(s). Data cabling shall adhere to the warranty requirements of the Belden/CDT IBDN System 4800LX (superior Category 6), Belden/CDT IBDN System 2400 (standard Category 6), Berk-Tek/Ortronics NetClearGT3 (superior Category 6), or Berk-Tek/Ortronics NetClearGT2 (standard Category 6). Voice cabling shall adhere to the warranty requirements of the Belden/CDT IBDN System 1200 (Category 5e), or Berk-Tek/Ortronics NetClearGT (Category 5e). Universal cabling shall adhere to the above data cabling requirements.

C. The Contractor shall install all undercarpet components of the installed manufacturer's system-wide solution to the specifications and requirements needed to extend the longest and most extensive performance warranty available under the installed solution(s). For undercarpet installations, the contractor shall be an AMP NETCONNECT authorized NETCONNECT Design & Installation (ND&I) contractor.

D. The Contractor shall install all fiber components of the installed manufacturer's system-wide solution (25 year Sumitomo Premium Warranty for air-blown fiber, 25 year Corning LANscape Extended Warranty, 25 year Belden IBDN or Berk-Tek/Ortronics NetClear Product Warranty) to the specifications and requirements needed to extend the longest and most extensive performance warranty available under the installed solution(s). The Contractor shall coordinate the Premium warranty for the OSP air-blown channel noting the use of Corning connectors and housings as part of the fiber channel.

E. Johns Hopkins University has arranged for Sumitomo Electric Lightwave to carry a 25-year Sumitomo warranty on air-blown fiber systems using Corning connectors and housings.

F. The Contractor shall submit in the bid documents any additional, contractor-specific warranties or guarantees to be offered on the project.

G. The Contractor shall provide any and all necessary documentation needed to implement this warranty and to verify the solution installation.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 27 0100

OPERATION AND MAINTENANCE OF COMMUNICATIONS SYSTEMS

PART 1  GENERAL

1.01 RELATED SECTIONS

A. Section 27 0000 : Operation and Maintenance of Communications Systems.
B. Section 27 1000 : Structured Cabling.
C. Section 27 2000 : Data Communications.
D. Section 27 3000 : Voice Communications.
E. Section 27 4000 : Audio-Video Communications.
F. Section 27 5000 : Distributed Communications and Monitoring Systems.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 SYSTEM DESCRIPTION

A. Data Communications.
B. Voice Communications
C. Audio-Visual Communications.
D. CCTV Communications.

PART 2  PRODUCTS

UNDER DEVELOPMENT

PART 3  EXECUTION

UNDER DEVELOPMENT

END OF SECTION
SECTION 27 0500

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section 27 0501 - Minor Communications Demolition
B. Section 27 0526 - Grounding and Bonding for Communication Services.
C. Section 27 0528 - Pathways for Communications Systems.
D. Section 27 0528.01 - Undercarpet Cables
E. Section 27 0528.02 - Systems Furniture
F. Section 27 0528.10 - Conduit
G. Section 27 0528.11 - Surface Metallic Raceways
H. Section 27 0528.12 - Surface Nonmetallic Raceways
I. Section 27 0528.13 - Communication Systems Furniture Poles
J. Section 27 0528.14 - Cable Trays for - Communications
K. Section 27 0528.15 - Boxes
L. Section 27 0528.16 - Underfloor Ducts
M. Section 27 0528.29 - Hangers and Supports for - Communications

1.02 RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.

1.03 DEFINITIONS

A. See Section 27 0000 - Communications General.

1.04 QUALITY ASSURANCE

A. The Contractor shall have an existing quality assurance and/or quality control program within the company. Inspectors shall be at an engineering or management level. Inspectors shall not have installation responsibilities on the job beyond providing quality control and/or quality assurance of the installation.
B. The Contractor shall submit a quality assurance and quality control plan for the installation.
C. The Contractor shall provide statements of experience in the bid documents for all proposed QA/QC inspectors. The statements shall include QA/QC-specific and industry-specific training, registrations, certifications, project experience as an installer, and project experience as a QA/QC inspector.
D. The Contractor shall provide an inspector for firestop product installation. This may be the same inspector as above, if trained in firestop products, their application, and their inspection. The Contractor may provide third-party inspection by qualified inspectors, approved by the firestop product manufacturer. IMPORTANT NOTICE: Firestopping at the Johns Hopkins Hospital is done by the owner.

E. The Contractor shall notify Johns Hopkins when QA/QC inspectors are on-site. Johns Hopkins reserves the right to require attendance at inspections, scheduled or otherwise.

F. Johns Hopkins reserves the right to independently provide QA, but not QC, at Johns Hopkins expense. Issues of quality assurance discovered by Johns Hopkins or its inspectors shall be remediated by the Contractor to the satisfaction of Johns Hopkins within the specifications of this RFQ.

1.05 Project Management

A. The Contractor shall provide management-level project management.

B. The Contractor shall submit a project management plan for the installation. Included in this plan shall be a statement on the underlying support structure for project managers within the Contractor's company.

C. The Contractor shall provide a statement of experience in the bid documents for the proposed project manager. The statement shall include PM-specific and industry-specific training, registrations, certifications, project experience as a PM. The Contractor may provide additional documentation on any added support resources available to the PM within the Contractor's company.

D. The Contractor shall attend progress meetings (weekly, or less often) as required by Johns Hopkins leading up to and during the installation. The Contractor Project Manager shall be in attendance. On rare occasion, a team lead or other supporting engineer may attend in the Contractor Project Manager's place, if pre-approved 24 hours in advance by Johns Hopkins. Emergencies and unforeseen events shall be approved on shorter notice, as determined by Johns Hopkins.

E. The Contractor shall provide written weekly update reports to Johns Hopkins during installation through to completion.

1.06 PROJECT CONDITIONS

A. See Section 27 0000 - Communications General

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

NOT APPLICABLE

END OF SECTION
SECTION 27 0501

MINOR COMMUNICATIONS DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Minor communications demolition.

1.02 RELATED SECTIONS

A. Section 01 7000 - Execution and Closeout Requirements: Additional requirements for alterations work.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Coordinate utility service outages with Johns Hopkins University.

B. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Telecommunications at least 48 hours before partially or completely disabling system.

C. Existing Data Network System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Networking at least 48 hours before partially or completely disabling system.

3.03 DEMOLITION AND EXTENSION OF EXISTING SYSTEMS

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.
F. Dispose of all hazardous material in accordance with federal, state/district, and local requirements.

END OF SECTION
SECTION 27 0526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 33 8243: Grounding and Bonding for Communications Distribution for outside cable plant grounding and bonding.

1.02 REFERENCES

B. Soares Book on Grounding, 2002
C. See Section 01 4219 - Reference Standards

1.03 DEFINITIONS

A. See Section 27 0000: Communications General.

1.04 DESIGN REQUIREMENTS

A. Historically, proper protection, grounding, and bonding has not taken place at Johns Hopkins campuses. Any design of new cable to a building shall trigger upgrades to all cable plant elements in the area to address any violations to current codes. This may include the design of lightning protectors, grounding busbars, and bonding backbones.

B. Establishing a suitable network ground is critical in grounding network equipment. A network ground is always required. Refer to ANSI-J-STD-607-A standard.

C. The telecommunications grounding system shall have a single point of attachment at the main electrical grounding electrode conductor. Other attachments to the system are made (to electrical service panels, cold water pipes, etc.), but these only serve as supplemental connections and shall be considered primary connections.

D. Without electrical service, specify a driven ground rod which is a minimum of ½” in diameter and 8 ft long. (Refer to NEC section 800-40.)

E. All grounding and bonding systems shall be carefully reviewed and pre-approved by Homewood Plant Operations. Any design may need to be enhanced for additional capacity beyond the scope of a current project to address the overall building needs.

F. Busbars

1. The designer shall specify a TMGB at the entrance facility or the main electrical room. The designer shall specify a TGB for all other network rooms.

2. The TMGB shall be bonded to an appropriately sized Bonding Conductor for Telecommunications (BCT) and TBB with two-hole lugs or exothermic welds. Exothermic welds are preferred for these bonds.

3. Specify a TMGB with insulated mounting brackets.

4. Specify a TGB with insulated mounting brackets.

5. Do not connect the BCT to the grounding electrode conductor or to the electrical service ground. Design for adequate slack in a coil at the electrical service or at the grounding electrode for Johns Hopkins electricians to make the connection. On new construction, the electrical contractor may make this connection.
6. Specify a rack-mount grounding busbar in each rack.

7. Specify a rack-mount busbar on the back of the rack, just below the fiber housing, or at a similar height for racks without housings.

8. Specify the position of the TMGB/TGB such that it is protected from physical damage from moving equipment, foot traffic, floor cleaning, etc.

9. Chatsworth busbars are undersized by industry standards. They are included in this specification for comparative bid purposes only. Use of Chatsworth busbars must be pre-approved by Johns Hopkins for a specific application.

G. Conductors

1. The Designer shall size the BCT and TBB according to the Telecommunication Bonding Backbone Sizing Chart below. The TBB and BCT shall be the same size cable.

2. The designer shall size and specify the TBB as a continuous cable from the TMGB to the farthest network room. The designer shall specify the use of pigtails to connect TGBs to the TBB. Pigtails shall attach to the TBB with irreversible compression connector (H-tap) or exothermic weld. The Designer will specify that the TBB is not to be cut, with both ends bonded directly to the busbar. The end of the TBB farthest from the TMGB may be bonded directly to the TGB.

3. Network bonding relies on short direct paths that have minimum resistive and inductive impedance. Designers shall specify the following:
   a. Bonding conductors shall be routed with minimum bends or changes in direction.
   b. Bonding connections shall be made directly to the points being bonded.
   c. Unnecessary connections or splices in bonding conductors shall be avoided, but when necessary, use an approved connection and position it in an accessible location.

4. Busbars may be bonded to structural steel as a telecommunications bonding backbone. Steel within buildings is not necessarily structural steel and, therefore, properly bonded to the building ground. Impedance testing shall be required to confirm potential steel within entrance facilities and network rooms as being properly grounded and available for use as a grounding conductor.

5. Structural steel used as lightning down-conductors shall not be used as a TBB.

6. Where possible, design a conductor from the EF busbar to structural steel within the same room or one within close proximity. Bonds to structural steel shall be exothermic welds. Vertical structural steel used as lightning down-conductors shall not be bonded to the telecommunications bonding system. In this instance, other structural steel (e.g. horizontal members) shall be bonded to the EF busbar.

7. Specify a conductor from any busbar to any electrical service panel within the room. Do not connect the conductor to the panel, rather provide adequate slack in a small coil.

8. Specify a conductor from the any busbar to any metallic cold water pipes within the room.

9. The Designer shall specify grounding equalizer as required by BICSI methodologies for multiple TBBs.

H. Bonding

1. The Designer shall specify bonding all telecommunications busbars to any electrical service panel, structural steel, and cold water pipes within the network room or entrance facility.
2. IMPORTANT - The Designer shall explicitly warn installers not to bond to gas piping and to confirm all potential cold water pipes.

3. Specify all necessary grounding hardware to properly ground the equipment in the network room per codes, standards, methodologies, and specifications.

4. Self-tapping screws, or any other type of screw, shall not be specified to form bonds or attach grounding hardware. All specified bonds shall be irreversible compression connectors, exothermic welds, or bolts.

5. Specify the bonding the EF busbar to an appropriately sized TBB with a two-hole lug or an exothermic weld.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each system component specified in this section.

1.06 PROJECT CONDITIONS

A. Contractors shall not attach grounding conductors from the telecommunications busbar or protectors to the main electrical building grounding busbar, grounding electrode conductor, or any element of the main electrical service distribution panel. Contractors shall provide the conductor and connector in a position to allow a Johns Hopkins electrician to make the final connection of an Information Transport System grounding system to the electrical grounding system.

B. Contractors shall not make modifications to the telecommunications grounding system without notifying Plant Operations, Networking, and Telecommunications in advance.

C. Contractors shall not attach grounding conductors to aerial (utility pole) grounding systems. Contractors shall notify the appropriate utility (or Plant Operations for Johns Hopkins poles with an existing grounding system) to make the connection, unless otherwise instructed by the utility company. Contractors installing aerial grounding systems for a Johns Hopkins pole without an existing grounding system shall provide all connections at the pole and shall notify Plant Operations of any other ungrounded cables in need of remedial grounding.

D. Protectors and grounding and bonding hardware shall be of manufacturers specified by this document.

E. All grounding conductors shall be sized such that if the maximum current possible for the electrical grounding electrode conductor passes through the telecommunications grounding system, the voltage drop over the grounding conductors shall not exceed 40 volts. Contractors shall provide the sizing calculations based on the grounding electrode conductor to Johns Hopkins or shall request these calculations from Johns Hopkins.

PART 2 PRODUCTS

2.01 MATERIALS

A. Busbars

1. Manufacturers

   a. Harger BICSI pattern TMGB kit (#TGBI14420TMGBKT), or individual component.

   b. Harger BICSI pattern TGB kit (#TGBI14220TGBKT), or individual components.
PART 3  EXECUTION

3.01 INSTALLATION

A. Entrance Facility Installations.

1. Contractors shall position the TMGB such that it is protected from physical damage from moving equipment, foot traffic, floor cleaning, etc.

2. Contractors shall install the TMGB with stand-off insulators.

3. If building TMGB is located in another room, the Contractor shall install a TGB with stand-off insulators.

4. The TMGB shall be bonded to an appropriately sized grounding conductor with a two-hole lug or an exothermic weld. An exothermic weld is preferred for this bond.

5. Contractors shall not connect the TMGB to the grounding electrode conductor or to the electrical service ground. Contractors shall leave adequate slack in a coil at the electrical service or at the grounding electrode for Johns Hopkins electricians to make the connection.

6. Contractors shall bond the entrance facility busbar to an appropriately sized TBB with a two-hole lug or an exothermic weld. TBB sizing is specified under the section on ISP.
7. Where possible, Contractors shall install a conductor from the entrance facility busbar to structural steel within the same room or one within close proximity. Bonds to structural steel shall be exothermic welds.

8. Contractors shall install a conductor from the entrance facility busbar to any electrical service panel within the room. Contractors shall not connect the conductor to the panel, but shall provide adequate slack in a small coil.

9. Contractors shall install a conductor from the entrance facility busbar to any metallic cold water pipes within the room.

B. Network Room Installations

1. The Contractor shall install a grounding busbar in each rack. The Contractor shall install the busbar on the back of the rack, just below the fiber housing, or at a similar height for racks without housings.

2. The Contractor shall prepare all painted or non-conductive surfaces as necessary to achieve a sufficient bond. Star washers may be used to penetrate painted surfaces, if a sufficient bond can be achieved.

3. The Contractor shall provide and install all necessary grounding hardware to properly ground the equipment in the network room per codes, standards, methodologies, and specifications listed in this document. Self-tapping screws, or any other type of screws, shall not be used to form bonds or attach grounding hardware.

4. Within each network room, the Contractor shall provide and install an insulated (green), stranded #6 copper ground wire from a network room busbar to each of any:
   a. Racks
   b. Ladder rack
   c. BETs
   d. Electrical service panels- The Contractor shall provide and install two-lug connectors or exothermic bonds to the busbar and shall provide small service loops at the electrical service panels. The connection to any panel shall be made by others.
   e. Metallic, cold water pipes- The Contractor shall verify the identification of the water pipe with JHU prior to bonding to it. The Contractor shall provide and install two-lug connectors or exothermic bonds to the busbar and shall provide and install appropriate grounding connectors for the water pipes, if present.

5. The Contractor shall not bend the grounding conductor wires into tight angles. Changes in direction shall be of the highest radius possible.

C. Large Telecommunications Enclosures Installations

1. The Contractor shall install a grounding busbar in any enclosure housing networking or other active equipment. The Contractor may install the busbar at any accessible and reasonable location. The busbar may be a rack-mount busbar attached to rails or a backboard.

2. The Contractor shall prepare all painted or non-conductive surfaces as necessary to achieve a sufficient bond. Star washers may be used to penetrate painted surfaces, if a sufficient bond can be achieved.
3. The Contractor shall provide and install all necessary grounding hardware to properly ground the equipment in the network room per codes, standards, methodologies, and specifications listed in this document. Self-tapping screws, or any other type of screws, shall not be used to form bonds or attach grounding hardware.

4. The Contractor shall connect the enclosure to a TBB with no more than 30 feet of insulated (green), stranded #6 copper ground wire.

5. The Contractor shall not bend the grounding conductor wires into tight angles. Changes in direction shall be of the highest radius possible.

D. Testing

1. The Contractor shall test the impedance of all bonds of the grounding system, including cable armor bonding to ground. The impedance of a two-point bonding test across any bond shall not exceed 0.1 ohm. The Contractor shall remediate any bond(s) over this limit or which contribute to a total impedance exceeding 0.1 ohm from any point in the network room to the busbar in that room.

2. All bonds installed by the contractor shall be tested for impedance with an earth ground resistance test in its two-point setup, such as a LEM Handy GEO tester. Place a QA label (with date and inspector) in proximity to each bond tested.

3. Test all grounding conductors, once installed, for current. Measure AC and bi-directional DC current. Report any AC current over 1 Amp. Report any DC current, in either direction, over 500 milliamps.
SECTION 27 0528
INTERIOR PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section 27 0528.01 - Undercarpet Cables
B. Section 27 0528.02 - Systems Furniture
C. Section 27 0528.10 - Conduit
D. Section 27 0528.11 - Surface Metallic Raceways
E. Section 27 0528.12 - Surface Nonmetallic Raceways
F. Section 27 0528.13 - Communication Systems Furniture Poles
G. Section 27 0528.14 - Cable Trays for Communications
H. Section 27 0528.15 - Boxes
I. Section 27 0528.16 - Underfloor Ducts
J. Section 27 0528.29 - Hangers and Supports for - Communications

1.02 REFERENCES

A. See Section 01 4219 - Reference Standards

1.03 DESIGN REQUIREMENTS

A. Communications cabling shall be pulled through a combination of open space, conduits and cable trays. These conduits and cable trays shall be used to route cabling between the building Network rooms and to each work area location. The pathway shall be designed to provide the capacity to properly install high performance UTP and Fiber Optic cabling for present and future use.

B. In most cases, cabling shall be installed within building provided conduit and cable tray. In instances where conduit or cable tray is not used, it is imperative that all new cable installed be appropriately supported so that no cable rests directly on ceiling tile, mechanical ductwork, or other structures. Cables shall be neatly routed and bundled above the drop ceilings in bundles containing fifty (50) cables or less, and be properly supported to minimize pair distortion. The use of cable tray is most appropriate. High performance sling-type supports may be used for adds/moves/changes or low cable count pathways. High performance J-hook supports may be used for 8 or fewer cables.

C. The support wire and rods for the suspended ceilings shall not be used for cabling support. Cables shall not be laid directly on ceiling tiles or rails. Cables placed in hangers in the ceiling area shall be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler system or plumbing piping, motors or any other electrical devices. The cable shall not be run in parallel with any high voltage electrical wiring. The maximum separation between support points for all cabling shall be five (5) feet.

D. All cable pathway material elements shall be certified by the manufacturer for a high performance twisted pair installation, when applicable. In all cases, support products shall be approved for the support of Category 6 or higher cables, including optical fiber.
E. When existing sleeves or shafts between floors are not adequate, design for a core and sleeve. Specify sealing the new holes as required.

F. Specify a nylon pull string in all cable trays, conduits, innerducts, raceways, and sleeves. Secure the pull string in neat and professional manner within outlet boxes and raceways, or tie loosely to a cable bundle exiting a sleeve.

G. Specify the necessary hardware to ensure the minimal bend radius as cables enter/exit conduits, sleeves, and cable trays. Specify bushings for all stub-out conduits, sleeves, etc. as necessary. Sharp edges and points are to be avoided on all pathway elements, including “all-thread” support rods.

H. Electrical non-metallic tubing (innerduct or “Smurf tube”) and flexible metallic tubing shall not be used within the horizontal cable system.

1.04 PROJECT CONDITIONS

A. Johns Hopkins facilities are health care, administrative, research, and educational facilities. As such, activities in all buildings are critical to the objectives of Johns Hopkins, its administration, faculty, staff, and student body. These objectives shall not be interrupted by the Contractor’s work activities. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. Unusually circumstances (e.g. voice cutovers) can occur and shall be declared and scheduled with as much notice as possible. Service disruptions, if needed, shall be at JH’s convenience and schedule.

B. Access within student housing is restricted to the immediate work areas. Contractors shall not enter other areas of the building without JHU escort, including hallways, loading dock areas, or other common areas. The Contractor shall coordinate access to work areas in which students reside with JHU and its housing office. Designers and Contractors may be required to have additional Contractor supervision and/or JHU supervision when working in student residences. Work in residential buildings that produces noise likely to be heard beyond the work area shall not take place prior to 8 AM.

C. Access within the medical campus is likewise restricted. Contractors and designers shall coordinate all activities within health care areas with Johns Hopkins. Designers and Contractors may be required to have additional supervision and/or JHU supervision when working in health care residences. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. All Contractors shall be prepared at all times to conduct emergency repairs to the cable plant in case of accidental disruption of the cable plant.

D. Many areas at JH campuses have asbestos present. This includes tiles, floor adhesive, pipe insulation, sprayed-on fire-proofing, and other sources. Designers and Contractor SHALL NOT assume an area is free from hazard. Designers and Contractors SHALL NOT move ceiling tiles unless the area has been confirmed to be free of asbestos above drop ceilings by JHU Safety officers. Significant costs are associated with working around existing asbestos and must be anticipated either in the form of abatement costs or in alternate routing to avoid contamination.

E. IMPORTANT: Johns Hopkins Hospital has more stringent requirements for work inspections, service outages, and work coordination. Contractors must closely coordinate work with Johns Hopkins Hospital representatives to ensure compliance with JHH Standard Specifications, Infection Control, and Commissioning and Inspection Procedure, and Coordinated Life Safety Assurance Program (CLASP).

PART 2 PRODUCTS

See individual sub-sections
3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions to ensure a manufacturer certified solution.

B. Cable pathways shall include: surface-mounted conduits, sleeves/conduits from hallways to laboratory and office spaces, cable trays in hallways and pedestrian tunnel, double gang boxes within walls, raceways above laboratory counters, and raceways suspended from laboratory ceilings.

C. The Contractor shall leave a nylon pull string in all cable trays, conduits, raceways, and sleeves upon completion of the work. The Contractor shall secure the pull string in neat and professional manner within the outlet box or raceway or tied very loosely to a cable bundle exiting a sleeve.

D. The Contractor shall confirm locations of supports and cable pathways above concealed ceilings with Johns Hopkins during installation to minimize conflicts with other building systems in the ceiling spaces.

E. The Contractor shall install necessary hardware to ensure the minimal bend radius as cables enter/exit conduits, sleeves, and cable trays.

F. The Contractor may need to coordinate exact placement of pathway elements with other trades.

G. The Contractor shall maintain the bend radii for optical fiber cables and copper cables when transitioning to/from cable support system.

H. Install minimum of 6 inches away from any light fixture or other source of electromagnetic interference (EMI).
SECTION 27 0528.01

UNDERCARPET CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flat conductor data cable.
B. Flat conductor cable fittings, connectors, outlets.

1.02 REFERENCES

D. See Section 01 4219 Reference Standards

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Undercarpet cable is to be used only as a last resort. Poke-thrus and communication systems furniture poles should be considered before designing an undercarpet system.
B. Undercarpet cable shall be designed per manufacturer's recommendation. Special attention shall be given to cable placement with respect to undercarpet electrical cables, if used, and to primary traffic patterns. See manufacturer's Undercarpet Cabling System Layout and Planning Manual.
C. The use of undercarpet cable will necessitate the installation of AMP network room hardware not normally allowed. Specify the inclusion of AMP patch panels and 110-style blocks, as necessary to provide a complete permanent link solution for the undercarpet cable.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for each component.
C. Shop Drawings: Indicate layout of cabling, including identification of cable types, components, and circuits.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
**1.07 WARRANTY**

A. The Contractor shall install all undercarpet components of the installed manufacturer’s system-wide solution to the specifications and requirements needed to extend the longest and most extensive performance warranty available under the installed solution(s). For undercarpet installations, the contractor shall be an AMP NETCONNECT authorized NETCONNECT Design & Installation (ND&I) contractor.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. AMP Netconnect/Tyco Electronic Corporation; Product Undercarpet Cable, Category 5e: www.ampnetconnect.com.

**2.02 VOICE AND DATA CABLE AND FITTINGS**

A. Data Cable: Undercarpet Cable, Category 5e.

B. Transition Box: Recessed or surface, wall-mounted type.

C. Provide manufacturer’s standard transition connectors and fittings, tap and splice connectors, crimping tools, and adhesive.

D. Fittings: Smooth plastic.

1. Data Cable Outlet Fitting: Low profile.

E. Network room hardware

1. Patch panels

2. 110-style termination blocks

3. Other hardware as required to provide a 25-Year System Warranty.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that floor surfaces are properly prepared according to flat conductor cable manufacturer's recommendations.

C. Do not install flat conductor cable in an area until construction traffic has been restricted from it and floor surfaces are ready for carpet tile installation.

**3.02 INSTALLATION**

A. Use manufacturer’s standard cutting and notching tools.

B. Install cable and connectors. Coordinate configuration and arrangement with installed systems.

**3.03 FIELD QUALITY CONTROL**

A. Perform field inspection in accordance with Section 01 4000.

B. Inspect and test flat conductor cable for continuity and short circuits before installing carpet tile.

C. Inspect and test in accordance with NETA STD ATS, except Section 4.

**3.04 PROTECTION OF FINISHED WORK**

A. Do not permit traffic over flat conductor cable before carpet tile is installed over it. Provide
appropriate barriers and covers.

END OF SECTION
SECTION 27 0528.02
SYSTEMS FURNITURE

PART 1 GENERAL

1.01 REFERENCES
B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
A. See Section 27 0000: Communications General.

1.03 DESIGN REQUIREMENTS
A. COMMUNICATIONS CABLING
1. Communication cables in modular furniture must be routed in internal pathways dedicated to communication cables. Modular furniture communication pathways shall not have power cabling or flexible metallic conduit containing power cabling.
2. Design all modular furniture pathways to support a maximum of 50% cable fill. Designers shall consider this value at the tightest point in the pathway. The Designer shall consider the projection of modular outlets into the raceway space and their impact on the overall raceway cross-section.
3. Designers shall specify flush work area outlet adapters. Surface-mount boxes are not to be used on modular furniture.
4. Openings in modular furniture for modular cords from MUTOAs shall be free from sharp edges that may damage modular cords.
5. Modular furniture may be cabled from consolidation points or MUTOAs. Modular furniture may be cabled directly from network rooms. Where the installation of modular furniture is intended to be a long-range installation, the designer should cable all work areas directly to the network rooms.
6. Surface-mount raceways installed beneath the work surface may be used.

B. POWER
1. Power cables within modular furniture panels shall be bound or twisted together by a qualified electrician, if the wires do not share a common jacket. Separate hot and neutral wires within modular furniture panels are a common source of high electromagnetic interference. Constant contact between the hot and neutral conductor insulation eliminates this problem.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Contractors shall not install network cabling in the same pathway as power cabling, even if the power cabling is in flexible metallic conduit.
C. Contractors shall not exceed 50% cable fill. The Contractor shall consider cable routing from attached modular panels when calculating cable fill.
D. The Contractor shall install work area outlet into flush adapters. Full size single- or double-gang boxes with faceplates are not to be used on modular furniture. Surface-mount boxes with side outlet locations may be used if flush bezels cannot be used.

E. Contractors shall install bezels or bushings, as needed, to eliminate edges that may damage modular cords.

F. Surface-mount raceway and boxes shall be attached to fabric panels or other vertical partitions in such a way as to prevent detachment. Adhesive tape shall not be used.

END OF SECTION
SECTION 27 0528.10

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.02 REFERENCES

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2001.
F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; National Electrical Manufacturers Association; 2003.
G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80); National Electrical Manufacturers Association; 2003.
J. See Section 01 4219 Reference Standards

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Design all enclosed pathways to support a maximum of 50% cable fill.
B. A minimum of four (4) 4” EMT sleeves shall be specified between stacked communications rooms. Sleeves shall extend 4” above and below the floor and be no farther than 4” from the wall. In a larger building, follow BICSI guidelines (40,000 sq. ft. rule) for additional penetrations based on total square footage serviced.
C. With regard to non-stacked rooms, conduit turns shall be designed with sweeping radii having no more than two (2) 90° bends. The inside radius of the conduit bends shall never be less than 10 times the internal diameter of the conduit. Pull boxes cannot be used in place of a 90° bend.
D. Conduits used as stub-outs shall be sized and installed to accommodate six category 6 UTP cables as well as 2 strand optical fiber.
E. Cables in mechanical spaces or lab environments requiring more stringent physical protection of cables shall be run in conduit.
F. All conduits shall be specified with pull string (200 lbs. or equivalent) and fire stopped at all rated partitions. Any used conduit shall be filled with innerduct (qty 3, 1.25” innerduct with pull stings installed).

G. Firestopping at the Johns Hopkins Hospital is done by the owner. All conduits must be installed per JHH Standard Specification so the owner, not the contractor, can perform the firestopping.

H. The use of condulets (e.g. LBs) is prohibited.

I. A minimum of one 4” conduit is required between network rooms on the same floor of a building. If cable tray or other support structured connect the two rooms, a dedicated conduit is not required.

J. Electrical nonmetallic tubing may be used as single WAO stub-outs with a single 90 degree turn out. ENT shall be a minimal size of 1.25” in diameter. Undersized Carlon Flex-Plus Blue “Smurf tube” has been used in the past and is NO LONGER allowed.

K. Flexible metallic tubing ("Greenfield") shall not be used within the horizontal cable system.

L. OSP cables shall be installed within rigid metallic conduit or intermediate metal conduit over the entire pathway, if extending over 50 feet to the entrance facility.

M. OSP cable shall not be run in electrical metallic tubing (EMT), unless the total length of the cable within the building is below 50 feet and the conduit is used for mechanical protection or as a sleeve between the floor with the entrance point and the next floor in either direction.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide for metallic conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, nonmetallic tubing, fittings, and conduit bodies.

C. Project Record Documents: Accurately record actual routing of conduits 2 inches (51 mm) or larger.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.

1. Minimum Size: 1 inch (25 mm) unless otherwise specified.

B. Underground Installations:

1. More than Five Feet (1.5 Meters) from Foundation Wall: Use rigid steel conduit, thickwall
non-metallic conduit, or thinwall non-metallic conduit.

2. Within Five Feet (1.5 Meters) from Foundation Wall: Use rigid steel conduit.

3. In or Under Slab on Grade: Use rigid steel conduit or thickwall non-metallic conduit.


C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.

D. In Slab Above Grade:
   1. Use rigid steel conduit or thickwall nonmetallic conduit.
   2. Maximum Size Conduit in Slab: 1 inch (25 mm).

E. Wet and Damp Locations: Use rigid steel conduit or thickwall nonmetallic conduit.

F. Dry Locations:
   1. Concealed: Use rigid steel conduit, intermediate metal conduit, electrical metallic tubing, or thickwall nonmetallic conduit.
   2. Exposed: Use rigid steel conduit, intermediate metal conduit, electrical metallic tubing, or thickwall nonmetallic conduit.

2.02 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.04 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.05 NONMETALLIC TUBING (INTERIOR USE ONLY)

A. Manufacturers:
   1. IPEX, Inc.; Model Kwikpath: http://www.ipexinc.com/

B. Description: 1.25" minimal size, riser or plenum as required.

C. Fittings: As required and provided by manufacturer. Fittings must be by same manufacturer as tubing.

2.06 NONMETALLIC TUBING (EXTERIOR USE)

A. See Section 33 8126 - Communications Underground Ducts, Tunnels, Maintenance Holes, and Handboxes

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.
B. Verify routing and termination locations of conduit prior to rough-in.
C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
B. Install steel conduit as specified in NECA 101.
C. Install nonmetallic conduit in accordance with manufacturer's instructions.
D. Arrange supports to prevent misalignment during wiring installation.
E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
F. Fasten conduit supports to building structure and surfaces.
G. Do not attach conduit to ceiling support wires.
H. Arrange conduit to maintain headroom and present neat appearance.
I. Route exposed conduit parallel and perpendicular to walls.
J. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
K. Route conduit in and under slab from point-to-point.
L. Maintain adequate clearance between conduit and piping.
M. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
N. Cut conduit square using saw or pipecutter; de-burr cut ends.
O. Bring conduit to shoulder of fittings; fasten securely.
P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
Q. Innerduct containing backbone cabling shall end with two feet of cable tray in network rooms. The innerduct may be shortened as needed to accommodate service loops.
R. Secure the innerducts to the wall of network rooms to prevent horizontal movement of the cable (D-rings are acceptable). Secure the cables to the wall in a non-deforming manner to prevent vertical movement of the cable.
S. Install no more than equivalent of two 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.
T. "Dog legs" within stud space shall be avoided. Conduits shall not run horizontally through studs before stubbing out of the wall.
U. Conduits from work area outlets shall turn into the office served by the WAO box or into the adjoining hallway.
V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
W. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.
X. Provide suitable pull string in each empty conduit except sleeves and nipples.

Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Ground and bond conduit under provisions of Section 27 0526 - Grounding and Bonding for Communications Systems.

AA. Firestop conduit under provisions of Section 07 8400 - Firestopping. Conduits in all fire-rated penetrations shall be fire-stopped as soon as the wall is rated. During renovations, temporary firestop shall be used after conduits are installed. Floor penetrations shall be firestopped at all times. Firestopping may be delayed if, during new construction, the partitions and floors are not completed to the point of forming their final fire barriers. The Contractor shall consult with the general contractor or local AHJ as to if temporary fire-stopping is required.

AB. Identify conduit under provisions of Section 27 0553 - Identification for Communications Systems.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400 - Firestopping.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section 07 7100 - Roof Specialties.

END OF SECTION
SECTION 27 0528.11

SURFACE METALLIC RACEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface Metallic Raceways.
B. Fittings.
C. Device Brackets and Plates.
D. Cover Brackets and Face Plates.

1.02 REFERENCES

C. UL 5 - Surface Metal Raceways and Fittings; Underwriters Laboratories Inc.; 1996.
D. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Throughout Johns Hopkins there are locations that preclude the installation of communications cables inside the walls. In those areas where the wall is not accessible, the designer shall specify a communications management raceway system. These systems shall be available in multiple sizes with all of the required components such as, raceways, high performance twisted pair rated fittings (tees and elbows) and junction boxes. Raceway components shall match the color and finish of WAO faceplates exactly.

B. The use of dual channel raceway (power and communications) is allowed. All products shall be UL-listed for this application. Proper connectors and fittings shall be specified to ensure separation of utilities.

C. In dormitories and student areas, raceway shall be metallic or high-impact resistant plastic. Raceway must be very securely anchored at all points. Raceways in these areas shall anticipate considerable physical abuse.

D. Surface mounted raceways shall be available in one piece latching cover, or two piece snap-fit design. Raceways shall accommodate all required fittings and boxes with no modification. Raceways shall be UL listed and meet NEC Article 386 requirements. Raceway shall be available with or without adhesive backing and should have optional backing for use on cinder block, stucco and wood. Adhesive backing is NOT the preferred method of attachment and should only be used when fasteners cannot be used.

E. Surface mount boxes shall be available in single or dual gang configurations. Boxes shall be UL listed and match the color of faceplates and raceway exactly. The faceplate shall attach directly to the surface mount box without requiring the use of any adapters.

F. The use of surface-mount raceway shall be pre-approved by Johns Hopkins. All surface-mount raceways shall be designed to maintain required copper and fiber bend radii. All surface-mount raceways shall anticipate the future installation of up to six category 6 UTP cables and/or
2-strand optical fiber cable. Raceways must be sized accordingly and include the use of fiber-ready corners.

G. IMPORTANT: JHMI Facilities department requires full disclosure of project locations due to restrictions imposed by Infectious Disease Control. In some locations, especially as they relate to some patient areas, cabling installed above the accessible ceiling is not allowed. In these locations, appropriately sized surface mounted raceway shall be installed to facilitate the installation of the cable. The location of this surface mounted raceway shall be approved by NTS prior to installation. Other locations may require isolated work areas and air filters.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's descriptive literature for each system component specified in this section.
C. Shop Drawings: Indicate raceway layouts, each system component required for complete system, raceway lengths, device types, locations; identify all circuits.
D. Closeout Submittals: If variations from approved shop drawings occur during installation of raceway system, submit final as-built drawings indicating such variations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation.
B. Maintain storage area conditions for products of this section in accordance with manufacturer's instructions until installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Surface Metallic Raceways:
   2. Product description: Two-piece system of galvanized steel, nominal 0.050 inch (1.27 mm) metal thickness, having total assembled cross-section dimension 4.75 inches (120 mm) high by 1.75 inches (44 mm) deep, having cross-section area 7.5 square inches (4838 sq mm), consisting of base, snap-on cover, and removable longitudinal barrier, dividing raceway interior into two equal spaces. Other sizes may be used based on project requirements.
   3. Finish: Ivory polyester topcoat over ivory primer, capable of being field-painted.

B. Fittings:
   1. Factory-formed units to complete indicated configuration of raceway systems, including, but not limited to, the following:
      a. External corner units.
      b. Internal corner units.
      c. Flat units.
      d. Blank end units.
      e. Elbows.
      f. Couplings: One per raceway joint location.
g. Wire clips: One for every 2 linear feet (609 mm) of indicated raceway configuration.

h. Replacement longitudinal barrier: One section for every 8 linear feet (2438 mm) of indicated raceway configuration.

2. Material: Same material and metal thickness as linear raceway components.


C. Device Brackets and Plates:

1. Factory-formed brackets and plates allowing installation of indicated power, data, and communications devices, both single-gang and two-gang, either vertically or horizontally in raceways.

2. Finish: Color matching linear raceway components.

D. Cover Brackets and Face Plates:

1. Plastic device mounting brackets and trim plates allowing installation of indicated power, data, and communications devices horizontally in raceways; trim cover sized to overlap device cut-out in raceway, concealing seams.

2. Finish: Color matching linear raceway components.

2.02 DESIGN REQUIREMENTS

A. The designer shall not allow the use of single gang, surface-mount box with a standard faceplate. Surface-mount locations shall use shallow, wall-mount boxes with outlets on the side, not on the face, of the box.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that substrates are prepared to receive products specified in this section.

3.02 INSTALLATION

A. IMPORTANT - JHMI Facilities department requires full disclosure of project locations due to restrictions imposed by Infectious Disease Control. In some locations, especially as they relate to some patient areas, cabling installed above the accessible ceiling is not allowed. In these locations, appropriately sized surface mounted raceway shall be installed to facilitate the installation of the cable. The location of this surface mounted raceway shall be approved by NTS prior to installation. Other locations may require isolated work areas and air filters.

B. Install components of raceway system in accordance with shop drawings and manufacturer's installation instructions.

C. Raceway shall be mounted in an unobtrusive manner. Horizontal raceway shall be used at the baseboard elevation, under or over chair rails, or along the ceiling. Where possible, raceway shall extend down from a WAO. The Contractor shall discuss placement of raceway prior to installation with the JH project manager.

D. Contractors firmly secure surface-mount raceway. Raceway should not be attached with adhesive mounts.

E. Installation of wiring for communications devices is specified in Section 27 1500.

F. Contractors shall not exceed 50% cable fill.

END OF SECTION
SECTION 27 0528.12

SURFACE NONMETALLIC RACEWAYS

PART 1  GENERAL

1.01 SECTION INCLUDES

A. Surface Non-Metallic Raceways.
B. Fittings.

1.02 REFERENCES

C. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Throughout Johns Hopkins there are locations that preclude the installation of communications cables inside the walls. In those areas where the wall is not accessible, the designer shall specify a communications management raceway system. These systems shall be available in multiple sizes with all of the required components such as, raceways, high performance twisted pair rated fittings (tees and elbows) and junction boxes. Raceway components shall match the color and finish of TO faceplates exactly.

B. The use of dual channel raceway (power and communications) is allowed. All products shall be UL-tested for this application. Proper connectors and fittings shall be specified to ensure separation of utilities.

C. In dormitories and student areas, raceway shall be metallic or high-impact resistant plastic. Raceway must be very securely anchored at all points. Raceways in these areas shall anticipate considerable physical abuse.

D. Surface mounted raceways shall be available in one piece latching cover, or two piece snap-fit design. Raceways shall accommodate all required fittings and boxes with no modification. Raceways shall be UL® listed (5A) PVC–rated up to 600 volts and meet NEC Article 388 requirements. Raceway shall be available with or without adhesive backing and should have optional backing for use on cinder block, stucco and wood. Adhesive backing is NOT the preferred method of attachment and should only be used when fasteners cannot be used.

E. Surface mount boxes shall be available in single or dual gang configurations. Boxes shall be UL® listed and match the color of faceplates and raceway exactly. The faceplate shall attach directly to the surface mount box without requiring the use of any adapters.

F. The use of surface-mount raceway shall be pre-approved by Johns Hopkins. All surface-mount raceways shall be designed to maintain required copper and fiber bend radii. All surface-mount raceways shall anticipate the future installation of up to six category 6 UTP cables and/or 2-strand optical fiber cable. Raceways must be sized accordingly and include the use of fiber-ready corners.

G. IMPORTANT: JHMI Facilities department requires full disclosure of project locations due to restrictions imposed by Infectious Disease Control. In some locations, especially as they relate...
to some patient areas, cabling installed above the accessible ceiling is not allowed. In these
locations, appropriately sized surface mounted raceway shall be installed to facilitate the
installation of the cable. The location of this surface mounted raceway shall be approved by
NTS prior to installation. Other locations may require isolated work areas and air filters.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's descriptive literature for each system component specified in this
section.
C. Shop Drawings: Indicate raceway layouts, raceway lengths, device types, and locations; identify
all circuits.
D. Closeout Submittals: If variations from approved shop drawings occur during installation of
raceway system, submit final as-built drawings indicating such variations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation of
products.
B. Maintain storage area conditions for products of this section in accordance with manufacturer's
instructions until installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Surface Nonmetallic Multi-channel Raceway System
   2. Corner Units:
      a. Supply factory-formed cover and trim cover units for internal and external corners of
         indicated raceway layouts:
      b. Finish corner units to match linear cover and trim cover units.
   3. Fittings:
      a. Supply factory-formed fittings specified in manufacturer's product data for indicated
         configurations and service requirements.

B. Surface Nonmetallic Single Channel Raceway System
   1. Acceptable Product: Wiremold Eclipse PN03, PN05, PN10 Series.
   2. Surface mount boxes
      a. Wiremold Large Data Box, four port, PDB4TJ
   3. Corner Units:
      a. Supply factory-formed cover and trim cover units for internal and external corners of
         indicated raceway layouts:
      b. Finish corner units to match linear cover and trim cover units.
   4. Fittings:
01  a. Supply factory-formed fittings specified in manufacturer's product data for indicated
02  configurations and service requirements.
03

04  PART 3 EXECUTION

05  3.01 INSTALLATION

06  A. IMPORTANT - JHMI Facilities department requires full disclosure of project locations due to
07  restrictions imposed by Infectious Disease Control. In some locations, especially as they relate
08  to some patient areas, cabling installed above the accessible ceiling is not allowed. In these
09  locations, appropriately sized surface mounted raceway shall be installed to facilitate the
10  installation of the cable. The location of this surface mounted raceway shall be approved by
11  NTS prior to installation. Other locations may require isolated work areas and air filters.
12
13  B. Install components of raceway system in accordance with manufacturer's installation
14  instructions.
15
16  C. Install components of raceway system in accordance with shop drawings and manufacturer's
17  installation instructions.
18
19  D. Raceway shall be mounted in an unobtrusive manner. Horizontal raceway shall be used at the
20  baseboard elevation, under or over chair rails, or along the ceiling. Where possible, raceway
21  shall extend down from a WAO. The Contractor shall discuss placement of raceway prior to
22  installation with the JH project manager.
23
24  E. Contractors firmly secure surface-mount raceway. Raceway should not be attached with
25  adhesive mounts.
26
27  F. Installation of wiring for communications devices is specified in Section 27 1500.
28
29  G. Contractors shall not exceed 50% cable fill.
30
31  H.

32  END OF SECTION
SECTION 27 0528.13

COMMUNICATION SYSTEMS FURNITURE POLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Utility columns.

1.02 REFERENCES

A. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002.
C. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Utility poles must be approved by JH designers and architects. Utility poles shall be approved for power and communications cabling, with separate pathways. Architectural columns should be considered in place of standard utility poles.
B. Utility poles shall have pre-manufactured knock-outs for work area outlets. WAOs shall be installed flush or with the minimal profile. Surface-mount boxes shall not be used on utility poles.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on materials, finishes, receptacle and connector configuration, and attachment details.

PART 2 PRODUCTS

2.01 MANUFACTURERS


2.02 UTILITY COLUMN COMPONENTS

A. Main Body: Steel.
B. Cover Plates: Steel or Plastic.
C. Convenience Receptacle Configuration: NEMA WD 6; Type 5-15. Furnish 4 per column.
D. Foot: Suitable for floor finish as indicated.
E. Provide concealed top clamp to fasten pole to inverted "T" grid ceiling suspension member.

2.03 ACCESSORIES

A. Trim plates for closing ceiling opening.
B. Flexible cable assembly with connector for branch circuit connections.

2.04 FABRICATION

A. Provide full-sized opening at top of pole.
PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install utility columns plumb and fasten supports to structure.
C. Contractors shall use pre-manufactured knock-outs for work area outlets. WAOs shall be installed flush or with the minimal profile. Surface-mount boxes shall not be used on utility poles.
D. Neatly cut openings in ceiling panels. Install trim plate.

END OF SECTION
SECTION 27 0528.14

CABLE TRAYS FOR COMMUNICATIONS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Cable trays and accessories.

1.02  REFERENCES

A. NEMA VE 1 - Metallic Cable Tray Systems; National Electrical Manufacturers Association; 2002.
C. See Section 01 4219 - Reference Standards.

1.03  DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04  DESIGN CONSIDERATIONS

A. Cable tray shall be single tiered and shall be installed to allow 12" of open space above and to one side of the tray. Actual dimensions of cable tray shall be determined by the volume of cable planned for installation at the time of construction, and account for future growth. The cable tray shall not be filled more than 50% of its capacity. Cable tray shall extend into the communications room providing access to racks and walls in a “T” design. Small rooms may use a single, straight cable tray in line with the rack, provided it extends parallel to the face of the rack.
B. Cable trays shall be installed only in corridors, hallways, and communications rooms, and not above individual offices, conference rooms, restrooms, etc.
C. A minimum of (2) 4" conduits shall be used in place of a cable tray when installation involves passing over inaccessible ceilings. Additional conduits may be required as cable volume dictates. Determination of conduit requirements shall be coordinated with appropriate Johns Hopkins personnel.
D. Design the cable tray products within network rooms for vertical strain relief as needed while maintaining 50% additional capacity within the support structure. Secure the cables with Velcro-type straps at a minimum of 36", or as recommended by the manufacturer to relieve vertical weight strain.
E. Specify appropriate hardware and parts to attach the tray to permanent building structure (concrete columns or deck, structural steel, or other immovable structures capable of supporting the cable tray). Parts shall be specifically designed and where possible UL-listed for their final installed configuration.

1.05  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for fittings and accessories.
C. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.

1.06  QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

   1. FieldMate Wire Basket Cable Tray
   2. SpecMate Center Spine Cable Tray
   3. SpecMate Twin Spine Cable Tray
   4. SpecMate Solid Bottom Cable Tray

B. Cablofil, Inc: www.cablofil.com
   1. Wire Cable Tray

   1. Cent-R-Rail Systems
   2. Cable Tray Systems
   3. Wire Basket Cable Support

D. GS Metals Corp.: www.flextray.com
   1. FLEXTRAY Cable Management System

E. Cable Management Solutions, Inc.
   1. Floor and Overhead Snake Tray
   2. Snake Canyon
   3. Wall Snake
   4. Ladder Snake

2.02 LADDER-TYPE CABLE TRAY

A. Description: NEMA VE 1, Class 20C ladder type tray.
B. Material: Formed aluminum or sheet steel, painted with gray epoxy.
C. Straight Section Rung Spacing: 6 inches (152 mm) on center.

2.03 TROUGH-TYPE CABLE TRAY

A. Description: NEMA VE 1, Class 20C trough type tray.
B. Material: Formed aluminum or sheet steel, painted with gray epoxy.
C. Covers: Flanged, solid, flush cover.

2.04 SOLID-BOTTOM-TYPE CABLE TRAY

A. Description: NEMA VE 1, Class 20C solid bottom cable tray.
B. Material: Formed aluminum or sheet steel, painted with gray epoxy.
C. Covers: Flanged, solid, flush cover.
2.05 WIRE MESH/BASKET METAL CABLE TRAY

A. Description: NEMA VE 1, wire mesh/basket metal cable tray.
B. Material: Formed sheet steel, hot-dip galvanized after fabrication in accordance with ASTM A 123/A 123M, painted with gray epoxy.
C. Wire diameter: 0.175 inches minimum
D. Minimum of two horizontal (length-wise) wires on the vertical sides

2.06 ACCESSORIES

A. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, and connectors.
B. Provide bushings or rubber edge trim as needed. All products shall be free of sharp edges or points that may damage cables.
C. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, and connectors.

2.07 WARNING SIGNS

A. Engraved/Printed Nameplates: 1/2 inch (13 mm) black letters on yellow laminated plastic nameplate, engraved/printed with the following wording: "WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!"

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cable tray securely, in a neat and workmanlike manner, as specified by NECA 1.
B. Install cable tray in accordance with manufacturer's instructions. Cut cable tray using manufacturer's equipment, if available from the manufacturer. Deburr all edges and points.
C. Arrange supports to prevent misalignment during wiring installation.
D. Fasten supports to building structure and surfaces.
E. Cable tray elements shall be supported with manufacturer's hardware to provide a minimal profile. Suspension shoes and brackets shall be used in place of trapeze struts. Sharp corners and threaded rod shall not extend below the basket creating a hazard.
F. Clearances: Install cable tray maintaining a minimum of:
   1. 12 inches of unobstructed clearance above the cable tray's highest plane
   2. 6 inches from any source of EMI
   3. 12 inches from any heat source exceeding 104 degrees F
G. If cables rise to the ceiling space of the floor above a network room (a vertical rise of 12 feet or more), the Contractor shall install cable tray in such a way as to relieve the vertical weight from the cables on all floors. The Contractor shall secure the cables with Velcro-type straps as needed to relieve vertical weight strain.
H. Continuous support elements shall be bonded to ground to TMGB/TGB with a grounding wire. Sections may be bolted together or tied together with grounding jumpers, if the support structure is approved by the manufacturer as a grounding conductor.
I. Innerduct shall not be placed in cable trays when extending horizontally from a network room.
J. Solid bottom cable tray must provide for the continual release of any trapped moisture within the cable tray.

K. Provide suitable pull strings in all cable trays.

L. Provide suitable fittings or gaps with bonding jumpers to accommodate expansion and deflection where cable tray crosses expansion joints.

M. Cable tray shall not penetrate fire-rated barriers. Cable tray shall end within 18 inches of fire-rated barriers. Cables shall use firestop assemblies or sleeves to penetrate fire-rated barriers.

N. Identify cable tray under provisions of Section 27 0553 - Identification for Communications Systems.

END OF SECTION
SECTION 27 0528.15

BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet boxes.
B. Poke-thrus.
C. Floor boxes.
D. Pull and junction boxes.

1.02 REFERENCES

B. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2003.
C. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2003.
E. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN CONSIDERATIONS

A. Outlet Boxes

1. The designer shall specify oversize (4-11/16 in X 4-11/16 in X 2-1/8 in) outlet boxes for work area outlet boxes with a single gang raised cover. Knockouts need to be specified for the appropriate feeder conduit.

2. Work area outlet boxes on opposite sides of a fire-rated wall shall not share the same stud space.

3. Work area outlet box elevations shall be designed in accordance with ADA requirements.

B. Poke-Thrus

1. In-floor conduit systems are allowed and are preferred over poke-thru penetrations, especially for work areas in open spaces without utility poles.

2. The use of poke-thrus shall be limited as much as possible. Where necessary, UL-tested, pre-firestopped products shall be used.

C. Floor Boxes

1. Floor boxes shall be sized to accommodate up to 6 UTP cables and 2 strands of optical fiber. It is likely AC power will be required in these boxes as well. The Designer shall specify a box that can housing communications cables in openings designed for communication outlets. Communication outlets are not to be installed in standard AC outlet shaped opening.
D. Pull and junction boxes

1. Design pull boxes as necessary. Pull boxes are not to be used to change direction of a conduit or cable run. All cables shall pass straight through pull boxes.

2. Pull boxes are required for long conduit runs. Place pull boxes every 98 feet (30 meters) or less and after two 90 degree bends or 180 degrees of total bend.

3. Size pull boxes according to BICSI methodologies. For example, a 1 inch conduit shall have a 4"(W) x 16"(L) x 3"(D) pull box.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Outlet Boxes

1. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.


B. Poke-Thrus

1. Two 20A duplex receptacles and up to four communication devices
   a. Wiremold RC4 Flush Poke-Thru

2. One 20A duplex receptacle and up to two communication devices
   a. Wiremold RC7 Flush Poke-Thru

3. No other manufacturers shall be used

C. Floor Boxes

1. Wiremold AC Series Raised Floor Boxes

2. Wiremold 880 Floor Boxes for Wood Floors

3. Other Wiremold floor boxes, as appropriate for application and as pre-approved by Johns Hopkins

D. Pull Boxes and Junction Boxes

1. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Set wall mounted boxes at elevations to accommodate mounting heights as 18 inches above finished floor, unless otherwise noted.

D. Set wall mounting boxes for wall phones at 46 inches to the center of the box, if installed over a counter or other low obstruction.

E. Set wall mounting boxes for wall phones at 48 inches to the center of the box, if unobstructed access is available.

F. Boxes are shown on Drawings in approximate locations unless dimensioned.
   1. Adjust box locations up to 3 feet (1 m) if required to accommodate intended purpose.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

J. Work area outlet boxes on opposite sides of a fire-rated wall shall not share the same stud space.

K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

L. Use flush mounting outlet box in finished areas.

M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.

O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

P. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

Q. Do not fasten boxes to ceiling support wires.

R. Support boxes independently of conduit.

S. Use gang box where more than one device is mounted together. Do not use sectional box.

T. Contractors shall not installed work area outlets in standard AC outlet shaped opening within floor boxes.

U. Set floor boxes level.

V. Large Pull Boxes: Use enclosure with removable cover in interior dry locations, surface-mounted cast metal box in other locations. Hinged lids may be used, if provided with a means to fasten securely open.

3.02 ADJUSTING

A. Adjust floor boxes and poke-thrus flush with finish flooring material.

3.03 CLEANING
A. Clean interior of boxes to remove dust, debris, and other material.
B. Clean exposed surfaces and restore finish.

END OF SECTION
SECTION 27 0528.16
UNDERFLOOR DUCTS

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Underfloor ducts.
B. Trench ducts.

1.02 REFERENCES
B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate layout, insert spacing and height, locations of fittings and accessories, and overall dimensions.
C. Product Data: Provide data showing component details, dimensions, and finishes.
D. Project Record Documents: Record actual locations of ducts, service fittings, junction boxes, and branch circuiting arrangements.
E. Maintenance Data: Instructions for locating inserts and installing afterset inserts.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.
C. Products: Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 EXTRA MATERIALS
A. See Section 01 6000 - Product Requirements, for additional provisions.
B. Provide ten afterset inserts.
C. Provide 10 percent of each service fitting type.
D. Provide two of each special tool required to locate preset inserts.
E. Provide two of each special tool required to install afterset inserts.

PART 2  PRODUCTS

2.01 MANUFACTURERS

2.02 UNDERFLOOR DUCT
A. Description: Steel duct with corrosion-resistant finish.

B. Type: Underfloor.

C. Configuration: One or two level system using ducts in parallel runs as shown on Drawings.

D. Inserts: Fabricate distribution lengths with preset inserts on 24 inches (610 mm) centers.

E. Inserts: Provide precut 1-1/4 inch (32 mm) diameter holes on 24 inch (610 mm) centers. Close with flat metal screw plugs.

F. Junction Boxes: Rectangular cover and trim, adjustable height; separate enclosures for each service to allow feeder ducts to cross under distribution ducts. Provide conduit and duct entrances and extension rings as required.

G. Supports: Adjustable before concrete topping placement.

H. Duct Markers: Corrosion resistant marker screws, with escutcheon.

I. Fittings and Accessories: Manufacturer's standard.

2.03 TRENCH DUCT

A. Description: Closed bottom, steel trench duct with corrosion resistant finish.

B. Compartments: Provide adjustable compartment dividers.

C. Supports: Adjustable before concrete topping placement.

D. Coverplates: 1/4 inch (6.4 mm) thick steel removable coverplates with gasketed joints.

1. At concrete floors: Smooth coverplate flush with floor.

E. Fittings and Accessories: Manufacturer's standard.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Locate ducts as indicated on Drawings.

C. Install underfloor duct with tops of preset inserts 1/8 inch (3 mm) below finished floor line.

D. Terminate ducts for telephone service 2 inches (50 mm) above floor in telephone closet using suitable fittings.

E. Provide expansion fittings with suitable bonding jumper where duct crosses building expansion joints.

F. Level cover plates flush with finished concrete floor.

G. Place rectangular plates square with wall lines.

H. Securely hold junction boxes and ducts in place during installation to avoid floating or other movement.

I. Close unused duct or conduit entrances to junction boxes. Seal duct terminations at junction boxes.

J. Ground and bond duct under provisions of the NEC.

K. Place schedule on the inside of coverplate of each junction box indicating distance to first insert in each direction, measured from the center of the box. Use self-adhesive labels for schedule.
L. Support Couplers and Supports: Join duct lengths using combination support couplers where practical. Provide additional supports at intervals of not over 5 ft (1.5 m), within 40 inches (750 mm) each side of junction boxes, and as close as practical to elbows, bends, and terminations.

M. Install insert within 12 inches (30 mm) of edge of junction box. Align inserts on same centers for all services.

N. Install a duct marker in each insert adjacent to junction box, at end of each duct run, on both sides of permanent partitions, and on both sides of change of direction of duct. Install markers flush with finished floor material. In carpeted areas, install marker screws level with carpet backing.

O. Install surface service fittings after installation of floor finishes. Cut floors as necessary, following duct manufacturer's recommendations. Replace damaged floor construction and finish.

P. Clean ducts and fittings of debris and dust before installing wire and cable.

3.02 PROTECTION

A. Protect boxes, covers, and rings from distortion and finish damage.

B. Replace boxes, covers, and rings marred during construction.

END OF SECTION
SECTION 27 0528.29

HANGERS AND SUPPORTS FOR COMMUNICATIONS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Conduit and equipment supports.
B. Anchors and fasteners.

1.02  REFERENCES

C. See Section 01 4219 - Reference Standards.

1.03  DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04  DESIGN CONSIDERATIONS

A. Specify Erico CableCat Adjustable Cable Support (CAT425 series slings). The Designer may specify the use of other sling-style hangers, provided they have metal components to hold the sling closed and to secure the sling to the support structure. All plastic supports are not acceptable (e.g. Arlington Loops). Design slings to be spaced at 4 ft to 5 ft intervals. The interval must vary in a single run to prevent a standing wave induction on the cable.

B. Specify Erico CableCat Cable Supports (CAT64 series). The Designer may specify the use of other J-hook style hangers, provided they are metal. Design supports to be spaced at 4 ft to 5 ft intervals.

C. Specify appropriate hardware and parts to attach the supports to permanent building structure (concrete columns or deck, structural steel, or other immovable structures capable of supporting the cable supports). Parts shall be specifically designed and where possible UL-listed for their final installed configuration.

D. Design for eight or fewer Category 6 cables to be supported with J-hooks. Support more than four Category 6 cables with slings or tray.

E. Specify cable supports above concealed ceilings using a rigid support to a structural element, or by attaching directly to a structural element.

F. Specify to “close” J-hook supports with manufacturer provided bars and not with cable ties.

G. Specify that J-hook supports can be attached to suspended ceiling grid-type wire with manufacturer clamps, provided:

1. The wire is painted orange prior to installation, to differentiate it from ceiling grid support wires,
2. The wire is attached to the ceiling grid, as required by the NEC,
3. The wire is not used to support the ceiling grid, as required by the NEC, and
4. The local authority having jurisdiction understands they are not supports for the ceiling grid.

1.05  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer’s catalog data for fastening systems.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ERICO International Corporation: www.erico.com

1. CableCat Adjustable Cable Support (CAT425 series slings)

2. CableCat Cable Support (CAT64 series)

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Anchors and Fasteners:

1. Obtain permission from Architect before using powder-actuated anchors.

2. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.

3. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.

4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.

5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.


7. Sheet Metal: Use sheet metal screws.


PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall install cable supports above concealed ceilings using a rigid support to a structural element or by attaching directly to a structural element.

B. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

2. Contractors may use existing threaded rods for other utilities, if pre-approved by JH and capable of supporting the additional load. Clearances must be maintained.

3. Obtain permission from Architect before drilling or cutting structural members.
C. The Contractor may install J-hook type or sling-type supports by attaching to suspended ceiling grid-type wire with manufacturer clamps, provided:

1. The wire is painted orange prior to installation, to differentiate it from ceiling grid support wires,
2. The wire is attached to the ceiling grid, as required by the NEC,
3. The wire is not used to support the ceiling grid, as required by the NEC, and
4. The local authority having jurisdiction understands they are not supports for the ceiling grid.

D. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

E. The Contractor shall support Category 5e cables with J-hook type or sling-type supports in concealed ceiling spaces.

F. The Contractor shall support Category 6 cables with sling-type supports and not with J-hooks if supporting more than eight cables.

G. J-hook and sling-type supports must be installed every 4-5 feet at on irregular interval. Installation of supports at a repeating interval (i.e. every 4 feet exactly) will establish a standing wave induction of interference on the cable. Attaching supports to alternating sides of structural steel can accomplishment this as can a non-linear installation.

H. The Contractor shall “close” J-hook supports with manufacturer provided bars and not with cable ties. The Contractor shall not use cable ties to strap cables to J-hook supports. The Contractor shall not install cables under such strain as to require tying to supports.

END OF SECTION
SECTION 27 0543

UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 31 8126 - Communications Underground Ducts, Manholes, and Handholes
B. This Section includes earthwork information in the absence of Division 31 specifications.
Conflicts between this section and Division 31 specifications shall be resolved by the
architect/engineer/designer in consultation with JH.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code.
C. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SAFETY AND RESTRICTIONS

A. See specific elements within this document for safety and restrictions information. Contractors
shall bear all responsibility and cost to locate existing underground utilities including, but not
limited to, electricity, natural gas, domestic water, steam and condensate, chilled water, sewer,
storm drainage, and telecommunications. Most of these utilities are owned and maintained by
Johns Hopkins. In many cases, utilities have used plastic pipe without metallic (detectable)
elements. Contractors shall have all underground utilities clearly marked prior to any
excavation.

B. Maryland’s Underground Facilities Protection Organization, Miss Utility, does not locate utilities
within the boundaries of the Johns Hopkins University Homewood Campus. Contractors shall
contact KCI Technologies at 410-891-1738 to locate all utilities. Other locators shall be
pre-approved by Homewood Plant Operations.

C. Contractors shall contact Johns Hopkins immediately if unmarked utilities are discovered.
Contractors shall stop all work in the area until the utility can be identified by Johns Hopkins.
Contractors may be required to recall KCI Technologies or other originally pre-approved locator
to trace the utility to an identifiable point. Contractors shall contact Johns Hopkins immediately
if a utility is damaged in any way. Contractors shall stop all work in the area until directed by
Johns Hopkins. Contractors shall contact Johns Hopkins Plant Operations at 410-516-8063
immediately. If unable to reach Plant Operations, Contractors shall contact the Johns Hopkins
University Security Department at 410-516-4600. Contractors shall then contact the Johns
Hopkins Project Manager.

D. Areas of the campus are restricted from heavy equipment, including but not limited to backhoes,
concrete trucks, utility and work trucks, and other full-sized vehicles. Contractors shall contact
Plant Operations for specific restrictions based on the location of the work area.

E. During construction of all pathways, Johns Hopkins Security shall determine if closures of Johns
Hopkins-controlled roads or spaces are possible at proposed dates and times. When on
non-Johns Hopkins property, Contractors shall coordinate all activities with interested parties.

F. Locating done by another trade or a general contractor in the same work area and for the same
overall project does not need to be repeated by the Contractors, provided 1) the entire cabling
work area was recently covered, 2) the markings are bold and undisturbed, and 3) the
geographic scope of the work area can be confirmed by the locating company.

G. Information from Johns Hopkins on underground utility placement does not waive Contractors
from confirming the presence and location of all underground utilities in the work area.

H. There are no specific safety information or restrictions for direct-buried pathways.

I. Contractors shall provide all necessary equipment to safely excavate and construct conduit/duct
pathways. Contractor shall comply with all federal, state, and Johns Hopkins regulations
regarding working in this environment. Appropriate personal protective equipment is required
and shall be the responsibility of the Contractors.

J. Contractors shall provide all necessary equipment to safely excavate and construct tunnel
penetrations. Contractor shall comply with all federal, state, and Johns Hopkins regulations
regarding excavation and working in this environment. Personal protective equipment is required
and shall be the responsibility of the Contractors.

K. See Section 27 0000 : Communications General.

1.05 DESIGN REQUIREMENTS

A. New construction or other circumstances may require the relocation of existing OSP elements.
Relocating OSP elements requires improving those elements to meet current codes, standards,
methods, and specifications.

B. During the relocation of OSP elements, services provided by or through the elements shall be
minimally impacted. Service outages are to be minimal and during off-hours. Extra effort may
be required to accommodate the service users (e.g. using half-taps on a replacement voice
backbone cable). All service outages must be pre-approved by Homewood Plant Operations.

C. The location of pathways shall be coordinated with Johns Hopkins Homewood Plant Operations
early in the design process. Pathways should anticipate future campus growth with respect to
placement and sizing. Pathways are likely to be oversized for a given project where the
pathway is in a growth area or may have a foreseeable additional use.

D. Pathway design shall avoid older, established trees. In very rare cases, small ornamental trees
that can be moved or replaced may be so treated with prior approval or Plant Operations.
Planting beds and shrubs can be disrupted as needed, provided they are fully restored to original
condition.

E. Walkways and roadways can be crossed as needed, provided there is full restoration. Empty
conduits have been placed under newer brick walkways to minimize walkway disruption.
Designers should consult with the Office of Facilities Management to review existing site plans
to locate these conduits.

F. Where possible, new conduits installed along the same pathway as an existing pathway shall be
installed as part of the existing ductbank. This physical arrangement minimizes the campus
area occupied by network ductbanks. Designers may design intercepting and accessing these
existing pathway elements. Designers may expose the existing ductbank and use its vertical
side to frame the space for the new conduits.

G. Security devices (alarms, sensors, cameras, etc.) may require dedicated cabling to specific,
non-standard locations. These devices will be designed as required and may run independent of
other pathways and requirements of this document. Plant Operations shall approve all pathway
designs involving security or life-safety cabling.

H. Underground Pathways
1. Underground conduit structures are pathways used for placing network cable between access points such as MHs, HHs, HBs, and building entrances. Cable pathways should be underground, where possible. Underground pathways should be concrete-encased conduit, where possible. Special pathways may use conduits without concrete encasement or with the installation of a concrete cap.

2. The conduits and fittings shall be a 4” ID PVC SCH 40. The conduits shall have bell ends and shall be joined with the appropriate adhesive for this type of conduit providing a permanent and watertight seal.

3. The diameter of a duct shall be at least 1.15 times the diameter of the cable, or one-half trade size larger in diameter than the diameter of the largest anticipated cable (whichever provides the greater clearance).

<table>
<thead>
<tr>
<th>Structure</th>
<th>Minimum Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power or other</td>
<td>3 in (75 mm) concrete foreign conduit</td>
</tr>
<tr>
<td></td>
<td>4 in (100 mm) masonry</td>
</tr>
<tr>
<td></td>
<td>12 in (300 mm) of well-tamped earth</td>
</tr>
<tr>
<td>Pipes (e.g. gas, water, oil)</td>
<td>6 in (150 mm) when crossing</td>
</tr>
<tr>
<td></td>
<td>12 in (300 mm) when parallel</td>
</tr>
<tr>
<td>Power conduit terminated on poles</td>
<td>Preferably 180 degrees but not less than 90 degrees.</td>
</tr>
</tbody>
</table>

NOTE: Check the local authority having jurisdiction for applicable codes. See NESC for other clearances.

4. Underground pathways shall be designed for a minimal depth of 30” to the top of the pathway elements, where possible. Deviations from this shall be pre-approved by Homewood Plant Operations. Pathways may gradually slope up to under 30” deep to enter HBs or HHs.

5. Design underground conduit elevations so that a slope exists at all points of the run to allow drainage. A drain slope towards the MH of no less than one percent grade is desirable.

6. Design for an aggregate bed of a minimum of 12 inches of compacted aggregate, under the same guidelines as MH installation, for the first 6 feet of any ductbank exiting a MH.

7. Design for conduit spacers beneath each conduit three times for every 20 linear feet of conduit with an additional support at the end. The spacers shall be evenly distributed over each 20 foot segment (e.g. one at each 20 foot joint and two evenly spaced over the middle). Each horizontal row of spacers (in cross-section) shall be designed with a 6” minimum horizontal distance from any other row of spacers so as to eliminate weak vertical shear planes.
8. Design conduit formations to facilitate orderly cable racking within the MH and ensure minimal change in the formation when entering a MH. The following recommendations allow for the design of the most efficient cable formation.

   a. The main conduit formations should enter the end walls of the MH at a point approximately halfway between the floor and roof.

   b. For wall racking considerations, design splayed ductbank entrances at the end walls rather than center placement.

   c. If the total number of conduits being placed is significantly less than the capacity of the terminating MH or cable entrance, conduits should enter at the lower level. The upper space should be reserved for future conduit additions.

   d. The conduit entrance into the MH should be sized for the ultimate number of conduits to prevent the need for future wall breakouts.

9. Refer to the current BICSI CO-OSP manual for conduit bend radii. Curved sections shall be pre-manufactured. Curved segments shall have minimum of 15 ft radii. Sweeps to enter utility tunnels may be less. Any sweep below 15 ft radius shall be pre-approved by Homewood Plant Operations.

10. Ductbank configuration shall vary, depending on the spaces into which the conduits end.

11. All buildings shall have a minimum of four conduits accessing the entrance facility. Two of these conduits shall be of four inches in inner diameter. The other two may be multi-cell conduits with a minimum of three factory-manufactured inner conduits.

12. Compacted aggregate to be used to backfill may be crushed stone or gravel fill provided the percent composition by dry weight as determined by laboratory sieves (U.S. series) conforms to the following grading when measured in accordance with ASTM C136-01 (Test Method C136-01 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates):

13. Lesser-grade material to be used to backfill. This backfill material may be material removed from the original excavation. All backfill materials shall be free from boulders, large rock, asphalt, concrete, bricks, wood blocks or roots, and other debris. High quality top-soil shall be used.

14. Match sod of the same origin as the surrounding area.

15. Design for all materials to prevent erosion of seeded areas.


17. Design for a level layer of compacted aggregate over each encased ductbank. The bed shall extend 1 foot above the surface of the ductbank. The first 6 inches of the aggregate bed shall be compacted to not less than 95% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A. The second six inches of the aggregate bed shall be compacted to not less than 85% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A.

18. Horizontal conduits shall end flush with the interior surface of the wall. Vertical conduits ending in eaves shall be designed such that they extend a minimum of 4" above the final floor. Cut the conduits square with the conduit and not necessarily level to the floor. Bushings shall be installed on conduit ends.

19. 4" compression-type duct plugs (Condux, Nonmetallic Eye Nut Plug- 08067840), or equivalent. Universal or "push-in" type plugs (e.g. Condux, Universal Plug- 08047601) are not an acceptable substitute.
20. Provide 1¼" OD nonmetallic flexible raceway (innerduct) with smooth exterior surface. Provide 1¼" OD corrugated nonmetallic flexible raceway (innerduct). All innerduct shall be orange.

21. Install warning tape to be provided by Johns Hopkins (Empire Level Mfg. Corp. 25 071 Orange FO cable MegaStretch Underground Marking Tape) or equivalent.

22. Provide #10 copper, green insulated tracer wire.

23. Specify the installation of 3/8" or greater Neptco Polyester Muletape pull strings.

24. Once built, the conduit system should remain usable for 75 to 100 years and fulfill design specifications.

I. Encasement

1. When fully encasing in concrete, 4" ID PVC type EB-35 conduits and fittings are acceptable. The conduits shall have bell ends and shall be joined with the appropriate adhesive for this type of conduit providing a permanent and watertight seal.

2. Designers shall plan for encasing ductbanks in concrete. All interbuilding pathways shall be encased. The concrete shall be 3/8" aggregate with a nominal compressive strength of 3000 PSI. Concrete surrounding the conduits shall be at least 3 inches around all sides of the conduit for complete encasement.

3. Fully encase any ductbanks that penetrate a MH or building for the first 6 feet beyond the structure.

4. When transitioning from an encased ductbank to a capped ductbank, it is not necessary to frame the transition in cross-section, provided the required area is encased to a minimum of 3 inches. The concrete may slope down into the area to be capped. If framing a transition point, the frame shall be removed prior to installing aggregate around the conduits and installing the cap.

5. Shape the top of the concrete in such a way as to slope water away from the ductbank-structure seams.

6. Design for steel reinforcing bars, vertically and horizontally, to form a vertical box framing the conduits. The vertical bars shall be driven a minimum of 6 inches deep to prevent the conduits from floating during concrete pouring. The horizontal bars shall be secured to the vertical bars to prevent movement. The vertical bars shall extend 3 inches above the top conduit row. Alternately, the bars may be less than 3 inches above the top conduit row, if an inverted spacer is placed on the top row to provide a 3 inches depth gauge for pouring concrete.

7. The design may use "U"-shaped bars to straddle the conduits, if driven into the trench as specified above. Designers may use a single horizontal bar or an upward pointing "U"-shaped bar in this configuration. The upward pointing "U"-shaped bar shall extend 3 inches over the top conduit or the Designers shall use an inverted spacer to provide a 3 inch depth gauge for pouring concrete.

8. Design for reinforcing bars, longitudinally. The bars shall be secured to each vertical reinforcing bar box. The longitudinal bars shall overlap 12 inches, unless welded together, and shall be secured to each other in a way to prevent movement.

J. Capping

1. Designers may propose a "capped" ductbank for certain pathways. These pathways may include parking lift gate cable or other low count cables to specific field devices. When
capping a ductbank, install filler sand around the conduits providing at least 3 inches of
sand below and to the side of all conduits. Filler sand above the top of the conduit
ductbank shall not be allowed.

2. Design the filler sand to fill to the side walls of the trench. Compact filler sand to the sides
of the conduits.

3. Designers may allow for framing on the compacted surface of the sand for pouring the
concrete cap.

4. Design for a 3 inch thick concrete cap over the conduits.

5. Extend the cap horizontally to a minimum of 3” beyond the outer most conduits.

6. If the cap is framed, designers may show lesser-grade backfill material to cover the sand
beyond the cap once the framing is removed.

K. Non-encasement

1. In special circumstances, designers may plan for conduits installed without concrete.
These installations may include parking lift gates, information kiosks, or other non-critical
devices as determined by Homewood Plant Operations.

L. Existing Ductbanks

1. Designers may use conducts and/or innerducts within existing ductbanks as directed by
Homewood Plant Operations. Where possible, used conduits with available innerducts or
space shall be used.

2. When designing optical fiber into a 4” conduit without existing innerduct or cable, design for
three 1-¼” OD innerducts.

3. When designing for a 200 pr copper cable, or less, design for two 1 ¼” OD innerducts with
the cable. Design for one 1 ¼” OD innerduct for larger copper cables, if possible.

4. Designers shall specify ribbed innerduct. Corrugated innerduct may be used only when
necessary to make tight bends and then only as much as needed before making a
transition to ribbed innerduct.

5. Specify Muletape in all innerducts.

6. Specify pre-formed duct plugs around innerducts and smaller compression-type duct plugs
in the innerducts.

7. Seal used conduits (when pre-formed plugs are not feasible) with a non-hardening,
removable sealant (PT Tech DuckSeal Sealant). Expanding foam products designed
specifically for duct sealing (e.g. 3M Part #4416 Duct Sealant Kit) may only be used on
conduits considered to be at capacity by Homewood Plant Operations.

8. Innerducts shall not extend beyond six inches from the end of the conduit.

M. Tunnels

1. As a pathway, the tunnels are available for use from buildings with existing tunnel access.
The tunnel shall not be penetrated by minor pathways. Major pathways may penetrate the
tunnel when designed to maintain the integrity of the tunnel structure.

2. Designers may need to address past poor practices within the tunnels in order to use
them. This could involve the installation of support mechanisms for new cabling and
existing cabling in the same area.

3. When selecting media for installation, the designer should ensure that it meets heat and
steam requirements to ensure protection of the network physical plant, where necessary.

N. Direct-buried

1. Direct-buried pathways shall not be used. All pathways shall include the use of conduit.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store all materials under cover and elevated above grade. Prevent water, dirt, and debris from entering conduits and tubing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conduits

1. Manufacturers

a. IPEX, Inc.: TerraCon PVC raceway for directional boring and open trenching
b. Carlon: PVC Bore-Gard for directional boring and open trenching
c.

2. PVC SCH 40

a. Manufactured to NEMA TC2 (Electrical Polyvinyl Chloride (PVC) Tubing and Conduit) specifications
b. Bell ends
c. Appropriate adhesive for this type of conduit providing a permanent and watertight seal

3. PVC SCH 40 Fittings

a. Manufactured to NEMA TC3 (PVC Fittings for Use with Rigid PVC Conduit and Tubing) specifications
b. Appropriate adhesive for this type of fitting providing a permanent and watertight seal

4. PVC SCH 40 Pre-Manufactured Sweeps

a. 6 ft radius, 90 degree sweeps
b. 45 degree sweeps of >6 ft radius

5. PVC type EB-35

a. For use only when fully encased in concrete
b. Manufactured to NEMA TC8 (PVC Plastic Utilities Duct for Underground Installations) specifications
c. Bell ends
d. Appropriate adhesive for this type of fitting providing a permanent and watertight seal

6. PVC type EB-35 Fittings

a. For use only when fully encased in concrete
b. Manufactured to NEMA TC9 (Fittings for PVC Plastic Utilities Duct for Underground) specifications
c. Appropriate adhesive for this type of fitting providing a permanent and watertight seal
B. Conduit Spacers

1. Manufacturers
   a. Underground Devices, WUNPEECE spacers- 4W20-2
   b. Other acceptable manufacturers offering equivalent products

C. Conduit plugs

1. Compression-type plug

2. Manufacturers
   a. Condux, Nonmetallic Eye Nut Plug- 08067840
   b. Other acceptable manufacturers offering equivalent products

3. Universal or "push-in" type plugs (e.g. Condux, Universal Plug- 08047601) not acceptable

D. Conduit Seals

1. Non-hardening, removable sealant- PT Tech DuckSeal Sealant, or equivalent

2. Expandable sealing bags, Tyco T-DUX

3. Expanding foam, 3M Part #4416 Duct Sealant Kit, or equivalent product designed specifically for duct sealing (expanding foam for insulation (e.g. Great Stuff) is not acceptable)

E. Innerduct conduits

1. Manufacturers
   a. Carlon, Ribbed Wall High Density Polyethylene, 1 1/4" OD, orange
   b. Carlon, Corrugated High Density Polyethylene, 1 1/4" OD, orange
   c. Endot, ENDOCOR corrugated, 1 1/4" OD, orange

F. Pull tape

1. 3/8" or larger

2. Manufacturers
   a. Neptco
      1) Polyester Muletape, 2500 lbs minimum
      2) Detectable Muletape, 22 AWG, 2500 lbs minimum
   b. Other acceptable manufacturers offering equivalent products

G. Warning tape

1. High stretch polymer, orange tape, blank print

2. Marked "Optic Fiber" or "Communications"

3. Manufacturers
   a. Empire Level Mfg., 25-071, Orange FO Cable MegaStretch
   b. Other acceptable manufacturers offering equivalent products

H. Tracer Wire

1. Green, insulated wire
01  2.  #10 copper conductor
02  I. Concrete
03  1.  - 3/8" maximum size
04  2.  Nominal compressive strength: 3000 PSI at 28 days
05  J. Steel reinforcing bars
06  1.  Size- standard size #5
07  K. Sand for filler
08  1.  clean and graded
09  2.  all passing a #4 U.S. sieve
10  3.  conforming to ASTM C33-01a (Standard Specification for Concrete Aggregates) for fine aggregates

PART 3  EXECUTION

3.01 INSTALLATION

A. Digging and Trenching

1.  In general, underground pathways shall be at a minimal depth of 30" to the top of the pathway elements, where possible. Deviations from this specification must be pre-approved by Homewood Plant Operations. Pathways may gradually slope up to under 30" deep to enter handboxes or handholes.

2.  All digging and trenching shall be in accordance with codes and requirements established by all applicable local, state, and federal agencies and departments.

3.  All trenching and digging shall be done in a neat and workmanlike manner. All methods of construction and details of workmanship shall be subject to the control and approval of Johns Hopkins.

4.  Contractors shall protect from direct damage during construction and damage resulting from construction all surrounding environments, including, but not limited to, existing roadways, sidewalks, curbing, trees and shrubs, open grass areas, and planting beds. Contractors shall use planking and ramps as needed to protect these areas.

5.  Contractors shall provide and install all necessary barriers to prevent unauthorized entry into the construction area. Contractors shall provide temporary walkways to divert pedestrian traffic safely around the construction area. Contractors shall contact the Johns Hopkins University Security Department at 410-516-4600 for approval of all temporary walkway locations.

6.  Contractors shall provide traffic control, signage, plating, etc. as necessary to maintain the safe flow of vehicular traffic as deemed necessary by Johns Hopkins. Contractors shall contact the Johns Hopkins University Security Department at 410-516-4600 for approval of any changes to the normal flow of vehicular traffic in and around the construction area and to arrange road closures, if necessary.
7. Contractors shall restore, repair, rebuild, or replace any items including, but not limited to, adjacent property, existing fences, trees and shrubs, roadways and curbs, sidewalks, and surface utilities and parts damaged during construction. Damaged items shall be restore, repair, rebuild, or replace to their original condition and to the satisfaction of Johns Hopkins. Johns Hopkins may waive this requirement for specific items if within the construction area and/or if scheduled for eventual demolition or replacement and at Johns Hopkins discretion.

8. Contractors shall secure all necessary permits, as required. Contractors shall contact Johns Hopkins to ascertain the existence of established permits covering this work.

9. Contractors shall coordinate construction schedules and all work on the construction site with Johns Hopkins. Other Contractors may be working in the area. Contractors shall coordinate construction schedules with any general contractor or construction manager hired by Johns Hopkins when working as a subcontractor or when required by Johns Hopkins.

10. Contractors shall provide a detailed photographic survey of all pathways and areas to be disturbed prior to construction. Contractors shall deliver a set of these photographs to Johns Hopkins prior to construction.

11. Contractors shall locate and stake all pathways and spaces to be installed. Contractors shall confirm with Johns Hopkins and the project engineers all staked pathways and spaces. Contractors shall notify Johns Hopkins of any discrepancies in the site plan and the existing conditions.

12. Contractors shall protect, support, and maintain all existing utilities in the work area as they are encountered during excavation. Shallow utilities to light posts or other devices may be temporarily re-routed or disconnected if pre-approved by Johns Hopkins.

13. Contractors shall install erosion control measures as needed to minimize erosion and to prevent soil run-off from the construction area.

14. Contractors shall provide and install bracing, shoring, and sheathing as necessary to protect personnel and surrounding conditions. Contractors shall adhere to all local, state, and federal requirements for safe excavations.

15. Contractors shall hand remove and stack all paving bricks and marble pavers in the construction pathway for re-installation later. Contractors shall remove granite or other stone or brick curbing pavers in the construction pathway for re-installation later.

16. Contractors shall sawcut all paved area encountered during excavations. Cuts shall be neat and straight.

17. Contractors shall remove all material excavated including soil, rubble, debris, or other materials encountered during excavation. Contractors may store excavated material on site at the discretion of Johns Hopkins and at a location designated by Johns Hopkins. Contractors shall not anticipate storing excavated material on site. Excavated material from ductbank trenches may be left near the trench to be used as backfill, if adhering to later backfilling specifications. Contractors shall properly dispose of any material taken from the construction area per local disposal requirements.

18. Contractors shall remove only the material necessary to safely install ductbanks as specified. Contractors shall contact Johns Hopkins immediately if the trench or hole bottom is wet, unstable, or otherwise unable to support the infrastructure to be installed.
19. Contractors shall provide pumps, as necessary, to keep water out of the excavation. Contractors shall direct effluent towards the nearest storm drain only if the effluent is free from dirt and debris. Otherwise, the effluent shall be diverted to an area free from vehicular and pedestrian traffic and other construction areas.

20. Contractors shall notify Johns Hopkins of any rock that cannot be excavated by a 3/4 cubic yard power shovel or broken sufficiently by an air hammer to clear the space required for infrastructure installation. Johns Hopkins shall determine the appropriate course of action.

B. Restoration

1. Contractors shall contact Johns Hopkins prior to any backfilling which will conceal an installed pathway element to enable Johns Hopkins to document and photograph the pathway.

2. Contractors may backfill in stages, when necessary to complete trenching and ductbank installation.

3. Contractors shall use pre-excavation photographs to restore the existing conditions, including brick walkway placement and pattern. Contractors shall restore brick walkways in the same pattern and arrangement as originally installed.

4. Contractors shall provide and install a level layer of compacted aggregate over each encased ductbank. The bed shall extend 1 foot above the surface of the ductbank. The first 6 inches of the aggregate bed shall be compacted to not less than 95% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A. The second six inches of the aggregate bed shall be compacted to not less than 85% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A.

5. Contractors shall remove all remaining excavated material from the construction area.

6. Contractors shall remove any erosion control devices no longer needed, not including those in and around seeded areas.

7. Restoration of disturbed landscaping shall be to the satisfaction of Plant Operations grounds keepers.

C. Conduit/Duct Pathways

1. During construction, Contractors shall use appropriate personal protective equipment to work safely within trenches and excavated areas. Contractors shall provide all appropriate safety equipment as needed to extract disabled workers or as otherwise needed to provide a safe work environment and to provide immediate support in emergency situations.

2. Contractors shall store all conduits and fittings in a manner to prevent dirt, rain, and other debris from entering the conduits. All conduits and fittings shall be free from dirt, water, and debris before installation.

3. All pathway elements shall be labeled in accordance with the Johns Hopkins OSP Administrative Specification.

4. Contractors shall locate each ductbank as specified by this document and subsequent documentation provided by Johns Hopkins.

5. Contractors shall install an aggregate bed of a minimum of 12 inches of compacted aggregate under the same specifications as maintenance hole installation (Section 7.3.2) for the first 6 feet of any ductbank exiting a maintenance hole.

6. Contractors shall mechanically tamp the bottom of all trenches to provide a firm surface. If a solid base is not achievable given soil or other conditions, the Contractors shall install a
minimum 4” bed of compacted aggregate under the same specifications as maintenance
hole installation (Section 7.3.2). Contractors shall excavate as needed to install this
aggregate bed while maintaining 30” of minimal cover over the final ductbank. Johns
Hopkins shall determine the need for an aggregate base prior to the placement of any
framing and laying of conduit in place.

7. Contractors shall obtain Johns Hopkins permission to proceed prior to the laying of
conduits into the trench.

8. When possible, the vertical trench walls shall be used as the vertical frame for pouring
concrete. When necessary, the sides of trenches shall be framed to maintain a straight
and neat cross-section for areas completely encased by concrete. Contractors shall not
use framing in areas to be filled with sand.

9. Contractors shall use exterior maintenance hole walls, utility tunnel walls or roof, and/or
building structure as framing into which the concrete is to be poured where possible.

10. When penetrating a MH or building, Contractors shall core-drill, shall use a
pre-manufactured knock-out window, or shall sawcut a window to penetrate the structure.
Contractors shall confirm with the MH manufacturer or a structural engineer that the
proposed method to access a structure and the final configuration of conduits per Johns
Hopkins shall not compromise the structural integrity of the structure. Contractors shall
provide Johns Hopkins with written documentation to this effect.

11. Contractors shall provide and install framing as necessary to prevent the penetration of
concrete into the interior space of a structure. Contractors shall remove this framing when
the concrete has properly set and after backfilling is complete.

12. Contractors shall install horizontal conduits ending in structures flush with the interior
surface of the wall. Contractors shall install vertical conduits ending in entrance facilities
such that they extend a minimum of 4” above the final floor. Contractors shall cut the
conduits square with the conduit and not necessarily level to the floor. Contractors shall
provide and install bushings on conduit ends.

13. Contractors shall provide and install conduit spacers beneath each conduit three times for
every 20 linear feet of conduit. The spacers shall be evenly distributed over each 20
segment (e.g. one at each 20 foot joint and two evenly spaced over the middle). Each
horizontal row of spacers shall be installed with a 6” minimum horizontal distance from any
other row of spacers so as to eliminate weak vertical shear planes.

14. Contractors shall provide and install steel reinforcing bars, vertically and horizontally, to
form a vertical box framing the conduits. The vertical bars shall be driven a minimum of 6
inches deep to prevent the conduits from floating during concrete pouring. The horizontal
bars shall be secured to the vertical bars to prevent movement. The vertical bars shall
extend 3 inches above the top conduit row. Alternately, the bars may be less than 3
inches above the top conduit row, if an inverted spacer is placed on the top row to provide a
3 inches depth gauge for pouring concrete.

15. Contractors may use “U”-shaped bars to straddle the conduits, if driven into the trench as
specified above. Contractors may use a single horizontal bar or an upward pointing
“U”-shaped bar in this configuration. The upward pointing “U”-shaped bar shall extend 3
inches over the top conduit or the Contractors shall use an inverted spacer to provide a 3
inch depth gauge for pouring concrete.

16. Contractors shall provide and install reinforcing bars, longitudinally, as detailed in the
drawings. The bars shall be secured to each vertical reinforcing bar box. The longitudinal
bars shall overlap 12 inches, unless welded together, and shall be secured to each other in
a way to prevent movement.
17. When abutting a MH or building, Contractors shall provide dowel holes in each structure to enable the longitudinal reinforcing rods to penetrate the structure far enough as to prevent vertical and horizontal shearing of the ductbanks from the structure. Contractors shall not penetrate the wall with these holes. Contractors may need to provide and install additional reinforcing rods to provide this type of anchoring around MH window knock-outs.

D. Concrete Encasement
1. When encasing a ductbank, Contractors shall provide and install concrete around the conduits providing at least 3 inches of concrete around all side the conduit ductbank for the areas indicated on the drawing for complete encasement.
2. Contractors shall use appropriate methods to remove air pockets from the concrete and to provide 100% fill around all conduits and spacers.
3. Contractors shall fully encase any ductbanks that penetrate a MH or building for the first 6 feet beyond the structure.
4. When transitioning from an encased ductbank to a capped ductbank, Contractors do not have to frame the transition in cross-section, provided the required area is encased to a minimum of 3 inches. The concrete may slope down into the area to be capped. If the Contractors frame a transition point, the frame must be removed prior to installing aggregate around the conduits and installing the cap.
5. Contractors shall shape the top of the concrete in such a way as to slope water away from the ductbank-structure seams.

E. Cap Preparation and Installation
1. When capping a ductbank, Contractors shall provide and install filler sand around the conduits providing at least 3 inches of sand below and to the side of all conduits. Contractors shall not install filler sand above the top of the conduit ductbank.
2. Contractors shall use appropriate methods to remove air pockets from the sand and to provide 100% fill around all conduits and spacers.
3. Contractors shall install the filler sand to the side walls of the trench. Contractors shall compact filler sand to the sides of the conduits.
4. Contractors may provide and install framing on the compacted surface of the sand for pouring the concrete cap.
5. Contractors shall provide and install a 3 inch thick concrete cap over the conduits for the areas indicated on the drawing. Contractors shall use appropriate methods to remove air pockets from the concrete.
6. Contractors shall extend the cap horizontally to a minimum of 3” beyond the outer most conduits.
7. If the cap is framed, Contractors may use lesser-grade backfill material to cover the sand beyond the cap once the framing is removed.

F. Final Installation of New Pathway
1. Contractors shall clean all conduits by pulling cylindrical brushes until all dirt is removed. Contractors shall blow all conduits dry.
2. Contractors shall install Muletape pull strings into all conduits.
3. Contractors shall install a tracer wire in one of the conduits of a new pathway. In maintenance holes, handboxes, and entrance facilities, the tracer wire shall be bonded to ground. The wire shall be clearly labeled per Johns Hopkins OSP Admin Spec.

4. In maintenance holes, the tracer wire shall loop up to the neck such that it can be reached without entering the hole. The wire shall be securely anchored along the neck, ceiling and wall.

5. Contractors shall install duct plugs at both ends of all conduits.

G. Existing Ductbanks

1. Contractors may use conduits and/or innerducts within existing ductbanks as directed by Homewood Plant Operations. Where possible, used conduits with available innerducts or space shall be used.

2. When installing optical fiber into a 4” conduit without existing innerduct or cable, Contractors shall install three 1 ¼” OD innerducts.

3. When installing a 200 pr copper cable, or less, Contractors shall install two 1 ¼” OD innerducts with the cable. When installing larger copper cables, Contractors shall install one 1 ¼” OD innerduct, if possible.

4. Contractors shall use ribbed innerduct. Contractors may use corrugated innerduct only when necessary to make tight bends and then only as much as needed before making a transition to ribbed innerduct.

5. Contractors shall install Muletape pull strings in all innerducts.

6. Contractors shall install pre-formed duct plugs around innerducts and smaller compression-type duct plugs in the innerducts.

7. Contractors shall seal used conduits (when pre-formed plugs are not feasible) with a non-hardening, removable sealant (PT Tech DuckSeal Sealant) or with an expandable sealing bag (Tyco T-DUX). Expanding foam products designed specifically for duct sealing (e.g. 3M Part #4416 Duct Sealant Kit) may only be used on conduits considered to be at capacity by Homewood Plant Operations.

8. Innerducts shall not extend beyond six inches from the end of the conduit.

9. Contractors shall replace any Muletape pull strings installed in conduits subsequently removed during installation, including outside of newly installed innerducts. Muletape pull strings in innerducts used to pull a cable does not need to be replaced.

H. Tunnel Pathways

1. Tunnel pathways are considered spaces under this specification. Refer to the latter section for specifications.

I. Direct-buried Pathways

1. Direct-buried pathways shall not be used for permanent installations.
SECTION 27 0553

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1  GENERAL

1.01 REFERENCES
A. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS
A. Designers shall refer to the Johns Hopkins Administrative Specification for Cable Plant Labeling and Records for labeling guidelines.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section 27 1113 - Communications Entrance Protection
B. Section 27 1116 - Communications Cabinets, Racks, Frames, and Enclosure
C. Section 27 1119 - Communications Termination Blocks and Patch Panels
D. Section 27 1123 - Communications Cable Management and Ladder Rack
E. Section 27 1126 - Communications Rack Mount Power Protection and Power Strips

1.02 RELATED SECTIONS

A. Section 07 8400 - Firestopping
B. Section 08 7411 - Electronic Locking Hardware
C. Section 09 6717 - Floor Coatings
D. Section 09 6900 - Access Flooring
E. Section 27 0000 - Communications General.
F. Section 27 1000 - Structured Cabling.
G. Section 27 2000 - Data Communications.
H. Section 27 3000 - Voice Communications.
I. Section 27 4000 - Audio-Visual Communications.
J. Section 27 5000 - Distributed Communications and Monitoring Systems.

1.03 REFERENCES

A. See Section 01 4219 - Reference Standards.

1.04 DEFINITIONS

A. Building Distributor (BD): A room from which intrabuilding backbone cables distribute to floor distributors. May also be a floor distributor if horizontal cables terminate within it. May also be an equipment room if PBX or core network electronics are present.

B. Building: All structures that include an OSP element that are not defined as spaces. These may include structures not normally occupied, such as storage sheds and athletic field grandstands.

C. Entrance Facility (EF): A room into which inter-building backbone cables enter. Cables may or may not terminate in this room. Most often, an EF is the BD

D. Equipment Room: A room containing voice and data electronics. Reserved for rooms with enough electronics to impact space and cooling requirements (rooms with PBX hardware or core network electronics).

E. Floor Distributor (FD): A room into which horizontal cable terminates. May be any of the above rooms as well. An FD with minimal switches to support the horizontal cables only is usually not considered an equipment room.
F. Network Room (NR): A generic term for an of the above terms. The preferred term, unless a more specific term is needed to better define specific requirements for the room.

G. See Section 27 0000: Communications General.

1.05 PROJECT CONDITIONS

A. Johns Hopkins entrance facilities are not classified as permit-required confined spaces by the Johns Hopkins Safety Office. Entrance facilities in mechanical spaces may pose dangers related to other utilities within the room (e.g., high voltage and steam). Personal protective equipment is strongly recommended and shall be the responsibility of the Contractors.

B. There are often other utilities or pre-existing communication services in entrance facilities. Contractors shall not disturb other utilities or pre-existing communication services.

PART 2 PRODUCTS

2.01 Plywood

A. 3/4” unpainted, fire-rated plywood

1. Class 1 (or A) per ASTM E84-01 Standard Test Method for Surface Burning Characteristics of Building Materials

2. Treated with:
   a. DRICON (Arch Wood Protection, Inc.)
   b. D-Blaze (Chemical Specialties, Inc.)
   c. FirePRO (Osmose, Inc.)

3. Allowable substitutions must not be significantly more corrosive to metals than untreated plywood under AWPA E12-94 Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.

B. 3/4” A/C-grade, void-free plywood

2.02 Paint

A. Intumescent

1. ASTM E84(UL 723) “Surface burning characteristics of building materials” Class “A” rating

2. ASTM E119(UL 263) “Fire tests of building construction and materials” certified.
   a. Hy-Tech Flame Guard Additive for interior flat latex paint
   b. PPG Pittsburgh Paint Firetex
   c. Benjamin Moore 220 Latex Fire Retardant Coating
   d. Sherwin Williams Flame Control

2.03 Conduit

A. Galvanized rigid steel conduit and fittings,

1. 4” trade size, manufactured to:
   a. ANSI C80.1 (Specification for Rigid Steel Conduit, Zinc Coated)
   b. Underwriters Laboratories Standard 6 (Electrical Rigid Metal Conduit – Steel)

B. Galvanized intermediate metal conduit and fittings,
1. 4" trade size, manufactured to:
   a. ANSI C80.6 (Intermediate Metal Conduit (IMC) Zinc Coated)
   b. Underwriters Laboratories Standard 1242 (Type IMC threaded and unthreaded conduit, nipples, bends, and couplings in 1 to 4 inch trade size)

C. Electrical metallic tubing (EMT) and fitting,
1. 4" trade size, manufactured to:
   a. ANSI C80.3 (Electrical Metallic Tubing – Zinc Coated)
   b. Underwriters Laboratories Standard 797 (Electrical Metallic Tubing- Steel)

2.04 Miscellaneous
A. Hopper Bins
1. Plastic or fiberglass, stackable
2. 100 pound capacity per bin
3. Front access to stacked bins
4. Large- 16.5 in (W) x 17.5" in (D) x 12.5" (H)
5. Small- 10.875 in (W) x 17.5" in (D) x 12.5" (H)
   a. Large- Hopper bin- NR652734BL (blue)
   b. Small- Hopper bin- NR652733xx (xx = GN - green; BG - beige; RD - red)

PART 3 EXECUTION
3.01 INSTALLATION
A. Entrance Facilities
1. OSP cables entering buildings shall adhere to NEC (1999) 800.50 (or its successor) requirements for conduit, if OSP cables need to extend beyond 50 feet or one floor.
2. The Contractor shall provide sufficient small, beige hopper bins for optical fiber cross connect storage. The Contractor shall provide sufficient small, green hopper bins for Category 6 copper patch cords. The Contractor shall provide sufficient small, black hopper bins for Category 5e patch cords. The Contractor shall provide sufficient small, red hopper bins for copper and optical fiber cables for security cross-connections. The Contractor shall provide for separate bins for separate length cables, with the exception of security cables which may be pooled.
B. Network Rooms
1. Network rooms shall be prepared with respect to power, entry pathways (cable tray, inter-floor sleeves, and building entrance conduits), plywood backboards, and other environmental conditions.
2. The Contractor shall provide hopper bins under the same requirement as an entrance facility as stated above.
3. Plastic or metal cable ties shall not be used in the network rooms. Velcro cable ties shall be used. Armored OSP cables are the only exception to this specification.
4. Service loops shall be secured to the wall in each location in an unobtrusive manner. Service loops shall not block access to other cables, utilities, or otherwise accessed structures (e.g. shut-off valves, meters, etc.). Service loops shall not rest horizontally on cable trays.

5. Fire-rated plywood shall not be painted. The plywood shall be anchored every two feet around the perimeter of the board only (no anchors greater than 6" from an edge) with galvanized or stainless steel anchors.

6. A/C-grade plywood shall be painted on both sides and all edges, twice, before mounting. Paint with a light colored intumescent paint.

C. Pathways

1. The Contractor shall install innerduct to protect unarmored optical fiber intra-building backbone cables.

2. Innerduct containing backbone cabling shall end with two feet of cable tray in network rooms. The innerduct may be shortened as needed to accommodate service loops.

3. Secure the innerducts to the wall of network rooms to prevent horizontal movement of the cable (D-rings are acceptable). Secure the cables to the wall in a non-deforming manner to prevent vertical movement of the cable. Plastic cable ties with screw-mounted (not adhesive-mounted) wall mounts are acceptable in this application.

4. The Contractor shall end the innerduct with two feet of the cable tray as shown on the attached drawings. The Contractor may shorten innerduct as needed to accommodate service loops.

5. The Contractor shall secure the innerduct to the back of the rack. The Contractor may secure the innerduct outside of the cable tray to facilitate bending the innerduct into the top of rack. Metal or plastic cable ties with screw-mounted (not adhesive-mounted) wall mounts are acceptable in this application.

END OF SECTION
SECTION 27 1113
COMMUNICATIONS ENTRANCE PROTECTION

PART 1 GENERAL

1.01 RELATED SECTIONS
A. Section 27 0526: Grounding and Bonding for Communications Systems.

1.02 REFERENCES
B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS
A. See Section 27 0000: Communications General.

1.04 DESIGN REQUIREMENTS
A. All OSP cables entering any building shall be properly protected and bonded to ground. Johns Hopkins University does not accept the exceptions to NEC (1999) 800.30(A) (or its successor) in that all communications circuits are to be considered potentially exposed. Special circuits to external devices may be exceptions, if pre-approved by Homewood Plant Operations.
B. Designers shall specify building entrance terminals (BET) and protector modules of the type and manufacturer specified by this document.
C. Design for multiple BETs such that grounding conductors connecting them are straight. Design BETs such that grounding conductors connecting them to the TMGB are as straight as possible.
D. Do not specify BETs to be inter-connected with horseshoe-shaped conductors. For multiple columns or rows of BETs, each column or row shall be connected to the EF busbar in as straight a fashion as possible.

PART 2 PRODUCTS

2.01 MATERIALS
A. Building Entrance Terminals
   1. 710 module or 110-style block on the "in" side
   2. 110-style block on the "out" side
   3. Fully enclosed housing covering terminations and modules
   4. Manufacturer
      a. Circa
      b. No substitutions
B. Building Entrance Terminal Modules
   1. PTC (positive temperature coefficient) version
   2. Manufacturer
      a. Circa, C4B1E(PTC)
      b. No substitutions
C. Other materials as needed to connect to the telecommunications grounding system.
PART 3  EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Contractors shall install multiple BETs such that grounding conductors connecting them are straight. Contractors shall install BETs such that grounding conductors connecting them to the TMGB are as straight as possible.

C. Contractors shall not inter-connect BETs with horseshoe-shaped conductors. For multiple columns or rows of BETs, each column or row shall be connected to the entrance facility busbar in as straight a fashion as possible.

D. The Contractor shall not connect more one BET to another BET beyond the TBB connection. Manufacturer requirements shall be followed and allow for a single BET to act as a “hub” for other BETs, but not beyond a second tier.

END OF SECTION
SECTION 27 1116

COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURE

PART 1 GENERAL

1.01 test text

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. The designer shall prepare rack layouts showing the placement of all equipment within each rack.
B. Typical racks shall be 7 ft high and have 19” rail spacing. The designer shall create network room layouts based on actual dimensions of approved products. The preferred equipment rack is the Ortronics Mighty-Mo 6 rack or the Middle Atlantic rack. The preferred equipment cabinet is the Ortronics cable management cabinet or the Chatsworth MegaFrame. Racks to contain Cisco Catalyst core switches or other large equipment requiring forward and rear attachment points to an open rack should be mounting into Ortronics racks. This equipment can be mounting in Ortronics or Chatsworth cabinets.
C. Security cabinets for video surveillance or access control systems shall be Chatsworth MegaFrames.
D. Berk-Tek/Ortronics Horizontal Cable Installation
1. Middle Atlantic racks/enclosures shall use Chatsworth or Ortronics cable management products.
2. Chatsworth racks/enclosures shall use Chatsworth cable management products.
3. Ortronics racks/enclosures shall use Ortronics cable management products.
E. Belden/CDT Horizontal Cable Installation
1. Middle Atlantic racks/enclosures shall use Chatsworth cable management products.
2. Chatsworth racks/enclosures shall use Chatsworth cable management products.
F. Smaller installations may be designed to use wall-mount cabinets or enclosures, provided the initial installation does not exceed 50% of the vertical rail space.
G. Equipment rooms needing higher security may be designed to use Ortronics Mighty Mo Cable Management Cabinets.
H. Equipment cabinets require one full louver door on front and back, a minimum one fan rack unit, and two 5 inch grommet holes in each side and top protected with plastic or rubber edging.
I. Ground equipment racks as specified under Section 27 0526 Grounding and Bonding for Communications Systems.
J. Specify power outlet strips in the equipment racks. Plug power outlet strips into power receptacles provided by the University.
K. Specify all wire management rings, ladder rack, brackets, wire management panels which, in the sole judgment of Johns Hopkins shall be required for a neat and workmanlike installation.

L. Plastic or metal cable ties shall not be used in the network rooms. Velcro cable ties shall be used.

M. The Designer shall specify the use of vertical and horizontal wire management on rack configurations. When configuring multiple racks in a line, the vertical cable management between racks shall be the larger size, while the smaller channels may be used at the ends. If future racks are anticipated, do not down-size the end likely to receive another rack.

N. Equipment cabinets require one full louver door on front and back, a minimum one fan rack unit, and two 5 inch grommet holes in each side and top protected with plastic or rubber edging.

O. Ground equipment racks as specified under Bonding and Grounding.

P. Specify power outlet strips in the equipment racks. Plug power outlet strips into power receptacles provided by the University.

Q. Specify all wire management rings, ladder rack, brackets, wire management panels which, in the sole judgment of Johns Hopkins shall be required for a neat and workmanlike installation.

R. Plastic or metal cable ties shall not be used in the network rooms. Velcro cable ties shall be used.

PART 2 PRODUCTS

2.01 MATERIALS

A. Racks and Rack Accessories

1. Ortronics

   a. Mighty-Mo 6, 7' high, 19" rails, 16.25" deep channel

   1) Horizontal cable management:

      (a) Ortronics Cable Management Panel With Cover, 2U, (OR-MM6HMF2RU)

   2) Vertical cable management:

      (a) Ortronics MM6 Vertical Cable Management "Cage", with door, 6" x 8" x 7", black (OR-MM6VMD706)

      (b) Ortronics MM6 Vertical Cable Management "Cage", with door, 10" x 13" x 7", black (OR-MM6VMD710)

2. Middle Atlantic Products

   a. MK Series Cable Management Rack, 7' high, 19" rails, 14" deep channel (MK-1945-24)

   1) Horizontal cable management:

      (a) Chatsworth Universal Horizontal Cable Manager, 2U, (30130-719)

   2) Vertical cable management:

      (a) Chatsworth Global Vertical Cabling Section, with door, 6"W x 7"H x 9.30"D, (12833-703)

      (b) Chatsworth 2"-Diameter Fiber Management Spools for 2.5" pass-through holes, package of 7 (12766-707)

B. Short Racks and Rack Accessories

1. Chatsworth

   a. Short Rack- Universal Rack

      1) Height below 7 feet (3 feet to 6 feet-6 inches)

      2) 19" rails

      3) black
C. Cabinets

1. Ortronics
   a. Mighty Mo Cable Management Cabinet
   b. 24" or 36" deep
   c. 19" rails
   d. Size as needed, not to exceed 50% initial capacity
   e. Black

2. Chatsworth Products
   a. M-Series MegaFrame Cabinet
   b. 30", 36", or 39" deep (30" for security cabinets)
   c. 19" rails
   d. Size as needed, not to exceed 50% initial capacity
   e. Black

D. Wall-mount Cabinets

1. Full-depth Cabinets
   a. Ortronics
      1) Mighty Mo Wall Mount Cable Management Cabinet
      2) 12, 16, or 21 U rails
      3) Black
      4) Size as needed, not to exceed 50% initial capacity
   b. Chatsworth Products
      1) M-Series 48" MegaFrame Cabinet
      2) 24", 30", or 36" deep
      3) 19" rails
      4) Size as needed, not to exceed 50% initial capacity
      5) Black

2. Shallow enclosures
   a. Hubbell REBOX
      1) Model RE2 - 2U for switches, 2U for patch panel
      2) Model RE4 - 5U for switches, 4U for patch panels
      3) Fan kit (2 for RE4; 1 for RE2)
      4) Fitted with standard locking hasp to receive full size padlock
   b. Chatsworth Wall-Mount Enclosure
      1) Part number: AAT-AWM-H
      2) Size: 42"W x 24"H x 7.5"D
      3) Space for a single 100 pair 110 style termination block, a single 6-port fiber optic adapter panel, two 19" x 2U spaces for patch panels or other panel mount termination hardware and one 19" x 3U space for active components up to 18" in depth
   c. Middle Atlantic Products
      1) WRP Series Low-Profile Wall Cabinet
      2) Black with solid cover
3) Model WRS-x (x=4, 6, or 8 - equals rack space in standard U)
4) Two fans: QFAN, 4.5” fans

E. Accessories
1. HellermannTyton- Flexiform Grommet
2. Middle Atlantic Products- protective grommet (GR-30)
3. or similar product

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall install open racks as shown in drawings by securely fastening the rack to the deck.
B. The Contractor shall provide horizontal cable management above and below the housing, as needed for a single management unit above and below the housing, dependant on final placement of the housing.
C. The Contractor shall securely fasten side-by-side racks to each other using rack manufacturer hardware.
D. The Contractor shall provide and install rack parts as shown on drawings provided by the designer.
E. The Contractor shall bag and leave attached to the rack any unused mounting screws or other hardware upon completion.
F. Provide vertical and horizontal cable management sized for no more than 40 percent fill.
G. Mount with minimum of 36 inches clear access behind and in front of rack/cabinet.
H. Ground rack/enclosure to TMGB/TGB with Grounding Wire.

END OF SECTION
SECTION 27 1119

COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. Horizontal Copper Rack Terminations

1. All horizontal cables shall be terminated in the T568B pin/pair configuration. All four pairs shall be terminated.
2. Cables shall be neatly dressed to their respective patch panel and within rack cable management using Velcro cable ties and/or rack cable management loops. Cables shall not be bundled outside of a rack, but shall be loose and random in cable tray.

B. Fiber Rack Terminations

1. Terminate the fiber on a rack mounted patch panel. All fiber-optic connecting hardware shall support individually terminated fibers onto the connectors. Adapter panels shall be limited to a single type of fiber (multimode or single mode).
2. Optical fiber cable shall be terminated in an appropriately sized, rack mountable enclosure. These enclosures shall be lockable (if room access is not controlled) and shall be of a sealed design to prevent the accumulation of dust, dirt and moisture in the panel. All optical patch panels shall meet all requirements set forth in the ANSI EIA/TIA-568-A wiring standard for connecting hardware. Termination panels shall be mounted in the top of the rack or cabinet.
3. The preferred fiber distribution housing is the Corning Pretium housing line.

C. Wall Mounted Terminations

1. Specify the installation of 110 blocks for wall field terminations. No wall-mounted hardware, including cable management, shall be above 5’6” from the finished floor.
2. Cable management troughs shall be installed such that all cross-connect wires may be installed within the troughs.
3. The Designer shall provide a detailed wall field layout for installation.
4. Cable management may move as needed to accommodate conditions.
5. A clear space of 5” to 6” above and below the top and bottom of the connecting hardware shall be maintained for cable handling.
6. Service loops shall be secured to the wall as needed and in an unobtrusive manner. Service loops shall not block access to other cables, utilities, or otherwise accessed structures (e.g. shut-off values, meters, etc.). Service loops shall not rest horizontally on cable trays.
7. Wall fields shall be designed to minimize the need to work behind equipment racks. Busbars and BETs can be readily located behind equipment racks while 110 block should be more accessible.

8. Wall field elements shall be 3 ft or more from any electrical service panels. Pathways within the space shall keep this clearance when possible.

PART 2 PRODUCTS

2.01 MATERIALS

A. Copper Terminations

1. Category 6 patch panels.
   a. Belden/CDT
      1) GigaFlex PS6+ Patch Panels, 48 port (AX101613)
   b. Ortronics
      1) Clarity6 Category 6 Patch Panels, 48 port, 8 port modules (OR-PHD68U48)

2. Category 5e patch panels.
   a. Belden/CDT
      1) Patch Panels, 2 U, 48-port, 8 port modules ( )
   b. Ortronics
      1) Clarity5E Patch Panels, 2 U, 48-port, 8 port modules (OR-PHD5E8U48)

3. COAX patch panels.
   a. Belden/CDT
      1) Flex Patch Panel (AX101456)
      2) MDVO Multimedia module, black, video F (A0407002) for COAX
   b. Ortronics
      1) Coaxial Patch Panel, 32 port, 2U (OR-817007137)
      2) Field-defined TracJack Patch Panel Kit for 32 modules
      3) TracJack Module F Connector F/F (OR-63700006-00)

4. Wall Terminations
   a. Belden/CDT
      1) Category 5e 110 Wiring Block with legs (100-pair- AX100691; 300-pair- AX100692; kits with connection block have other part numbers)
      2) Connector Blocks (C4- AX100707, C5- AX100708)
      3) Cable Management Trough with legs (AX100706)
   b. Ortronics
      1) Ortronics Category 5e 110 Wiring Blocks with Legs (100 pair- OR-30200145; 300 pair- OR-3020007)
      2) Ortronics Connector Blocks
      3) 110 Jumper Trough with legs (OR-30200140)

B. Fiber Terminations

1. Intrabuilding Backbone Cabling
   a. Corning Cable Systems
      1) Rack-mount housing, Pretium Housing, 4U, 12 adapter panels (PCH-04U)
      2) Rack-mount housing, Pretium Housing, 1U, 2 adapter panels (PCH-01U)
3) Wall-mount housing, Wall-Mountable Building Terminal (WBT), lockable (WBT-024-L)

b. Adapter Modules
1) Corning Cable Systems, 12-fiber SC duplex panel (multimode- CCH-CP12-91)
2) Corning Cable Systems, 12-fiber SC duplex panel (single mode- CCH-CP12-59)
3) Corning Cable Systems, 12 LC duplex adapters multimode 62.5 micron, ceramic insert, composite housing (CCH-CP24-A8)
4) Corning Cable Systems, 12 LC duplex adapters, single-mode, ceramic insert, composite housing (CCH-CP24-A9)

2. Horizontal Cabling
a. Belden/CDT
1) Rack-mount housing, FiberExpress Rack Mount Patch Panels, 4U, black
2) Adapter panels, Universal Fiber Adapter Strips, 12 LC duplex, black
3) Adapter panels, Universal Fiber Adapter Strips, 12 Secure/Keyed LC duplex

b. Ortronics
1) Rack-mount housing, ORMMAC series, 4U
2) Adapter panels, Six Pack Adapter Panels, 6 dual LC, multimode (OR-615LCSM6)
3) Adapter panels, Six Pack Adapter Panels, 6 dual LC, single mode (OR-615LCSM6C)

20 C. All additional materials needed to properly terminate and secure cables, including but not limited to panel/plate connectors, grounding kits, strain-relief hardware, break-out kits, blank panels/plates, etc.

PART 3 EXECUTION
3.01 INSTALLATION

A. Horizontal Cable Rack Terminations
1. All horizontal cable shall be installed per manufacturer instructions to ensure a manufacturer certified solution.
2. The Contractor shall provide and install modular patch panels as shown on the attached drawings.
3. The Contractor shall terminate all horizontal cables in the T568B pin/pair configuration. All four pairs shall be terminated.
4. The Contractor shall neatly dress cables to their respective patch panel and within rack cable management using Velcro cable ties and/or rack cable management loops. Cables shall not be bundled outside of a rack, but shall be loose and random in cable tray.
5. Provide identification labels for each cable.

B. Optical Fiber Rack Terminations
1. The Contractor shall provide and install rack-mounted optical fiber housings as shown on the attached drawings.
2. The Contractor shall terminate all fibers using dual SC connector panels/plates and fiber connectors.
3. The Contractor shall place all fiber slack neatly in the fiber housing.
4. The Contractor shall secure cable strength members to cable strain relief brackets or attachment points within the fiber housing.
5. The Contractor shall install blank panels/plates to fill all empty locations within fiber housings.

6. The Contractors shall install additional materials needed to properly terminate and secure the inter-building and intra-building optical fiber cables, including but not limited to panel/plate connectors, grounding kits, strain-relief hardware, break-out kits, blank panels/plates, etc.

7. Provide identification labels for each adaptor.

C. Wall Termination Fields

1. All wall field terminations shall be installed per manufacturer instructions to ensure a manufacturer certified solution.

2. The Contractor shall install 110 blocks and protectors as shown in the attached drawings. No wall-mounted hardware, including cable management, shall be above 5’6” from the finished floor.

3. Cable management troughs shall be installed such that all cross-connect wires may be installed within the troughs. Final installed locations may change during installation. Wire management shall be adjusted appropriately during installation.

4. The Contractor may move cable management as needed to accommodate conditions. Cable management will remain continuous for cross-connects between protectors and 110 blocks.

END OF SECTION
SECTION 27 1123

COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 0528.14 - Cable Trays for Communications

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

PART 2 PRODUCTS

2.01 Cable tray products specified in Section 27 0528.14 - Cable Trays for Communications

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall provide and install additional cable tray in network rooms as shown on the drawings. The Contractor may adjust the cable tray size as appropriate for the total cables installed.
B. The Contractor shall provide and install hardware to maintain bend radii of cables at changes in direction of the cable tray.
C. The Contractor shall secure cable tray to permanent building structures.
D. The Contractor shall cover the bottom 1 foot of any cable tray all-thread support rods with conduit to prevent cable rub damage.
E. Coordinate exact placement with other trades.
F. Size supporting devices to withstand cable weight plus 60 percent future fill.
G. Cut and install per manufacturer’s recommendations.
H. Bond and ground to TMGB/TGB with Grounding Wire. Sections: Bolted together or tied together with Grounding Wire running entire length of cable support system.
I. Maintain bend radius for fiber optic and copper cables when transitioning to/from cable support system.

END OF SECTION
SECTION 27 1126

COMMUNICATIONS RACK MOUNT POWER PROTECTION AND POWER STRIPS

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. Coordinate type of power strip with Networking based on their anticipated equipment.
B. Not all network racks shall have an uninterrupted power supply. Coordinate a UPS with Networking.
C. Networking shall specify and install a UPS. Design racks to accommodate the space required for a UPS at the bottom of the rack.
D. A second power strip may be necessary to accommodate transformer equipment such as media converters or power injectors.
E. Environmental monitoring
   1. Environmental monitoring units shall be installed in all network rooms. In a row of three or fewer open racks, a single unit shall be installed. For larger rows, one unit shall be installed in every third rack.
   2. Environmental monitoring units with power outlets may be installed. Environmental monitoring units may be installed as rack-mount units with separate power outlet strips.
F. Uninterrupted power supplies
   1. Security cabinets for video surveillance or access control systems shall have Minuteman UPS units with additional battery capacity.

PART 2 PRODUCTS

2.01 MATERIALS

A. Horizontal rack-mount power strips
   1. Standard rack-mount for 19" rails
   2. 125 volt, type NEMA 5-15P
   3. Maximum output- 15 amp rating with 15 amp breaker
   4. UL-1449 rating
   5. Cord length- 10 feet or longer, 5-15P plug
   6. Mounting- 19" rack-mount, recessed or rear recepticals
   7. Manufacturers -
      a. Geist Manufacturing, Inc. - SP104-10 - standard power strip (10 outlets)
b. Geist Manufacturing, Inc. - SP104-10TL - standard power strip (10 outlets), twist-lock plug (L5-15P)
c. Geist Manufacturing, Inc. - SPT064-10 - transformer power strip (6 rotated outlets)
d. Geist Manufacturing, Inc. - SPT064-10TL - transformer power strip (6 rotated outlets), twist-lock plug (L5-15P)
e. Other acceptable manufacturers offering equivalent products

B. Vertical rack-mount power strips

1. Recepticals- 125 volt, type NEMA 5-20R
2. Maximum output- 20 amp rating for each circuit with 20 amp breakers
3. UL-1449 rating
4. Cord length- 10 feet or longer, 5-20P plug
5. Mounting- mounting brackets for standard rack
6. Manufacturers -
   a. Geist Manufacturing, Inc. - VSSA104-102S20 - 10 outlets, 39"
   b. Geist Manufacturing, Inc. - VSSA104-102S20 - 10 outlets, 39", twist-lock plug (L5-20P)
   c. Geist Manufacturing, Inc. - VSSB204-102S20 - 20 outlets, 66"
   d. Geist Manufacturing, Inc. - VSSB204-102S20 - 20 outlets, 66", twist-lock plug (L5-20P)
   e. Other acceptable manufacturers offering equivalent products

C. Environmental monitoring units

1. Horizontal power strip unit
   a. 10 outlets NEMA, 15 amp, 19" horizontal, 5-15P power cord plug
   b. Geist Manufacturing, Inc. - RacSense RSMRN102-101D15ST5
   c. Geist Manufacturing, Inc. - RacSense RSMRN102-101D15TL5, twist-lock plug (L5-15P)
   d. No other manufacturers allowed.

2. Vertical power strip unit
   a. 20 outlets NEMA, 20 amp, 66" vertical, 5-20P power cord plug
   b. Geist Manufacturing, Inc. - RacSense RSMBN202-102S20ST5
   c. Geist Manufacturing, Inc. - RacSense RSMBN202-102S20TL5, twist-lock plug (L5-20P)
   d. No other manufacturers allowed.

3. In-line monitor
   a. 15, 20, or 30 amp in-line unit
   b. Select model appropriate for UPS power requirements and plug types
   c. Geist Manufacturing, Inc. - RacSense RSML series
General Specification, v.2.01

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Power strips and uninterrupted power supplies shall be mounted such that the recepticals face the rear of the rack.

C. Contractor shall install UPS components as directed by the owner at the time of installation. UPS components shall be mounted in the lowest rack position. Additional battery packs shall be connected to the primary UPS per manufacturer's instructions.
D. No power cords shall exit an enclosure through a door opening. Power cords shall exit through knock-outs on top or from underneath the enclosure, provided the cord and plug can pass beneath the enclosure sides and/or door frame without having to lift the enclosure.

E. Power cords shall be secured such that they do not pose a trip hazard and cannot otherwise be accidentally disconnected.

END OF SECTION
SECTION 27 1313

COMMUNICATIONS COPPER INTRABUILDING BACKBONE CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.
G. Section 33 8213: Copper Communications Distribution Cabling (Interbuilding Backbone Cabling).

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. The Information Transport System backbone cabling system shall be designed to conform to the requirements of ANSI/EIA/TIA-568-B. In conformance with this standard, the cabling system shall be designed in a hierarchical star topology.
B. Copper cables from BETs to termination wall fields are considered intrabuilding backbone cables.
C. Copper backbone cables shall be Category 3 multi-pair copper cable, 24 AWG, ARMM riser-rated cable. This shielded, non-plenum cable shall consist of solid-copper conductors insulated with expanded polyethylene covered by a PVC skin, be conformance tested to meet EIA/TIA 568A for Category 3 cables, be UL® tested and UL® listed as CMR. The sheath shall have improved frictional properties, allowing it to be pulled through conduit without the use of lubricants. The cable shall be available in 25, 50, 100, 150, 200, 300, 400, 600, 900, 1200, 1500, and 1800 pair counts.
D. For all cables, specify riser or plenum rated as required. Plenum-rated cables may be used, if network rooms are not "stacked" and horizontal pathways between rooms are necessary and pass through plenum spaces.
E. Secure all copper backbone cables to the network room wall to prevent horizontal movement of the cable (D-rings are acceptable). Secure the cables to the network room wall in a non-deforming manner to prevent vertical movement of the cable, preferably with a wire mesh grip. Use of the cable tray is permitted to route the ARMM cable to the 110 termination blocks.
F. Unless otherwise specified or noted, size backbone/tie cables based on 1.5 pairs/connected voice outlet plus 20 percent spare. Round up to next available pair sizing when doing calculations.
G. Copper intra-building backbone cables run entirely with stacked network rooms or within conduit can be unarmored. Otherwise, the cables shall be armored, including cables run in open raceways.

PART 2 PRODUCTS

2.01 MATERIALS

A. For all cables, the designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.

B. Intrabuilding voice cable
   1. 24 AWG copper
   2. Manufacturers
      a. Superior-Essex
         1) Category 3, CMR/CMP, ARMM
         2) Category 3, CMR/CMP
      b. Other acceptable manufacturers offering equivalent products

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. The Contractor shall use common vertical sleeve(s) for all copper intra-building backbone cables.

C. In the BD/FD, the Contractor shall provide a 10 foot service loop wall-mounted just below the cable tray.

D. In large telecommunications enclosures, the Contractor shall provide a service loop/coil of up to 10 feet as able to contain within the enclosure.

E. The Contractor shall secure all copper backbone cables to the network room wall to prevent horizontal movement of the cable (D-rings are acceptable). The Contractor shall secure the cables to the network room wall in a non-deforming manner to prevent vertical movement of the cable, preferably with a wire mesh grip. The Contractor may use the cable tray to route the cable to the 110 termination blocks.

F. The cable shall be continuous and without splices, except to attach to BETs.

G. Cables may be installed in conduit, cable support system, or in cable hangers 4 to 5 feet OC.

H. The Contractor shall not install backbone cables such that they lay on suspended ceilings, ceiling support structures, or other utilities within the ceiling (electrical conduit, HVAC ductwork, plumbing, etc.). Anchor cables to not interfere with other services or space access.

I. The Contractor shall bond to ground all cable shields and drain wires at each end.

J. The Contractor shall test and label all cables.

END OF SECTION
SECTION 27 1313.13

PART 1  GENERAL

1.01 REFERENCES
  B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
  A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS
  A. The cable shall be continuous and without splices, except to attach to BETs.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 27 1323

COMMUNICATIONS OPTICAL FIBER INTRABUILDING BACKBONE CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.
G. Section 33 8223: Optical Fiber Communications Distribution Cabling (Interbuilding Backbone Cabling).

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. The Information Transport System backbone cabling system shall be designed to conform to the requirements of ANSI/EIA/TIA-568-B. In conformance with this standard, the cabling system shall be designed in a hierarchical star topology.

B. The preferred fiber cable is Corning MIC optical fiber cable. This cable shall be armored or shall be routing in conduit or steel raceway. Substitutions to this cable shall be pre-approved by Johns Hopkins. Submit all specifications for substitution candidate to the Johns Hopkins contact prior to specification.

C. A single hybrid (multimode and single mode) cable is preferred, but individual cables (multimode and single mode) may be used. Hybrid cables shall be orange, if available.

D. Optical fiber cables shall meet or exceed all applicable national and local building fire code requirements. Fiber cables used in a return air plenum environment shall have an Underwriters Laboratories rating that meets or exceeds the requirements of NFPA 262-1985 and UL®-910. (OFNP) and (UL®) shall be printed every two (2) feet on the cable jacket. The optical fiber riser cable shall have an Underwriters Laboratories rating that meets or exceeds the requirements of UL®-1666 (OFNR) and (UL®) shall be printed every two (2) feet on the cable jacket.

E. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical and environmental requirements of this specification. The attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable. No nominal values will be acceptable.

F. Johns Hopkins does not follow the industry standard practice of reversing pairs in optical fiber termination. In all cases, the first strand of a termination module is blue. The complexity of the Johns Hopkins infrastructure and the past practices makes this requirement necessary.
G. Connections between any fiber optic patch panel shall be made with a pre-manufactured, fiber optic patch cord. All fiber optic jumper assemblies shall comply with the standards for both fiber optic cables and fiber optic connectors.

H. Fiber shall be installed with strain relief as outlined by BICSI methodologies.

I. A service loop of 20 feet is required at each BD and ER location. A service loop of 10 feet is required at all FD locations. Service loops shall be neatly secured a minimum of eight feet above floor level on an adjacent wall within the communications room.

J. Secure the cable to the cable tray using Velcro cable ties.

K. Secure the cables to the wall to prevent horizontal movement of the cable (D-rings are acceptable). Secure the cables to the wall in a non-deforming manner to prevent vertical movement of the cable, preferably with a wire mesh grip.

L. Optical fiber intra-building backbone cables run entirely within stacked network rooms, within metallic conduit, or within innerduct can be unarmored. Otherwise, the cables shall be armored, including cables run in open raceways.

M. Multi-Mode Fiber Characteristics
   1. All specified multi-mode fiber optic cable shall meet the following grade, attenuation and bandwidth characteristics.
      a. 62.5/125 micron, FDDI grade, Graded Index
      b. 3.0 dB/km @ 850 nm Maximum attenuation
      c. 1.5 dB/km @ 1300nm Maximum attenuation
      d. 160 MHz km @ 850nm Minimum bandwidth
      e. 500 MHz km @ 1300nm Minimum bandwidth

N. Termination panels/connectors for multimode fiber shall be beige in color.

O. Single mode Fiber Characteristics
   1. All specified single-mode fiber optic cable shall meet the following grade, attenuation and bandwidth characteristics.
      a. 8.3 to 9/125 micron
      b. 1.0 dB/km @ 1310 nm and 1550nm Maximum attenuation

   2. The termination panels/connectors for single mode fiber shall be blue in color.

P. Terminations and Connectors for Fiber Optic Cable
   1. Each strand of optical fiber cable shall be terminated with field installable, SC-compatible, ceramic tip mechanical and/or epoxy-type connector. Terminate the fiber on a rack mounted patch panel.
   2. Typical loss shall not exceed 0.2 dB with a maximum loss of 0.4 dB per connector using SC type connectors with 62.5/125 multi-mode fibers. Durability shall not be less than 0.2 dB change over 100 re-matings
   3. Single-mode connectors shall be PC angle polished at 4 to 12 degrees with back reflection of –40 dB or less.

PART 2 PRODUCTS

2.01 MATERIALS
A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.

B. Cable may be single mode/multimode hybrid cables where both fiber types are in a common outer sheath.

C. Multimode, 62.5/125 micron, tight buffered, plenum and/or non-plenum:
   1. Corning Cable Systems
      a. Premise Distribution Tight Buffered, MIC, orange
      b. Premise Distribution Tight Buffered, MIC, interlocking armored, orange

D. Single mode, 9/125 micron, tight buffered, plenum and/or non-plenum:
   1. Corning Cable Systems
      a. Premise Distribution Tight Buffered, MIC, yellow
      b. Premise Distribution Tight Buffered, MIC, interlocking armored, yellow

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. In the BD/FD the Contractor shall provide at least 10 feet of cable in a wall mounted service loop just below the cable tray.

C. In large telecommunications enclosures, the Contractor shall provide a service loop/coil of up to 10 feet as able to contain within the enclosure.

D. The Contractor shall secure the cable to the cable tray using Velcro cable ties.

E. The Contractor shall secure the cables to the wall to prevent horizontal movement of the cable (D-rings are acceptable). The Contractor shall secure the cables to the wall in a non-deforming manner to prevent vertical movement of the cable, preferably with a wire mesh grip.

F. The Contractor shall install fiber optic cable in conduit, cable tray or supported from building structure at 3 feet OC.

G. Johns Hopkins does not follow the industry standard practice of reversing pairs. In all cases, the first strand of a termination module is blue.

H. All optical fiber cables are to be continuous and without splicing. Optical fiber based MUTOAs are not considered splices.

I. Comply with manufacturers’ recommendations regarding pulling tension and allowable lubricants.

J. The Contractor shall be responsible for verifying actual footages and distances identified on attached prints (i.e. wall-to-wall, pullbox-to-pullbox and ER to network room).

K. The Contractor shall be responsible for verifying that conduits and raceways ready for occupancy before cable placement.

L. The Contractor shall assume responsibility for difficulties or damage to cable during placement.

M. Where fiber optic cable passes through vertical riser space or network rooms, secure fiber to wall vertically every 36 inches. Review fasteners, strain relief and routing with owner.

N. The Contractor shall test and label all cables.
END OF SECTION
SECTION 27 1323.13

COMMUNICATIONS OPTICAL INTRABUILDING FIBER SPLICING AND TERMINATIONS

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. The cable shall be continuous and without splices.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 27 1500
COMMUNICATIONS HORIZONTAL CABLING

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Section 27 1513 - Communications Copper Horizontal Cabling
B. Section 27 1523 - Communications Optical Fiber Horizontal Cabling
C. Section 27 1533 - Communications Coaxial Horizontal Cabling
D. Section 27 1543 - Communications Work Areas, Faceplates, and Connectors

1.02  RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.

1.03  REFERENCES

B. See Section 01 4219 - Reference Standards.

1.04  DEFINITIONS

A. See Section 27 0000 : Communications General.

1.05  SYSTEM DESCRIPTION

A. A single copper channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics NetClear solution or a Belden/CDT IBDN solution.
B. A single optical fiber channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics NetClearMM1 solution or a Belden/CDT IBDN FiberExpress solution.
C. See Section 27 0000 - Communications General for specific substitutions and conditions when designing and installing at APL or SPH facilities. These facilities use other manufacturers for horizontal cable systems.

1.06  DESIGN REQUIREMENTS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.
B. Horizontal cable shall be installed in a star topology. Each WAO shall be cabled directly to a floor distributor. The horizontal cabling shall be terminated in a room on the same floor as the WAO. Exceptions may be made for certain areas. Cables that must be routed through floors (poke-thrus, conduits, floor boxes, etc.) and utilize ceiling space on the level below may be
routed to the network room on the lower floor. This is a noted deviation from BICSI methodologies.

C. All cable, WAO, and network room equipment installation shall be in strict accordance with the methodologies contained in the latest BICSI Telecommunications Distribution Methods Manual, unless specifically noted by this document or other JH documentation specific to the project. This includes, but is not limited to cable attachments, firestopping, cable routing, equipment rack grounding & bonding, pulling tensions, and EMI protection methods.

D. All cables placed in a conduit shall not exceed the fill capacities as listed in the ANSI/EIA/TIA-569, even though the maximum fill quantities as listed in ANSI/NFPA 70 are less strict.

E. Upon entering the floor distributor, the cabling should be separated according to service application (voice, data, video), extended around the interior perimeter of the room via the specified cabling tray, and then routed to the floor at the furthest point of the appropriate service backboard for voice, data, or video. Smaller network rooms with cable tray extending directly from the wall penetration to the rack does not need to encircle the room; however, sufficient cable slack (10 ft.) needs to be accommodated. All added cables shall follow the established path.

F. Specify new cables, equipment, and supplies to provide a complete system. All products specified within this document by catalog/part numbers are for reference only. Designers shall not deviate from structured cabling components with respect to cable, connectors, or termination devices. Designers may substitute products of very similar nature with respect to support structure and other “non-conductor” elements of the cable plant. However, products that are substituted shall meet the electrical, mechanical, and safety characteristics of the specified product. Approved products within this document have undergone careful selection by JH and exclusion of other products may be intentional. Samples of the proposed substitutions shall be submitted prior to design and all materials shall be approved in advance by the University’s Project and Network Managers. Only written approval of substitutions will be allowed. Any substitutions without written approval are done at the risk of the designer. Unacceptable substitutions will be rejected without explanation or appeal.

G. Each type of material (fiber optic cable, equipment rack components and termination hardware) shall be the product of a single manufacturer unless approval is obtained from Johns Hopkins. Johns Hopkins project manager approval shall be obtained prior to specifying material.

H. All cables shall be one continuous piece without splices.

I. During renovations or MAC work, cables shall be installed within existing conduit, wire-ways or spaces when possible, and terminate at existing WAO locations. While the pathways should be re-used where possible, cabling components, with the exception of faceplates, shall be new. Existing faceplates with sufficient room for additional cable may be used.

J. Voice and data cables shall be defined by color and consistent throughout the building. Standard voice cables shall be white. Standard data cables shall be blue. Security and life safety cables shall be red or placed in red conduit.

K. It is the responsibility of the designer to determine before the design submission if plenum rated (CMP, MPP) cable is required for any part of this installation. Specify cables rated for plenum and riser use as required by the NEC.

L. Specify an unterminated Category 5e cable to an emergency phone location. Specify an unterminated Category 5e cable to the elevator machine room. These cables shall be terminated in the network room in keeping with other voice cables. Additional cabling may be necessary for these systems. The Designer will needed to determine this.
M. Specify installing pull strings with horizontal cables as the cables are pulled.

N. Specify placement of horizontal cables in cable trays in a random overlapping fashion. Cable ties in the cable tray shall not be used, except as needed to maintain bend radii when changing directions. Plastic or metal cable ties shall not be used, except to secure innerduct.

O. Specify all horizontal cable free of surface damage, kinks, excessive twists, and visible anomalies.

P. All horizontal cables shall be installed per manufacturer instructions to ensure a certified channel solution.

Q. All cables shall be installed, tested, labeled and documented as specified in this document.

R. Copper horizontal cable lengths:
   1. Horizontal cables from the FD to the WAO, shall be no longer than 295 ft. (90 m).
   2. Horizontal cables used for patch cords and cross-connect jumpers in the FD, shall be no more than 16 ft (5 m) long.
   3. There is a 33 ft (10 m) allowance for the combined length of patch cords and cables used to connect equipment at the WAO and FD.
   4. The combined sum of all the above components shall be no longer than 328 ft (100 m).

S. The horizontal data cables provided to each individual WAO shall consist of a 4-pair 100 ohm, Category 6, UTP cable and any one of the following depending on the needs of the occupants:
   1. 2-fiber 62.5/125 micron multimode optical fiber cable
   2. 75-ohm RG-6 cable for Video/CATV
   3. A second 100 ohm, Category 6, UTP cable
   4. If specific applications require other types of cabling, the other types may be installed.

T. The horizontal voice cables provided to each individual WAO shall consist of two 4-pair, 100 ohm, Category 5e rated cables. Single cable locations may be allowed for guest phones and wall phones.

U. Optical fiber (fiber-to-the-desktop) may terminate in each FD or may return to a single concentrated FD functioning as a BD for fiber to the desktop.

V. Two strand optical fiber “zipcord” shall not be used for horizontal distribution.

1.07 PROJECT CONDITIONS

A. Schedule work in a manner to complete above ceiling work/below raised floor work prior to tile/panel installation. In the event the contractor is required to remove tiles/panels, coordinate with Contractor and do not break or disturb grid.

PART 2 PRODUCTS

2.01 MATERIALS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions to ensure a manufacturer certified solution.

B. The Contractor shall provide and install pull strings with horizontal cables as the cables are pulled.

C. The Contractor shall only support horizontal cable by JHU-approved cable support devices specified above.

D. The Contractor shall install all cables such that they do not rest on any structure other than JHU-approved cable support devices specified above.

E. The Contractor shall place horizontal cables in cable trays in a randomly overlapping fashion. The Contractor shall not use cable ties in the cable tray, except as needed to maintain bend radii when changing directions.

F. The Contractor shall install all horizontal cable free of surface damage, kinks, excessive twists, and visible anomalies. Damaged cable shall be replaced at Contractor expense. Horizontal cables damaged by others during construction shall be replaced by the Contractor under unit pricing specified in bid documents.

G. No cabling shall be exposed, except when in cable tray or within a floor distributor. Raceway or conduit shall be used in the WAO spaces.

END OF SECTION
SECTION 27 1513

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1  GENERAL

1.01 RELATED SECTIONS

A. Section 27 1533 - Communications Coaxial Horizontal Cabling

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SYSTEM DESCRIPTION

A. A single copper channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics NetClear solution or a Belden/CDT IBDN solution.

B. See Section 27 0000 - Communications General for specific substitutions and conditions when designing and installing at APL or SPH facilities. These facilities use other manufacturers for horizontal cable systems.

1.05 DESIGN REQUIREMENTS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.

B. A typical WAO shall incorporate two Category 6, 8P8C outlets for data and two Category 5e 8P8C outlets for voice. Each outlet shall be designated by a different color (blue for data and white for voice).

C. Copper horizontal cable lengths:

1. Horizontal cables from the FD to the WAO, shall be no longer than 295 ft. (90 m).

2. Horizontal cables used for patch cords and cross-connect jumpers in the FD, shall be no more than 16 ft (5 m) long.

3. There is a 33 ft (10 m) allowance for the combined length of patch cords and cables used to connect equipment at the WAO and FD.

4. The combined sum of all the above components shall be no longer than 328 ft (100 m).

D. The horizontal voice cables provided to each individual WAO shall consist of two 4-pair, 100 ohm, Category 5e rated cables. Single cable locations may be allowed for guest phones and wall phones.

E. When cable runs are being installed, additional slack at both ends shall be left to accommodate any future cabling system changes.

1. The FD shall have 10 ft of cable slack.

2. The WAO shall have 12" of cable slack, installed above ceiling and not secured.

F. Conduits
1. Electrical nonmetallic tubing (innerduct or “Smurf tube”) and flexible metallic tubing shall not be used within the horizontal cable system.

G. Multi User Telecommunications Outlet Assembly (MUTOA)

1. Johns Hopkins will allow the limited use of MUTOAs. These installations shall be limited to areas of anticipated frequent reconfiguration of work areas.

2. MUTOAs may be integrated into modular furniture panels when the panels are specifically manufactured for this purpose.

3. MUTOAs must be ready accessible. MUTOAs shall not be installed above drop ceilings. MUTOAs shall be installed with an enclosure.

4. Designers must calculate and label MUTOAs with the maximum length of modular cord allowed at a specific MUTOA. Designers must de-rate the total length of the horizontal channel accordingly.

H. Consolidation Point

1. Johns Hopkins will allow the limited use of consolidation points. These installations shall be limited to areas of anticipated frequent reconfiguration of work areas.

2. Designers may incorporate consolidation points to feed smaller MUTOAs, including MUTOAs incorporated into modular furniture.

3. Consolidation points shall not be used to extend horizontal cables as part of move, adds, and changes. Consolidation points may be used to extend large bundles of cables when relocating entire network rooms. This application requires pre-approval.

4. Consolidation points shall be “110-block based” and shall be fully enclosed after installation to prevent dust contamination of the 110-blocks.

5. Consolidation points may be installed above concealed ceilings; however, they must be readily accessible. The ceiling must indicate the presence of the consolidation point by a marker on the ceiling grid stringers.

PART 2 PRODUCTS

2.01 MATERIALS

A. Unshielded twisted pair, 4-pair 100 ohm, Category 6, plenum and/or non-plenum, blue:

1. Berk-Tek
   a. Berk-Tek LanMARK 1000 Series (Category 6)
   b. Berk-Tek LanMARK 2000 Series (enhanced Category 6)

2. Belden/CDT
   a. Belden/CDT 2400 Series (Category 6)
   b. Belden/CDT 4800LX Series (enhanced Category 6)

B. Unshielded twisted pair, 4-pair 100 ohm, Category 5e, plenum and/or non-plenum, white:

1. Berk-Tek
   a. LanMARK 350 Series (Category 5e)

2. Belden/CDT
   a. GigaFlex 1200 Series (Category 5e)
PART 3  EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. UTP cables pulled for data connections shall be blue. UTP cables pulled for voice connections shall be white. UTP cable pulled for security and life safety should be red.

C. Replace UTP cables that do not pass Category 6 or 5e testing, as required by the cable type.

D. Horizontal cables shall not exceed 90 m. Installation to remote locations in excess of 90 m. may be allowed with a de-rated capacity. Such installations must be pre-approved by Johns Hopkins.

E. The Contractor shall not untwist UTP cable pairs more than 0.5 inches when terminating.

F. The Contractor shall make use of raceways built into furniture for open office furnished work areas, when conditions previous described are met.

G. The Contractor shall not install cable in common cable hangers with speaker cables.

H. The Contractor shall maintain following clearances from EMI sources:
   1. Power Cable: 6 inches.
   2. Fluorescent Lights: 12 inches.
   3. Transformers: 36 inches.

I. Do not install cable with more than 25 lbf (110 N) pull force, per ANSI/TIA/EIA and BICSI TDMM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on; long pulls inside conduit, pulls of multiple cables into single small bore conduit, on conduit runs greater than 100 linear feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use tensile rated cords (i.e. fishing line) for difficult or questionable pulls - to judge to go/no-go condition of conduit and pulling setup.

J. The Contractor shall firestop all openings and penetrations through fire and smoke rated wall and floor assemblies.

K. Multi User Telecommunications Outlet Assembly (MUTOA)
   1. The Contractor shall fully enclose MUTOAs to prevent dust contamination of the 110-blocks.
   2. MUTOAs must be labeled for maximum length of modular cables. If MUTOAs are not labeled, the Contractor shall consult the designer for this value and shall label the location appropriately.

L. Consolidation Point
   1. The Contractor shall fully enclose consolidation points to prevent dust contamination of the 110-blocks.

END OF SECTION
SECTION 27 1523

COMMUNICATIONS OPTICAL FIBER HORIZONTAL CABLEING

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 SYSTEM DESCRIPTION

A. A single optical fiber channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics GIGAlite solution or a Belden/CDT FiberExpress solution.
B. See Section 27 0000 - Communications General for specific substitutions and conditions when designing and installing at APL or SPH facilities. These facilities use other manufacturers for horizontal cable systems.

1.04 DESIGN REQUIREMENTS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.
B. Optical fiber (fiber-to-the-desktop) may terminate in each FD or may return to a single concentrated FD.
C. Fiber to the desktop shall be 50 micron multimode optical fiber, unless otherwise specified. Fiber installed with the intention of cross-connecting directly to intrabuilding or interbuilding backbone fiber must be 62.5 micron fiber.
D. Two strand optical fiber "zipcord" shall not be used for horizontal distribution when a round 2-strand cable of the same fiber is available from the manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.
B. 2-strand, tight-buffered, 50/125 micron multimode, plenum and/or non-plenum, orange:
   1. Belden/CDT
      a. FiberExpress FX2000, distribution series, round
   2. Berk-Tek
      a. GIGAlite-10, interconnect

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.

B. Install two-strand optical fiber cable with the blue strand on the left when facing the faceplate. Johns Hopkins does not follow the industry standard practice of reversing pairs in optical fiber termination.

C. Replace UTP cables that do not pass testing, as required by the cable type.

D. Horizontal cables shall not exceed 90 m. Installation to remote locations in excess of 90 meters may be allowed if using a centralized fiber distribution design. Such installations must be pre-approved by Johns Hopkins.

E. The Contractor shall make use of raceways built into furniture for open office furnished work areas, when conditions previously described are met.

F. Do not install cable with more than 50 lbf (220 N) pull force, per ANSI/TIA/EIA and BICSI TDMM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on; long pulls inside conduit, pulls of multiple cables into single small bore conduit, on conduit runs greater than 100 linear feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use tensile rated cords (i.e. fishing line) for difficult or questionable pulls - to judge to go/no-go condition of conduit and pulling setup.

G. The Contractor shall firestop all openings and penetrations through fire and smoke rated wall and floor assemblies.

H. Multi User Telecommunications Outlet Assembly (MUTOA)
   1. The Contractor shall fully enclose MUTOAs to prevent dust contamination.
   2. MUTOAs must be labeled for maximum length of modular cables. If MUTOAs are not labeled, the Contractor shall consult the designer for this value and shall label the location appropriately.

END OF SECTION
SECTION 27 1533

COMMUNICATIONS COAXIAL HORIZONTAL CABLELING

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 SYSTEM DESCRIPTION

A. A single copper channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics solution or a Belden/CDT solution as determined by the installed UTP system.
B. See Section 27 0000 - Communications General for specific substitutions and conditions when designing and installing at APL or SPH facilities. These facilities use other manufacturers for horizontal cable systems.

1.04 DESIGN REQUIREMENTS

A. For all cables, the Designers shall specify riser or plenum rated as required. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the Designer can specify plenum cable entirely to simplify the installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. 75 ohm, coax cable for video, plenum and/or non-plenum, white:
   1. Berk-Tek
      a. CATV grade, RG-6 Quad Shield Coaxial Cable
   2. Belden/CDT
      a. Broadband COAX CATV cable, quad shield

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. COAX cables shall be white.
C. Replace cables that do not pass testing, as required by the cable type.
D. Horizontal cables shall not exceed 90 m. Installation to remote locations in excess of 90 m. may be allowed with a de-rated capacity. Such installations must be pre-approved by Johns Hopkins.
E. The Contractor shall make use of raceways built into furniture for open office furnished work areas, when conditions previous described are met.
F. The Contractor shall not install cable in common cable hangers with speaker cables.
G. The Contractor shall maintain following clearances from EMI sources:
1. Power Cable: 6 inches.
2. Fluorescent Lights: 12 inches.
3. Transformers: 36 inches.

H. Do not install cable with more than 50 pounds (220 N) pull force. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on; long pulls inside conduit, pulls of multiple cables into single small bore conduit, on conduit runs greater than 100 linear feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use tensile rated cords (i.e. fishing line) for difficult or questionable pulls - to judge to go/no-go condition of conduit and pulling setup.

I. The Contractor shall firestop all openings and penetrations through fire and smoke rated wall and floor assemblies.

J. Multi User Telecommunications Outlet Assembly (MUTOA)
1. The Contractor shall fully enclose MUTOAs to prevent dust contamination.
2. MUTOAs must be labeled for maximum length of modular cables. If MUTOAs are not labeled, the Contractor shall consult the designer for this value and shall label the location appropriately.

END OF SECTION
SECTION 27 1543

COMMUNICATIONS WORK AREAS, FACEPLATES, AND CONNECTORS

PART 1 GENERAL

1.01 RELATED SECTIONS

1.02 REFERENCES


B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SYSTEM DESCRIPTION

A. A single copper and fiber channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics NetClear solution or a Belden/CDT IBDN GigaFlex solution.

B. See Section 27 0000 - Communications General for specific substitutions and conditions when designing and installing at APL or SPH facilities. These facilities use other manufacturers for horizontal cable systems.

1.05 DESIGN REQUIREMENTS

A. Design all work area outlets to ensure a manufacturer certified solution.

B. The typical WAO installation in an office environment shall incorporate two Category 6, 8P8C outlets for data and two Category 5e 8P8C outlets for voice near an office desk. Each outlet shall be designated by a different color (Blue for Data, White for Voice). Larger offices may include a single data and voice outlet for use at a conference table.

C. General locations shall use faceplates with 6-port capacity, using blank modules as needed. The designer shall specify the layout of all outlets within a faceplate to ensure consistency in the installation. For renovations, the designer should match the faceplate layout of the existing conditions in that it does not violate this specification. Single port specialty faceplates for wall phone locations are allowed.

D. Specify color-coded (white voice and blue data) outlets and designation shutters/doors.

E. The designer shall specify all 8P8C outlets to be terminated in the T568B pin/pair configuration. All four pairs shall be terminated.

F. Optical fiber shall be designed for termination on LC or SC connectors. Secure installations shall use Belden/CDT Secure/Keyed LC Connectors. LC connectors shall be used with 50 micron optical fiber. SC connectors shall be used with 62.5 micron optical fiber.

G. The designer shall not allow the use of single gang, surface-mount box with a standard faceplate. Surface-mount locations shall use shallow, wall-mount boxes with outlets on the side, not on the face, of the box.

H. When specifying a Belden/CDT solution, the designer shall specify Interface plates or MediaFlex plates, exclusively, for voice and data locations- excluding coax and wall phone locations. Specify one faceplate style for installation in the material list.

1.06 PROJECT CONDITIONS
A. Johns Hopkins facilities are health care, administrative, research, and educational facilities. As such, activities in all buildings are critical to the objectives of Johns Hopkins, its administration, faculty, staff, and student body. These objectives shall not be interrupted by the Contractor’s work activities. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. Unusually circumstances (e.g. voice cutovers) can occur and shall be declared and scheduled with as much notice as possible. Service disruptions, if needed, shall be at JH’s convenience and schedule.

B. Access within student housing is restricted to the immediate work areas. Contractors shall not enter other areas of the building without JHU escort, including hallways, loading dock areas, or other common areas. The Contractor shall coordinate access to work areas in which students reside with JHU and its housing office. Designers and Contractors may be required to have additional Contractor supervision and/or JHU supervision when working in student residences. Work in residential buildings that produces noise likely to be heard beyond the work area shall not take place prior to 8 AM.

C. Access within the medical campus is likewise restricted. Contractors and designers shall coordinate all activities within health care areas with Johns Hopkins. Designers and Contractors may be required to have additional supervision and/or JHU supervision when working in health care residences. The active cable plant associated with specific work and active cable plant beyond the construction area will not be disrupted at any time. All Contractors shall be prepared at all times to conduct emergency repairs to the cable plant in case of accidental disruption of the cable plant.

D. All work area outlets shall comply with ADA requirements for placement. Utility rooms and mechanical spaces are not required to follow ADA guidelines and locations shall be placed to the convenience of the mechanical systems and environment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Faceplates

1. Belden/CDT
   a. Interface Plate, white, 6-port (AX101441) or MediaFlex Faceplate Kit (AX101784)
   b. MDVO Faceplate, white, 1-port (A0405257) for single coax
   c. Stainless Steel plate, (AX1020x; 2-port x=07, 4-port x=09, 6-port x=10)
   d. Blank Insert, as needed

2. Ortronics
   a. Ortronics single gang, fog white, 6-port, TracJack faceplates (OR-40300545)
   b. Ortronics single gang, stainless steel TracJack faceplates (OR-4030045x; 2-port x=4, 4-port x=6, 6-port x=7)
   c. TracJack blank modules, as needed
   d. Ortronics Color Coded Designation Shutters on all modules (Blue- OR-20326155 for data; Fog White- OR-20309154 for voice)

B. Wall phone faceplates

1. Sprint Products Group
   a. Wall jack, 4 conductors, steel with studs (PT-630AD-4)
C. Surface mount interface box

1. Belden/CDT
   a. MDVO Side Entry Box, 2-port (A0645273)
   b. MDVO Multimedia Outlet Box, 6-port, white (A0643207)

2. Ortronics
   a. TracJack surface mount interface box, 2-port (OR-40400054)
   b. Surface mount box, Fog White, 6-port (OR-40400056)

D. Raceway faceplates and adapters:

1. Wiremold 4000 or 5000 series- Device Mounting Bracket with appropriate additional hardware

2. Raceway parts vary by manufacturer.

E. Connector Modules

1. Belden/CDT
   a. GigaFlex PS6+ modules, blue, 8P8C, 180° exit (AX101071) for data
   b. GigaFlex PSSE modules, white, 8P8C, 180° exit (AX101046) for voice
   c. MDVO Multimedia module, white, video F (A0407001) for COAX
   d. MDVO SC single fiber module, phosphor bronze insert, white (A0407005)
   e. MDVO LC dual fiber module, multimode, (AC300682)
   f. MDVO LC dual fiber module, single mode, (AC300686)
   g. MDVO Secure/Keyed LC modules, single mode, for secure installations
   h. MDVO Secure/Keyed LC modules, multimode, for secure installations

2. Ortronics
   a. Ortronics Clarity6 Category 6 TracJack modules, blue, 8P8C, 180 exit (OR-TJ600) for data
   b. Ortronics Clarity5E Category 5e TracJack modules, fog white, 8P8C, 180 exit (OR-TJ500) for voice
   c. Ortronics TracJack Module F Connector F/F (OR-63700006) for COAX
   d. SC connector modules
      1) Ortronics TracJack Module, SC, 1 fiber, 180° (OR-63700017)
      2) Ortronics TracJack Module, SC, 1 fiber, angled, 2 units high, 45° (OR-63700051)
      3) Ortronics TracJack Module, SC, 2 fibers, 180° (OR-63700015)
   e. LC connector modules
      1) Ortronics TracJack Module, 1-LC, 2 fiber, 180° (OR-63700039)
      2) Ortronics TracJack Module, 1-LC, 2 fiber, angled, 2 units high, 45° (OR-63700050)

3. Icons and Shutters
   a. Belden/CDT
      1) ID tab included with module, no extra parts required.
b. Ortronics
1) Ortronics Color Coded Designation Shutters, Blue- OR-20326155 for data.
2) Ortronics Color Coded Designation Shutters, Fog White- OR-20309154 for voice.

F. Masking Tape
1. 2" wide
2. 60-day clean release

PART 3 EXECUTION

3.01 INSTALLATION

A. When installing a Belden/CDT solution, install Interface plates or MediaFlex plates, exclusively, for voice and data locations- excluding coax and wall phone locations. Specify one faceplate style for installation in the material list.

B. The Contractor shall provide 12" of cable slack in in-wall, surface-mounted, and raceway boxes, provided the manufacturer's bend radius is not exceeded. Some of the slack may be pulled back into junction boxes, raceways, cable trays, or concealed ceiling space. Slack beyond the outlet box shall be easily pulled out of the box and shall not be secured with cable ties or otherwise secured beyond the box to prevent this.

C. The Contractors shall install outlet modules as shown on the drawings.

D. The Contractor shall install optical fiber outlet modules with the tab notch on top when mounting on a faceplate and with the tab in front when mounting on a surface-mount box. Install two-strand optical fiber cable with the blue strand on the left when facing the faceplate module. Johns Hopkins does not follow the industry standard practice of reversing pairs in optical fiber termination.

E. The Contractor shall terminate all 8P8C outlets in the T568B pin/pair configuration. All four pairs shall be terminated.

F. The Contractor shall provide and install blank modules in faceplates, as needed.

G. The Contractor shall install color-coded (shall match outlet color) designation shutters/ID tabs on all data/voice work area outlets. The Contractor shall install color-coded icon tabs (shall match outlet color) on all work area outlets. The Contractor shall cap all fiber connectors.

H. Wall phone installations
1. Install the 4-conductor plate, connecting the blue conductor to the red terminal and the blue/white conductor to the green terminal. Wrap the remaining conductors around the cable jacket- do not trim these conductors back to the jacket.
2. Johns Hopkins acknowledges that this is a deviation from ANSI/TIA/EIA and BICSI requirements and acknowledges that this installation is not within the parameters of any currently approved manufacturers' solutions for voice cabling. Johns Hopkins does not require a manufacturer's warranty on wall phone cable installations, but does expect the standard warranty of the installer with respect to workmanship and connectivity.

I. The Contractor shall cover all outlet openings and shutters with masking tape, if other construction is taking place in the area. Tape shall be applied with sufficient pressure to ensure up to 60 days of adhesion. Tape shall not wrap around the edges of faceplate or surface-mount box.

J. The Contractor shall install all outlets in a neat and professional manner to the satisfaction of JH.

K. The Contractor shall install outlets in layouts shown in the attached drawings.
01 L. The Contractor shall label outlets as shown on the drawings and specified below or per JHH Standard Specification.

03 M. Surface-mounted raceway and boxes are specified below.

04 N. All WAOs shall be installed per manufacturer instructions to ensure a certified channel solution.

END OF SECTION
SECTION 27 1619

COMMUNICATIONS STATION CORDS, PATCH CORDS, AND CROSS CONNECT WIRE

PART 1  GENERAL

1.01 RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SYSTEM DESCRIPTION

A. A single copper and fiber channel solution shall be installed for the entire project. Designers and/or installers shall select to install a Berk-Tek/Ortronics NetClear solution or a Belden/CDT IBDN GigaFlex solution.

1.05 DESIGN REQUIREMENTS

A. The designer shall specify the inclusion of one copper work area modular cord for each copper network outlet installed. The designer shall specify these cords to be left in the network room servicing the work area.
B. The designer shall specify the inclusion of one optical fiber work area modular cord for each network outlet installed. The designer shall specify LC-LC work area cords, LC-SC work area cords, or a combination of both. The designer shall specify these cords to be left in the network room servicing the work area.
C. Cross-connect jumpers and patch cords used to configure additions, moves, and changes shall meet the performance requirements described in ANSI/TIA/EIA-568-B. Jumpers, patch cords and equipment cords shall be rated at the same or higher performance category as the cabling to which it connects.
D. Cross-connect jumpers and patch cords shall not two-strand ends that are permanently mated as part of the connector. The two strands must be able to be reversed at active equipment or patch panels to correct any polarity issues.
E. Copper Patch Cords
   1. Specify sufficient patch cords (Category 6) to activate all data ports. The Designer shall specify the appropriate number of cords, boxed or bagged, in each network room.
      a. 90% of the patch cords, 4 ft. cords.
      b. 10% of the patch cords, 7 ft. cords.
2. The Designer may change this ratio based on the rack design.

F. Optical Fiber Patch Cords

1. The Designer shall specify optical fiber patch cords, bagged or boxed in the network room, as follows:

   a. 4 two-strand multimode, dual SC, 1 meter per data switch to be installed

   b. 4 two-strand single mode, dual SC, 1 meter per data switch to be installed

2. A patch cord, as used here, is dual strand “zipcord.”

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver all station cords to project site and store in network room(s).

B. Deliver all patch cords to project site and store in network room(s).

PART 2 PRODUCTS

2.01 MATERIALS

A. Copper Work Area (Station) Cords

   1. Belden/CDT

      a. GigaFlex PS6+ Modular Cord, white, 15ft (AX350047)

   2. Ortronics

      a. Clarity6 Modular Cord Category 6, white, 15ft (OR-MC615-09)

B. Copper Patch Cords

   1. Belden/CDT

      a. GigaFlex PS6+ Modular Cord, green (4 ft- AX350056, 7 ft- AX350057)

   2. Ortronics

      a. Clarity6 Modular Cord Category 6, green (3 ft- OR-MC603-05, 7 ft- OR-MC607-05)

C. Optic Fiber Work Area (Station) Cords

   1. Belden/CDT

      a. Duplex LC connectors, 50/125 micron, FX2000, 3 meter (AX200665)

      b. Duplex LC to SC, 50/125 micron, FX2000, 3 meter (AX200668)

   2. Ortronics

      a. Duplex LC connectors, 50/125 micron, OptiMo, 3 meter (OR-61150D62003M77C)

      b. Duplex LC to SC, 50/125 micron, OptiMo, 3 meter (OR-61150D62003M79C)

D. Optical Fiber Patch Cords

   1. Multimode patch cords:

      a. Belden/CDT

         1) Duplex LC connectors, 50/125 micron, FX2000, aqua, 1 meter

         2) Duplex LC connectors, 50/125 micron, FX2000, aqua, 3 meter

         3) Duplex LC to SC, 50/125 micron, FX2000, aqua, 1 meter

         4) Duplex LC to SC, 50/125 micron, FX2000, aqua, 3 meter

         5) Duplex LC to SC, 62.5/125 micron, FX300, orange, 1 meter
PART 3 EXECUTION

3.01 INSTALLATION

A. Copper Patch Cords

1. The Contractor shall provide sufficient copper station cords of the type/category matching the horizontal cable for all data ports. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.

2. The Contractor shall provide sufficient patch cords of the type/category matching the horizontal cable to activate all data ports. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.

3. Route patch cord from patch panel port, through horizontal cable management, into vertical cable management and into appropriate switch/patch panel.

4. Do not leave coil of excess cords in one place, rather find longer route to take up slack or use shorter patch cord.

B. Optical Fiber Patch Cords

1. The Contractor shall provide sufficient optical fiber station cords of the type/category matching the horizontal cable for all data ports. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.

2. The Contractor shall provide sufficient optical fiber patch cords to activate all fiber data ports, 2-strand zipcord, bagged or boxed in each network room.

3. Route patch cord from patch panel port, through horizontal cable management, into vertical cable management and into appropriate switch/patch panel.
4. Do not leave coil of excess cords in one place, rather find longer route to take up slack or use shorter patch cord.

END OF SECTION
PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 0000 - Communications General.
B. Section 27 1000 - Structured Cabling.
C. Section 27 2000 - Data Communications.
D. Section 27 3000 - Voice Communications.
E. Section 27 4000 - Audio-Visual Communications.
F. Section 27 5000 - Distributed Communications and Monitoring Systems.
G. Section 33 8200 - Communications Distribution

1.02 REFERENCES

A. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. The Designer shall require validation testing on all voice and data communications cable installed as part of any project. This testing shall verify that the cable has been installed properly and has the specific characteristics required by the project.

B. Category 5e Testing

1. Specify the use of an approved level IIe or III balanced twisted-pair field test device. Scanners shall be in good working order and have current calibration stickers from a manufacturer-approved calibration facility.

2. All installed category 5e channels shall perform equal to or better than the minimum requirements as specified by the current ANSI/TIA/EIA standards for Category 5e. If the cable manufacturer has a separate, more stringent set of test standards required to certify the total solution being installed, the Contractor shall use the more stringent requirements.

3. Category 5e balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.

4. The designer will specify that Johns Hopkins is to be provided with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. With the test results, the contractor shall provide software from the tester manufacturer to enable viewing of test results in native format. If software is not available, test results may be provided in comma-delimited text format. This must be pre-approved by JH.

C. Category 6 Testing
1. All category 6 field testing shall be performed with an approved level III balanced twisted-pair field test device. Scanners shall be in good working order and have current calibration stickers from a manufacturer-approved calibration facility.

2. All installed category 6 channels shall perform equal to or better than the minimum requirements as specified by the current ANSI/TIA/EIA standards for Category 6. If the cable manufacturer has a separate, more stringent set of test standards required to certify the total solution being installed, the Contractor shall use the more stringent requirements.

3. Category 6 balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.2. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.

4. The designer will specify that Johns Hopkins is to be provided with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. With the test results, the contractor shall provide software from the tester manufacturer to enable viewing of test results in native format. If software is not available, test results may be provided in comma-delimited text format. This must be pre-approved by JH.

D. Copper Test Equipment

1. Specify that all balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit.

2. The Contractor shall set the testers to the correct cable, by manufacturer and name, to ensure correct parameters are used during testing. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

E. Optical Fiber Testing

1. The Designer shall require the testing of all optical fiber strands for insertion loss and length. The Designer shall require bi-directional OTDR tests on all OSP optical fiber strands.

2. Specify the testing of insertion loss at 850 nm and 1300 nm for 62.5/125mm multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.

3. Specify the testing of insertion loss at 1310 and 1550 for single mode cabling in at least one direction using the Method A.1 (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-7.

4. The Designer shall calculate the allowable attenuated loss based on final installed length, attenuation coefficient, and connector loss.

<table>
<thead>
<tr>
<th>Fiber Insertion Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Condition</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>OSP Multimode @ 850 nm</td>
</tr>
<tr>
<td>OSP Multimode @ 1300 nm</td>
</tr>
<tr>
<td>Single Mode OSP</td>
</tr>
</tbody>
</table>
Single Mode ISP  1.5 dB

The values in the above table are rough estimates based on 1000 ft for OSP cables and 15 ft and 30 ft for ISP cables. The Contractor shall submit calculation values with the test results.

5. The designer will specify that Johns Hopkins is to be provided with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. The Contractor may provide supplemental summaries generated by the Contractor.

F. Optical Fiber Test Equipment

1. Specify that all optical fiber test equipment shall be factory calibrated as recommended by the field test equipment manufacturer.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. The Contractor shall provide Johns Hopkins with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. With the test results, the contractor shall provide software from the tester manufacturer to enable viewing of test results in native format. If software is not available, test results may be provided in comma-delimited text format. This must be pre-approved by JH.

1.06 PROJECT CONDITIONS

A. Johns Hopkins reserves the right to be present during all testing.

B. Testing of existing and active connections may be restricted until after normal working hours. Plant Operations shall determine is testing can occur during normal business hours.

C. Testing shall take place only when the channel is fully installed. If channel components may be moved or re-positioned after testing, the Contractor shall delay testing until cables, faceplates, and other components are in their final positions. This includes any repositioning by other trades prior to occupancy by the owner.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 General

A. The Contractor shall perform validation testing on all voice and data communications cable installed as part of any project. This testing shall verify that the cable has been installed properly and has the specific characteristics required by the project.

B. JH reserves the right to be present during any testing.

C. The Contractor shall provide all required test equipment and personnel necessary to support the certification and validation tests prescribed in this section.

D. The Contractor shall provide a listing of the test equipment proposed for use for all certification testing.

3.02 High Pair Count Copper Cables

A. The Contractor shall provide a continuity test for all voice pairs. All voice grade copper cable shall be tested by toning-out each pair.
B. The Contractor shall provide Johns Hopkins with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software.

3.03 Category 5e Copper Cables
A. All category 5e field testing shall be performed with an approved level IIe or III balanced twisted-pair field test device.
B. All installed category 5e channels shall perform equal to or better than the minimum requirements as specified by the current ANSI/TIA/EIA standards for Category 5e. If the cable manufacturer has a separate, more stringent set of test standards required to certify the total solution being installed, the Contractor shall use the more stringent requirements.
C. Category 5e balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.
D. The Contractor shall provide Johns Hopkins with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. With the test results, the contractor shall provide software from the tester manufacturer to enable viewing of test results in native format. If software is not available, test results may be provided in comma-delimited text format. This must be pre-approved by JH.

3.04 Category 6 Copper Cables
A. All category 6 field testing shall be performed with an approved level III balanced twisted-pair field test device.
B. All installed category 6 channels shall perform equal to or better than the minimum requirements as specified by the current ANSI/TIA/EIA standards for Category 6. If the cable manufacturer has a separate, more stringent set of test standards required to certify the total solution being installed, the Contractor shall use the more stringent requirements.
C. Category 6 balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.2. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.
D. The Contractor shall provide JHU with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. With the test results, the contractor shall provide software from the tester manufacturer to enable viewing of test results in native format. If software is not available, test results may be provided in comma-delimited text format. This must be pre-approved by JH.

3.05 Coaxial Cables
A. The Contractor shall test all coaxial cables per ANSI/SCTE ANSI/SCTE 15 2001 ((Formerly IPS SP 100). Tests shall include characteristic impedance, conductor resistance, velocity of propagation (VOP), structural return loss (SRL), and attenuation from 5 - 1000 MHz.

3.06 Copper Test Equipment
A. All balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The
calibration certificate shall be provided for review prior to the start of testing.

B. The Contractor shall set the testers to the correct cable, by manufacturer and name, to ensure correct parameters are used during testing. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

3.07 Fiber Optic Testing

A. The Contractor shall test all optical fiber strands for insertion loss and length. The Contractor shall perform bi-directional OTDR tests on all OSP optical fiber strands.

B. The Contractor shall test insertion loss at 850 nm and 1300 nm for 62.5/125m multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.

C. The Contractor shall test insertion loss at 1310 and 1550 for single mode cabling in at least one direction using the Method A.1 (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-7.

D. The Contractor shall determine and record length using an OTDR, optical length test measurement device or sequential cable measurement markings.

E. The Contractor shall calculate the allowable attenuated loss based on final installed length, attenuation coefficient, and connector loss.

F. The Contractor shall remediate any stands testing above calculated limit as determined by the designer.

G. The Contractor may, at their expense, have a third party terminate the fiber in order to achieve this limit. Third party installers must be listed as subcontractors in the bid documents. Contractors may list this subcontractor as “tentative.”

H. JHU reserves the right to have third party testing to confirm the test results. The Contractor shall remediate, at their expense, any strands exceeding this limit by third party testing.

I. The Contractor shall provide Johns Hopkins with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. The Contractor may provide supplemental summaries generated by the Contractor. The Contractor shall provide Fiber performance calculation worksheets and fiber link attenuation records as illustrated in Section 21 (Figures 21.14 and 21.15) of the BICSI Telecommunications Cabling Installation Workbook, Technician, 2nd Edition.

3.08 Fiber Test Equipment

A. All optical fiber test equipment shall be factory calibrated as recommended by the field test equipment manufacturer. The calibration certificates shall be provided for review prior to the start of testing.

3.09 Bonding and Grounding

A. All bonds installed by the contractor shall be tested for impedance with an earth ground resistance test in its two-point setup, such as a LEM Handy GEO tester. The Contractor shall place a QA label (with date and inspector) in proximity to each bond tested.

B. The Contractor shall test all grounding conductors, once installed, for current. The Contractor shall measure AC and bi-directional DC current. The Contractor shall report any AC current over 1 Amp. The Contractor shall report any DC current, in either direction, over 500milliamps.

C. Test all bonds for a maximum impedance of 0.1 using a two-point impedance test. Contractors shall remediate any bond above 0.1 impedance.

D. Test all bonds for a maximum impedance of 0.1 using a two-point impedance test. Contractors
shall remediate any bond above 0.1 impedance.
END OF SECTION
SECTION 27 2129
DATA COMMUNICATIONS SWITCHES AND HUBS

PART 1 GENERAL

1.01 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.02 DESIGN REQUIREMENTS
A. Designers shall anticipate the use of 48-port, 1U Cisco switches. A BD location shall include a 1U Cisco switch for fiber distribution to other FD switches.
B. Designers shall anticipate the use of 48-port, 1U Cisco switches in the FD with an additional 1U Cisco switch for uplink of the other switches to the BD.
C. Designers shall provide for a 3U space for each switch with horizontal cable managers.
D. Data switches shall be located below fiber distribution housings and patch panels.
E. On new room installations, designers shall anticipate an initial installation of data switches as needed to activate 1 data port at all locations services by that FD.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION
A. The Contractor shall leave sufficient space for the installation of data switches.
B. The Contractor shall install a 3U space for each switch.
C. Network electronics shall be installed by Johns Hopkins Institutions.

END OF SECTION
SECTION 27 2133

DATA COMMUNICATIONS WIRELESS ACCESS POINTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 1543 - Communications Work Areas, Faceplates, and Connectors

1.02 UNIT PRICES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

B. Submit unit price for wireless access point. Includes enclosure, dual data copper cables up to 90 meters, two-port surface mount box, and data cable modules.

1.03 REFERENCES


B. See Section 01 4219 - Reference Standards.

1.04 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.05 DESIGN REQUIREMENTS

A. A single 2-port surface-mount or recessed box shall be specified at locations for wireless node connectivity. The locations may be specified on the wall below the suspended ceiling as a surface-mount box or as a standard faceplate. Locations concealed above the ceiling shall be specified as a surface-mount box.

B. Wireless access points may be enclosed in an unmarked plastic box with a screw cover. Wireless access points above drop ceilings to not need to be enclosed.

C. Wireless access points may be concealed in an heated plastic box with a latch cover for outdoor installations.

D. Designers shall specify the installation of a 110V electrical outlet at new wireless access points. Injecting power over Ethernet cables is not the preferred method to power access points.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wireless access point enclosure

1. Designed specifically for wireless access points

2. Fully enclosed and opaque, plain without indications of contents.

3. Lockable with a standard padlock.

4. Capacity for a Cisco wireless access point.


6. Capacity for a dual data outlet surface mount box.


PART 3 EXECUTION

3.01 INSTALLATION
A. Install a dual data outlet for each wireless access point location. If installed within an enclosure box, use a 2-port surface mount box per Section 27 1543 - Communications Work Areas, Faceplates, and Connectors.

B. Install wireless access points above drop ceiling whenever possible.

C. Coordinate final placement of wireless access points with Architect.

END OF SECTION
SECTION 27 3213

TELEPHONE SETS

PART 1  GENERAL

1.01 REFERENCES

A. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. Telephone handsets are provided by Telecommunications at additional project expense. The
designer shall note this in all specifications.

PART 2  PRODUCTS

2.01 MATERIALS

A. Supplied by others.

PART 3  EXECUTION

3.01 INSTALLATION

A. Telephone handsets shall be installed by Johns Hopkins Institutions.

END OF SECTION
SECTION 27 3223

ELEVATOR TELEPHONES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. See Section 27 1513 : Communications Copper Horizontal Cabling.

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. Designers shall plan for a single voice cable to the elevator machine room for use by the elevator installers per Section 27 1513 - Communications Copper Horizontal Cabling.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the cable to the elevator machine room and in proximity to the elevator equipment.
B. The cable shall be installed within conduit or solid raceway within the elevator machine room. The cable shall not be exposed within the room. The conduit may end up to 12" from the elevator equipment. Coordinate pathway installation with the elevator contractor.
C. Leave a 20 foot coil of cable at the end of the pathway to be terminate by the elevator contractor.
D. Label the cable where it enters the room using a hang tag on the pathway.
E. The Contractor shall terminate the cable with a single voice module for testing purposes. The module will likely be removed by the elevator contractor. No faceplate or box need be installed at this location.

END OF SECTION
SECTION 27 3226

EXTERIOR EMERGENCY TELEPHONES

PART 1 GENERAL

1.01 REFERENCES
C. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS
A. Designers shall consult with Telecommunications on emergency phone requirements, as these vary greatly based on location.

PART 2 PRODUCTS

2.01 MATERIALS
A. Inside emergency phones
   1. ISP copper voice cable per Section 27 1513 - Communications Copper Horizontal Cabling
B. Outside emergency phones
   1. OSP copper voice cable per Section 33 8213 Copper Communications Distribution Cabling
   2. 6-pair, 24 AWG copper cable
   3. Building Entrance Terminals
      a. Circa
      b. 110 in:110 out
      c. Circa C4B1E(PTC) modules

PART 3 EXECUTION

3.01 INSTALLATION
A. Install the cable to the emergency phone location.
B. Inside emergency phones
   1. The cable shall be installed within conduit or solid pathway. The cable shall not be exposed beyond the primary pathway elements.
C. Outside emergency phones
   1. The cable shall be installed in OSP conduit per Section 33 8126 - Communications Underground Ducts, Tunnels, Maintenance Holes, and Handholes.
   2. All OSP cables to emergency phones shall terminate on a BET within the nearest building.
D. The Contractor shall terminate the cable with a single voice module for testing purposes. The module will be removed by Johns Hopkins Institutions. No faceplate or box need be installed at this location.
E. The Contractor shall coordinate the installation of any surface mount enclosure for emergency phones. Enclosures shall be provided by others.

F. Telephone units shall be provided and installed by others.

END OF SECTION
SECTION 28 1300
ACCESS CONTROL

PART 1  GENERAL

1.01 RELATED SECTIONS
A. Section 08 7411 - Electrical Locking Control

1.02 REFERENCES
B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.04 SYSTEM DESCRIPTION
A. Security Access System: Control access to building using encoded cards:
   1. Selected Exterior Doors: Control access into building.
   2. Selected Building Areas: Control access into specific areas.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in
   this section with minimum three years documented experience and with service facilities within
   100 miles of Project.
C. Installer Qualifications: Company specializing in installing the products specified in this section
   with minimum three years documented experience.
D. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable
   for purpose specified and indicated.

PART 2  PRODUCTS

2.01 MANUFACTURERS
A. Security Access System:
   1. Blackboard, Inc. - Homewood Campus

2.02 COMPONENTS
A. Homewood- Products provided by Johns Hopkins Institutions

PART 3  EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Cable provided by Johns Hopkins Institution for Contractor use.

END OF SECTION
SECTION 28 1600

INTRUSION DETECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Intrusion detection devices.
B. Alarm control panel.
C. Signaling devices.

1.02 REFERENCES

C. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SYSTEM DESCRIPTION

A. Intrusion Detection System: Protect building and selected areas from intrusion during SECURE hours as follows:

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection required.
C. Product Data: Provide electrical characteristics and connection requirements.
D. Test Reports: Indicate satisfactory completion of required tests and inspections.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
F. Project Record Documents: Record actual locations of initiating devices, signaling appliances, and end-of-line devices.
G. Operation Data: Operating instructions.
H. Maintenance Data: Maintenance and repair procedures.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
C. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

1.07 MAINTENANCE SERVICE
A. Furnish service and maintenance of intrusion detection system for one year from Date of
   Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intrusion Detection System:
   1. Honeywell, Inc; ADEMCO products
   2. Bosch Security Systems; Radionics products
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ALARM CONTROL PANEL

A. Control Panel: Modular construction with flush or surface wall-mounted enclosure.
B. Power supply: Adequate to serve control panel modules, remote detectors, and alarm signaling
devices. Include battery-operated emergency power supply with capacity for operating system
in standby mode for 24 hours.
C. System Supervision: Provide electrically-supervised system, with supervised alarm initiating
and alarm signaling circuits. Component or power supply failure places system in alarm mode.
D. Initiating Circuits: Supervised zone module with alarm and trouble indication.
E. Signal Circuits: Supervised zone coded signal module, sufficient for signal devices connected to
system; occurrence of single ground or open condition places circuit in trouble mode and does
not disable that circuit from transmitting alarm.
F. Remote Station Signal Transmitter: Electrically supervised, capable of transmitting alarm and
trouble signals over telephone lines to central station receiver.
G. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each detection zone to
provide accessory functions specified.
H. Occupied/Unoccupied Selector: ________.
I. Entry and Exit Time Delays: ________.
J. Alarm Sequence of Operation: Actuation of intrusion detecting device places system in alarm
mode, which causes the following operations:
   1. Sound and display local alarm signaling devices with non-coded signal.
   2. Transmit zone-coded signal to central station.
   3. Indicate location of actuated device on control panel and on remote annunciator panel.
   4. Alarm Reset: Key-accessible reset function resets alarm system out of alarm if alarm
      initiating circuits have cleared.

2.03 INITIATING DEVICES

A. Magnetic Switches:
B. Proximity Switches:
C. Motion Detectors:
D. Glass Break Detectors:
E. Duress Switches:
PART 3  EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Use 18 AWG minimum size conductors for detection and signal circuit conductors. Install wiring in conduit.
C. Make conduit and wiring connections to door hardware devices furnished and installed under Section 08 7100.

3.02 FIELD QUALITY CONTROL
A. Perform field inspection and testing in accordance with Section 01 4000.
B. Test in accordance with NFPA 72.

3.03 MANUFACTURER’S FIELD SERVICES
A. Provide the services of the manufacturer’s technical representative to prepare and start systems.
B. Include services of technician to supervise installation, adjustments, final connections, system testing, and Johns Hopkins Institutions training.

3.04 DEMONSTRATION
A. Demonstrate normal and abnormal modes of operation, and required responses to each.
B. Provide 4 hours of instruction each for two persons.
   1. Conduct instruction at project site with manufacturer’s representative.

END OF SECTION
SECTION 28 2300

VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 SYSTEM DESCRIPTION

A. Description: Provide video communications between points of surveillance indicated on Drawings and central monitoring station.
B. Configuration: NTSC, with 1 volt peak-to-peak across 75 ohms.
C. Distribution: Baseband, DC to 6 MHz.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.
C. Product Data: Provide showing electrical characteristics and connection requirements for each component.
D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
E. Project Record Documents: Record actual locations of cameras and routing of television cable.
F. Operation Data: Instructions for starting and operating system.
G. Maintenance Data: Routine trouble shooting procedures.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.
D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles of Project.
E. Products: Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01 COMPONENTS
A. Manufacturers:

1. Bosch Security Systems (Philips)
   a. Cameras

2. American Dynamics CCTV Systems
   a. Recorders- Intellex DVMS recorder; NO SUBSTITUTIONS ALLOWED
   b. Cameras-
      1) Intellex Speeddome Ultra VII pan-tilt-zoom cameras
      2) ADC660 B/W low light cameras

3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Coax Cable

1. Inside cable
   a. RG6/U type
   b. 95% copper braid
   c. 18 AWG conductor
   d. Product: West Penn 25806 or equivalent

2. Outside cable
   a. RG6 type
   b. 95% copper braid
   c. 18 AWG conductor
   d. PE jacket, flooded
   e. Product: West Penn 6325 or equivalent

B. Optical Fiber

1. Inside cable
   a. 2-strand, 62.5/125 micron multimode, plenum and/or non-plenum, orange:
      1) Belden/CDT
         (a) FiberExpress 300, InfiniCor, tight-buffered, distribution series, 2 fiber round
      2) Berk-Tek
         (a) GIGAlite, tight-buffered, 2 fiber round

2. Outside cable
   a. Corning Cable Systems, FREEDM cable
      1) Interlocking armored
      2) Listed NEC OFNR, riser-rated
      3) Loose tube, gel-free
      4) Multimode- 62.5/125 micron
      5) Single Mode
   b. Berk-Tek, ADVENTUM cable
      1) Listed NEC OFNP, plenum rated
      2) Loose tube, DryGel
PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Contractor shall coordinate connector types for optical fiber and/or coax at time of installation.
C. Install each camera location with coax cable not to exceed 298 feet (90 m).

3.02 INTERFACE WITH OTHER PRODUCTS
A. Interface installation of video surveillance with security access and intrusion detection systems.

3.03 MANUFACTURER'S FIELD SERVICES
A. Provide the services of manufacturer's technical representative to prepare and start systems and supervise final wiring connections and system adjustments.

3.04 ADJUSTING
A. Adjust manual lens irises to meet lighting conditions.

3.05 DEMONSTRATION
A. Demonstrate system operation and provide four hours of instruction with manufacturer's training personnel.
B. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

END OF SECTION
SECTION 31 2333

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. 31 8126 : Communications Underground Ducts, Manholes, and Handholes

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SAFETY AND RESTRICTIONS

A. See specific elements within this document for safety and restrictions information. Contractors shall bear all responsibility and cost to locate existing underground utilities including, but not limited to, electricity, natural gas, domestic water, steam and condensate, chilled water, sewer, storm drainage, and telecommunications. Most of these utilities are owned and maintained by Johns Hopkins. In many cases, utilities have used plastic pipe without metallic (detectable) elements. Contractors shall have all underground utilities clearly marked prior to any excavation.

B. Maryland's Underground Facilities Protection Organization, Miss Utility, does not locate utilities within the boundaries of the Johns Hopkins University Homewood Campus. Contractors shall contact KCI Technologies at 410-891-1738 to locate all utilities. Other locators shall be pre-approved by Homewood Plant Operations.

C. Contractors shall contact Johns Hopkins immediately if unmarked utilities are discovered. Contractors shall stop all work in the area until the utility can be identified by Johns Hopkins. Contractors may be required to recall KCI Technologies or other originally pre-approved locator to trace the utility to an identifiable point. Contractors shall contact Johns Hopkins immediately if a utility is damaged in any way. Contractors shall stop all work in the area until directed by Johns Hopkins. Contractors shall contact Johns Hopkins Plant Operations at 410-516-8063 immediately. If unable to reach Plant Operations, Contractors shall contact the Johns Hopkins University Security Department at 410-516-4600. Contractors shall then contact the Johns Hopkins Project Manager.

D. Areas of the campus are restricted from heavy equipment, including but not limited to backhoes, concrete trucks, utility and work trucks, and other full-sized vehicles. Contractors shall contact Plant Operations for specific restrictions based on the location of the work area.

E. During construction of all pathways, Johns Hopkins Security shall determine if closures of Johns Hopkins-controlled roads or spaces are possible at proposed dates and times. When on non-Johns Hopkins property, Contractors shall coordinate all activities with interested parties.

F. Locating done by another trade or a general contractor in the same work area and for the same overall project does not need to be repeated by the Contractors, provided 1) the entire cabling work area was recently covered, 2) the markings are bold and undisturbed, and 3) the geographic scope of the work area can be confirmed by the locating company.
G. Information from Johns Hopkins on underground utility placement does not waive Contractors from confirming the presence and location of all underground utilities in the work area.

H. Contractors shall provide all necessary equipment to safely excavate and construct conduit/duct pathways. Contractor shall comply with all federal, state, and Johns Hopkins regulations regarding working in this environment. Appropriate personal protective equipment is required and shall be the responsibility of the Contractors.

I. Contractors shall provide all necessary equipment to safely excavate and construct tunnel penetrations. Contractor shall comply with all federal, state, and Johns Hopkins regulations regarding excavation and working in this environment. Personal protective equipment is required and shall be the responsibility of the Contractors.

J. See Section 27 0000 : Communications General.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate

1. Crushed stone or gravel fill

2. Percent composition by dry weight as determined by laboratory sieves (U.S. series)

<table>
<thead>
<tr>
<th>Compacted Aggregate Size</th>
<th>Passing Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2 inches</td>
<td>100 %</td>
</tr>
<tr>
<td>1 inch</td>
<td>90-100 %</td>
</tr>
<tr>
<td>#4</td>
<td>0-5 %</td>
</tr>
</tbody>
</table>

B. Lesser-grade material

1. This backfill material may be material removed from the original excavation. All backfill materials shall be free from boulders, large rock, asphalt, concrete, bricks, wood blocks or roots, and other debris.

C. Top soil

1. High quality, able to support productive plant growth

2. Free from weeds, nutgrass, stones, roots, or similar substances

D. Sod

1. Same origin as the surrounding area.

E. Grass Seed

1. Mix approved by Johns Hopkins grounds keepers.

F. Erosion Control

1. Contractors shall provide all materials necessary to minimize erosion and soil run-off to the satisfaction of Johns Hopkins.

2. Contractors shall provide all materials to prevent erosion of seeded areas.
PART 3 EXECUTION

3.01 INSTALLATION

A. Digging and Trenching

1. In general, underground pathways shall be at a minimal depth of 30" to the top of the pathway elements, where possible. Deviations from this specification must be pre-approved by Homewood Plant Operations. Pathways may gradually slope up to under 30" deep to enter handboxes or handholes.

2. All digging and trenching shall be in accordance with codes and requirements established by all applicable local, state, and federal agencies and departments.

3. All trenching and digging shall be done in a neat and workmanlike manner. All methods of construction and details of workmanship shall be subject to the control and approval of Johns Hopkins.

4. Contractors shall protect from direct damage during construction and damage resulting from construction all surrounding environments, including, but not limited to, existing roadways, sidewalks, curbing, trees and shrubs, open grass areas, and planting beds. Contractors shall use planking and ramps as needed to protect these areas.

5. Contractors shall provide and install all necessary barriers to prevent unauthorized entry into the construction area. Contractors shall provide temporary walkways to divert pedestrian traffic safely around the construction area. Contractors shall contact the Johns Hopkins University Security Department at 410-516-4600 for approval of all temporary walkway locations.

6. Contractors shall provide traffic control, signage, plating, etc. as necessary to maintain the safe flow of vehicular traffic as deemed necessary by Johns Hopkins. Contractors shall contact the Johns Hopkins University Security Department at 410-516-4600 for approval of any changes to the normal flow of vehicular traffic in and around the construction area and to arrange road closures, if necessary.

7. Contractors shall restore, repair, rebuild, or replace any items including, but not limited to, adjacent property, existing fences, trees and shrubs, roadways and curbs, sidewalks, and surface utilities and parts damaged during construction. Damaged items shall be restore, repair, rebuild, or replace to their original condition and to the satisfaction of Johns Hopkins. Johns Hopkins may waive this requirement for specific items if within the construction area and/or if scheduled for eventual demolition or replacement and at Johns Hopkins discretion.

8. Contractors shall secure all necessary permits, as required. Contractors shall contact Johns Hopkins to ascertain the existence of established permits covering this work.

9. Contractors shall coordinate construction schedules and all work on the construction site with Johns Hopkins. Other Contractors may be working in the area. Contractors shall coordinate construction schedules with any general contractor or construction manager hired by Johns Hopkins when working as a subcontractor or when required by Johns Hopkins.

10. Contractors shall provide a detailed photographic survey of all pathways and areas to be disturbed prior to construction. Contractors shall deliver a set of these photographs to Johns Hopkins prior to construction.
11. Contractors shall locate and stake all pathways and spaces to be installed. Contractors shall confirm with Johns Hopkins and the project engineers all staked pathways and spaces. Contractors shall notify Johns Hopkins of any discrepancies in the site plan and the existing conditions.

12. Contractors shall protect, support, and maintain all existing utilities in the work area as they are encountered during excavation. Shallow utilities to light posts or other devices may be temporarily re-routed or disconnected if pre-approved by Johns Hopkins.

13. Contractors shall install erosion control measures as needed to minimize erosion and to prevent soil run-off from the construction area.

14. Contractors shall provide and install bracing, shoring, and sheathing as necessary to protect personnel and surrounding conditions. Contractors shall adhere to all local, state, and federal requirements for safe excavations.

15. Contractors shall hand remove and stack all paving bricks and marble pavers in the construction pathway for re-installation later. Contractors shall remove granite or other stone or brick curbing pavers in the construction pathway for re-installation later.

16. Contractors shall sawcut all paved area encountered during excavations. Cuts shall be neat and straight.

17. Contractors shall remove all material excavated including soil, rubble, debris, or other materials encountered during excavation. Contractors may store excavated material on site at the discretion of Johns Hopkins and at a location designated by Johns Hopkins. Contractors shall not anticipate storing excavated material on site. Excavated material from ductbank trenches may be left near the trench to be used as backfill, if adhering to later backfilling specifications. Contractors shall properly dispose of any material taken from the construction area per local disposal requirements.

18. Contractors shall remove only the material necessary to safely install ductbanks as specified. Contractors shall contact Johns Hopkins immediately if the trench or hole bottom is wet, unstable, or otherwise unable to support the infrastructure to be installed.

19. Contractors shall provide pumps, as necessary, to keep water out of the excavation. Contractors shall direct effluent towards the nearest storm drain only if the effluent is free from dirt and debris. Otherwise, the effluent shall be diverted to an area free from vehicular and pedestrian traffic and other construction areas.

20. Contractors shall notify Johns Hopkins of any rock that cannot be excavated by a 3/4 cubic yard power shovel or broken sufficiently by an air hammer to clear the space required for infrastructure installation. Johns Hopkins shall determine the appropriate course of action.

B. Restoration

1. Contractors shall contact Johns Hopkins prior to any backfilling which will conceal an installed pathway element to enable Johns Hopkins to document and photograph the pathway.

2. Contractors may backfill in stages, when necessary to complete trenching and ductbank installation.

3. Contractors shall use pre-excavation photographs to restore the existing conditions, including brick walkway placement and pattern. Contractors shall restore brick walkways in the same pattern and arrangement as originally installed.

4. Contractors shall provide and install a level layer of compacted aggregate over each encased ductbank. The bed shall extend 1 foot above the surface of the ductbank. The
The first 6 inches of the aggregate bed shall be compacted to not less than 95% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A. The second six inches of the aggregate bed shall be compacted to not less than 85% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A.

5. Contractors shall remove all remaining excavated material from the construction area.

6. Contractors shall remove any erosion control devices no longer needed, not including those in and around seeded areas.

7. Restoration of disturbed landscaping shall be to the satisfaction of Plant Operations grounds keepers.

END OF SECTION
SECTION 33 8119

COMMUNICATIONS UTILITY POLES

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 SAFETY AND RESTRICTIONS

A. Contractors shall provide all necessary equipment to safely work on utility poles. Contractor shall comply with all federal, state, and Johns Hopkins regulations regarding working in this environment. Johns Hopkins Office of Health, Safety & Environment may regulate work with utility poles owned by Johns Hopkins. Personal protective equipment is required and shall be the responsibility of the Contractors.
B. Contractors shall coordinate with Plant Operations to gain access to Johns Hopkins utility poles. Contractors shall provide advanced notice for this access. Contractors shall coordinate with utility companies to gain access to non-Johns Hopkins utility poles.
C. Johns Hopkins Security shall determine if closures of Johns Hopkins-controlled roads or spaces are possible at proposed dates and times. When on non-Johns Hopkins property, Contractors shall coordinate all activities with interested parties and/or city officials.
D. Contractors must receive approval from Plant Operations prior to any trimming of Johns Hopkins trees to clear aerial pathways.
E. Contractors must receive approval from Plant Operations for building attachments from aerial pathways prior to installation.
F. Contractors shall follow all pole owner-specific safety requirements.
G. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. Utility poles shall have very limited use. New utility poles shall not be installed. Certain fringe areas with existing poles may utilize them, if pre-approved by Homewood Plant Operations. Areas of the campus beyond the contiguous core may use existing poles, if pre-approved.
B. Aerial pathways follow the same general guidelines as utility poles previously mentioned. In addition, interbuilding, aerial cabling shall not be permitted. This type of installation in certain fringe area may be allowed, if pre-approved. Areas of the campus beyond the contiguous core may use aerial pathways, if pre-approved. Underground pathways will always be preferred, unless limited by existing conditions.
C. Refer to the current BICSI CO-OSP manual for transverse loads on poles (kg/m per lb/ft of span length).
D. Pole height should provide sufficient space for the maximum number of attachments that will be made during the service life of the pole line. The attachment space shall include the space between the top of the pole, as well as the highest and lowest attachments. For pole lines...
supporting cable, 457 mm (18 in) should be provided at the top of the pole and 305 mm (12 in)
for each cable attachment.

E. As long as the last section is less than 30.5 m (100 ft), a slack span design may be used when
it is not possible to terminate an aerial run with a deadend guy. By using less than normal
stringing tension in the final span, guying on that end can be omitted. Situations that may
require the use of a slack span design include space deficiencies and right-of-way problems.

F. Pole to building slack span construction shall be used for cables under 300 pair. For cables 300
pair or greater, select an alternate route into the building.

G. Refer to the latest edition of the NESC for typical attachment clearances.

H. Midspan clearances should be at least 75 percent of the clearance required at the pole. Consult
the latest edition of the NESC for specific details.

I. Refer to the current NESC for the required radial clearances from antennas, signs, pole
structures, storage tanks, and chimneys.

J. When installing multiple strands on a pole line, the designer should design separate guys and
anchors for each strand. One guy may be used when the distance between two strands is 610
mm (24 in) or less.

K. Generally, all corner poles should be guyed except when a pole line supporting 6M or 6.6M has
less than 910 mm (36 in) of pull, or when a pole line supporting 10M strand has less than 610
mm (24 in) of pull.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials used shall be manufactured for the specific purpose in which they are to be used.

B. When available, materials shall meet or exceed any available ANSI or ASTM standard for
manufacture and installation.

C. All materials used shall meet or exceed any requirements for use as established by Baltimore
Gas and Electric, Verizon, the City of Baltimore, or any other third-party owner for leased pole
installations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Aerial pathways shall only be used when existing poles are in place and available. Poles may
be Johns Hopkins-owned or available for lease from local utilities.

B. Contractors shall obtain permits, lease agreements, and any other required documentation for
Johns Hopkins use of non-Johns Hopkins poles. All documentation shall be in the name of
Johns Hopkins and shall be submitted to Johns Hopkins prior to installation.

C. Contractors shall adhere to requirements of the utility pole owner when using non-Johns Hopkins
poles. Owner requirements that violate the standards, and methodologies listed in Appendix 2
shall be approved by Homewood Plant Operations prior to pole use. Plant Operations may
eliminate a specific pole as a pathway element based on unacceptable owner requirements.
SECTION 33 8126

COMMUNICATIONS UNDERGROUND DUCTS, TUNNELS, MAINTENANCE HOLES, AND HANDBOXES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. 27 0543 : Underground Ducts and Raceways for Communications Systems

1.02 REFERENCES


B. See Section 01 4219 - Reference Standards.


1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 SAFETY AND RESTRICTIONS

A. Communications Underground Ducts


B. Tunnels

1. Johns Hopkins tunnels are not classified as permit-required confined spaces by Johns Hopkins Safety Office. Personal protective equipment is strongly recommended and shall be the responsibility of the Contractors. Conditions may be excessively hot, cramped, and/or damp.

2. Contractors shall coordinate with Plant Operations to gain access to the tunnels. Contractors shall provide advanced notice for this access. Space restrictions may prohibit access, if other utility contractors are in the same area. Ongoing utility work and emergency repairs may prevent access. Delays in installation schedules because of inaccessibility to the tunnels may be accepted by Johns Hopkins project managers and should be brought to their immediate attention. Plant Operations shall determine priorities in the event of overlapping work areas.

3. Generally, work in tunnels is not restricted by day or time.

C. Maintenance Holes

1. Johns Hopkins maintenance holes are classified as permit-required confined spaces by the Johns Hopkins Safety Office. During construction of a maintenance hole, but prior to the final pathway connection(s) to other existing underground spaces or building entrance facilities, maintenance holes are not permit-required confined spaces. Contractors shall contact the Safety Office at least 24 hours in advance of a permit-required confined space entry. Contractors shall provide all necessary equipment for such an entry. Contractors shall comply with all federal, state, and Johns Hopkins regulations regarding permit-required confined space entry. Johns Hopkins Safety Office can provide confined space entry permits to Contractors.

2. Contractors shall use appropriate personal protective equipment to work safely within maintenance holes. Contractors shall provide all appropriate safety equipment as needed to extract disabled workers or as otherwise needed to provide a safe work environment and to provide immediate support in emergency situations. Conditions may be excessively hot, cold, cramped, and/or damp.
3. Contractors shall coordinate with Plant Operations to gain access to maintenance holes. Contractors shall provide advanced notice for this access. Space restrictions may prohibit access, if other utility contractors are in the same area. Ongoing utility work and emergency repairs may prevent access. Delays in installation schedules because of inaccessibility to maintenance holes may be accepted by Johns Hopkins project managers and should be brought to their immediate attention. Plant Operations shall determine priorities in the event of overlapping work areas.

4. Generally, work in maintenance holes is not restricted by day or time.

D. Handholes and Handboxes

1. Johns Hopkins handboxes and handholes are not classified as permit-required confined spaces by the Johns Hopkins Safety Office. Personal protective equipment is strongly recommended and shall be the responsibility of the Contractors.

2. Contractors shall coordinate with Plant Operations to gain access to handboxes and handholes. Contractors shall provide advanced notice for this access.

1.05 DESIGN REQUIREMENTS

A. Communications Underground Ducts


B. Tunnels

1. Johns Hopkins University has an existing tunnel structure below parts of the main contiguous campus. These tunnels have been used extensively for Information Transport System cabling and are available for additional installations. Site conditions within the tunnels vary by location. Designers should contact Plant Operations for information on tunnel conditions. Installation of additional tunnels is unlikely at this time. Designs should not anticipate expansion of this system.

2. The tunnels supply high voltage power, steam/condensate, chilled water, and domestic water to a variety of buildings. Space may be very limited for installation beyond existing cable locations within the tunnel.

3. Oversight of the Homewood tunnels is the responsibility of Plant Operations. All installations shall be approved and coordinated with the Plant Operations. All designs requiring new tunnel penetrations shall be approved in advance by the Director of Plant Operations.

4. Penetrate tunnel walls in such a position to allow broad sweeps of cables into the tunnel space while minimizing interference to the passage and access to adjacent utilities. Vertical (roof) penetrations may be allowed in certain instances for small ductbanks.

5. All ductbanks abutting a tunnel shall be concrete encased for a minimum of ten horizontal feet from the tunnel.

6. When abutting a ductbank to a tunnel wall, provide dowel holes in the exterior surface of the tunnel for reinforcing bars. These bars shall extend into the tunnel wall without penetrating the wall and be embedded in the concrete ductbank. Dowel holes are not required for reinforcing bars when penetrating the roof of the tunnel.

7. Shape the concrete in such a way as to slope water away from the ductbank-tunnel seam. Alternately, purge the area around the seam as to slope water away.
8. Specify waterproofing material to provide a permanent, waterproof coating. Designs may include a protective membrane, sprayed/brushed product, or any combination. The specified product shall be manufactured for the explicit, but not necessarily exclusive, purpose of waterproofing concrete.

9. Design for waterproofing material to the sides and top of a horizontal ductbank extending no less than 4 feet from the tunnel wall. Specify a waterproofing material to the tunnel wall extending a minimum of 18 inches (wrapping over and onto tunnel roof if required) from the ductbank. The waterproofing shall be applied to all surfaces except the bottom of the ductbank where poured on aggregate bed.

10. Design for waterproofing material to all sides of a vertical ductbank extending no less than 6 vertical feet from the tunnel roof. Specify a waterproofing material to the tunnel roof extending 18 inches (or to the edge of the tunnel roof) from the ductbank, and to any curved part of the ductbank within 6 feet of the roof. The waterproofing shall be applied to all surfaces.

11. Existing Support Structures
   a. Use existing pathways and support mechanisms within tunnels, when possible. These include existing raceways, chases, and support strands. All cable installations shall be supported off the tunnel floor.

12. New Open Support Structures
   a. Support structures shall be designed to minimally impact open space and access to other utilities within the tunnels. Support structures shall be placed against, or as close as possible, to walls and ceilings. All cable installations shall be supported off the tunnel floor.
   b. These support structures shall be Snake Tray products. Fully enclosed box raceways have been used in the past and shall not be used on new installations. Designers shall specify Snake Tray cable turn out and cable turning fence parts as needed. Designers shall not substitute connectors or other Snake Tray-specific parts designed for the Snake Tray series installed.

13. New Support Wires
   a. Designers may specify support wires onto existing or installed structures for the attachment of cables. Support wires shall be designed to minimally impact open space and access to other utilities within the tunnels. Support wires and any other support structure needed to install support wires shall be placed against, or as close as possible, to walls and ceilings.
   b. Support wires shall be 10M (minimum size) galvanized steel. They shall be supported every 8 feet (maximum interval). Messenger supported wiring shall be grounded per NEC1999 Section 321-7, which considers them to be conductor enclosures per NEC1999 Section 250-86. Grounding within the tunnels shall be coordinated with Plant Operations.

14. Cable Lashing
   a. When using existing support strands, attach cables directly the support strand. Installations may wrap around a single existing cable and support strand provided the support strand bears the weight of the cable. New cables shall not add any strain to existing cables.

15. Vertical Exits
a. Cables leaving the tunnel beneath a building, vertically into the building, shall be
   supported by vertical backbone cable supports.

16. Nonmetallic Flexible Raceway (Innerduct)
   a. The use of nonmetallic flexible raceway (innerduct) intended to house a single cable
      within the tunnels shall be minimized. Innerduct shall not be placed into existing or
      new enclosed raceways, including “open” raceways like Snake Tray. Innerduct may
      be used to transition into and out of these raceways. Innerduct may be used for
      mechanical protection when support wires are used for optical fiber cables. Innerduct
      is not required within the tunnels in any location, unless specified by Homewood Plant
      Operations for a given installation.
   b. Innerduct shall be 1.25 inches OD or greater. Innerduct may be corrugated or smooth
      walled. Smooth wall innerduct shall have interior longitudinal ribs. Innerduct with a
      corrugated exterior shall not be used in the tunnels, except where needed for tight
      bends. Innerduct within the tunnels shall be orange. Innerduct may be non-plenum
      rated. All innerducts and connection parts (couplings, etc.) shall be from a single
      manufacturer and shall be installed per the manufacturer’s instructions.
   c. Fire alarm cable installations shall be designed in accordance with the NEC.
   d. Voice communications cable shall not be in innerduct within the tunnels.

17. Splices
   a. Cables may be spliced in the tunnels as needed to obtain necessary cable lengths
      and to branch cables as needed. Locations of splice cases are to be pre-approved by
      Homewood Plant Operations. Splice locations shall enable relatively easy access for
      future maintenance and installations. Splice cases shall be fully supported off the
      tunnel floor.
   b. Splice specifications are detailed later in this specification.

C. Maintenance Holes
   1. In general, the use of MHs should be minimized as a design element. Where possible,
      contractors shall use HBs. Large ductbanks (greater than three conduits) shall necessitate
      the use of a MH. Primary building backbone cables shall use MHs within the pathway.
   2. Designers may use an existing MH to provide needed pathways. An existing MH shall be
      upgraded with respect to integral parts and grounding as specified in the installation of a
      new MH. If a single new conduit is installed into a MH, the entire MH shall be addressed
      with respect to integral parts and grounding.
   3. Designers shall provide butterfly drawings indicating planned cable pathways, racking,
      location and type of splice case(s), and entry configuration for new MH and use of existing
      MH. MHs shall be designed with the following installed as integral parts: A sump,
      corrosion-resistant pulling irons, cable racks (grounded per applicable electrical code or
      practice), ladders (grounded per applicable electrical code or practice).
   4. Except when needed to support telecommunications equipment, MHs should not be used
      as pathways for power and light conductors. For specific details, consult the NESC (or
      applicable safety code).
   5. Label and document all space elements in accordance with the Johns Hopkins OSP
      Administrative Specification.
   6. New MHs shall be designed to accept a splay conduit entry, where possible. A splay entry
does not require the cables to be routed since they align with the cable racks. Conduits may enter a single off-center window in the end wall. Submit documentation from the manufacturer should a center penetration be required to maintain structural integrity of the MH.

7. The design must anticipate any future additions of new ductbanks to same MH wall so as to avoid crossing the designed ductbank. This can be done at other vertical elevations if necessary.

8. All ducts entering MH and building entrance point locations shall be sealed to prevent the intrusion of liquids and gases into the MH or building. Universal duct plugs are available in a variety of sizes for use in unoccupied ducts. In those ducts where the cable has been installed, ducts can be sealed through the use of putty sealants, compression plugs, or sealing bags.

9. Specify MHs engineered with sufficient ratings to withstand the necessary load for the location. The minimum rating shall be H-10. A MH installed in a roadway or asphalt-based walkway shall be rated as AASHTO H-20 (20 ton GVW vehicles under ASTM C-857), unless a lower rating is pre-approved by Homewood Plant Operations.

10. MHs shall be pre-cast. A pre-cast MH shall be Type A. Right angle turns are to be made with sweeping conduits outside of the MH (subsidiary ducts). Type J, L, or T MHs may be used with prior permission where physical restrictions require lateral ducts.

11. Additional “knock-out” windows may be present within the MH. Permission should be sought prior to final design.

12. Pre-cast sections of a MH with horizontal seams shall have a bonding ribbon clamped or welded to the embedded reinforcing steel of the MH to enable connection of the reinforcing steel between sections.

13. Specify watertight joint sealer between MH sections, provided or approved by the MH manufacturer when possible. Contractors shall provide Johns Hopkins with the MSDS for the sealer products used.

14. MHs may be site-poured to accommodate existing cabling or unusual conditions only with pre-approval of Plant Operations.

15. MHs shall have an interior height of 6’-6” or greater. MHs shall have a minimal width of 6 feet and a minimal length of 8 feet. Smaller MHs (in length and width only) shall be pre-approved in advance by Homewood Plant Operations. Larger MHs may be required in areas of known future expansion.

16. MH collars shall be pre-cast, when the appropriate size is available. MH collars shall be sized to allow a 30” opening.


18. If a MH has two or more openings, all of the openings should be the same size. At least one opening should be provided for MHs up to 3.7 m (12.0 ft) in length, two openings beyond 3.7 m (12.0 ft) in length, and three openings beyond 6 m (20 ft) in length.

19. Pulling irons shall be installed at all eight corners of the MH. At least two embedded loops are to be installed in the ceiling to support temporary lighting. Pulling irons and loops are to be galvanized or otherwise treated to prevent rust or corrosion. Pulling irons are to be embedded in the MH structure by the manufacturer.
20. Compacted aggregate to be used to form a bed under MHs may be crushed stone or gravel fill as specified under the materials section.

21. Do not install conduits into the neck of a MH for any purpose including lighting, sump pump drains, and/or sump pump power. Avoid ceiling penetrations of any kind. Designers may specify conduits into the ceiling of a MH for sump pump drain or power lines, with prior approval from Plant Operations.

22. Specify a level bed of compacted aggregate onto which a MH is to be installed. The bed shall extend 1 foot beyond the exterior of the MH when in final position. The aggregate bed shall be a minimum of 6" thick (post-compaction) and shall be compacted to not less than 95% density compared to maximum laboratory tests by weight per ASTM D1557-64T, method A.

23. Specify water-tight joints in pre-cast MH sections.

24. Design the MH cover flush with the final grade of the surrounding area. If the distance from the final grade to the MH ceiling is 24" or greater, specify permanent steps into the neck.

25. Use pre-formed openings for penetrations into the MH.

26. Specify a sump pump. Design a separate pathway to the MH for power and effluent discharge. Power cables shall not be installed into a communication ductbank. Sump pump discharge shall be routed to the nearest available storm drain. The discharge hose shall not be installed into a communications ductbank, but shall have an independent pathway out of the MH.

27. Design for MH racking on all four sides. Stanchions shall be installed at a minimum of two vertical locations on each wall. Stanchions shall be stacked at each location to provide a minimum of 6 feet of height. Two spare cable rack arms of equal size to those planned for use shall be installed at each vertical location used. Splayed MHs that function as straight pass through spaces may not need racking on the short sides with the penetrations as determined by Johns Hopkins.

28. Specify a permanent ladder in a MH. Installed ladders shall meet all federal and state requirements for permanently mounted ladders in MHs.

29. Specify an 8 ft ground rod (per NESC) into the floor of each MH. Seal the space around the ground rod to prevent water penetration around the rod. Bonding ribbon between pre-cast sections shall be bonded to the ground rod or grounding conductor.

30. Specify an insulated (green), stranded #6 (minimum) copper grounding conductor from the ground rod to each wall. Designers may specify a single conductor encircling the space. The conductor(s) shall run the entire length of each long wall and shall be securely anchored to the wall.

31. Specify exothermic welds for all grounding conductor bonds within a MH.

32. Bond to ground all existing conductive racking, stanchions, and ladders.

33. Do not design any permanent attachments to pulling irons or loops. Cables are not to be permanently supported by pulling irons or loops.

34. Use of Existing Maintenance Holes
   a. Follow all guidelines above when using existing MHs, unless waived by Homewood Plant Operations.
   b. Specify a sump pump, power, and drain as specified above, if standing water or evidence of past flooding is evident in the MH.
c. Design for racking on any side without racking. Johns Hopkins may waive this specification for certain MH walls based on current MH configuration. Specify racking of manufacturer and type specified above.

d. Designers are not required to specify a ladder into an existing MH lacking a ladder.

e. Specify grounding into an existing MH without proper grounding as required by codes, standards, methodologies, and specifications referenced in this document.

f. Bond to ground all existing conductive racking, stanchions, and ladders. Notify Johns Hopkins of any pre-existing splice cases not bonded to ground.

g. Designers are not required to specify pulling irons and loops into existing MHs, unless needed by the Contactor.

D. Handholes and Handboxes

1. In general, HBs shall be incorporated over MHs, whenever possible. New HHs shall not be installed. Where possible, contractors shall use existing HBs over existing HHs. HBs and HHs shall not be used with ductbanks exceeding three conduits (not more than a total of six conduits, three in and three out). A HB/HH shall not be used as an intersection of two independent pathways, but can be used to form a radial branch of a single pathway (e.g. three in one side, one out of three sides). Plant Operations may waive the conduit count specifications, acknowledging these deviations from BICSI methodology, in special circumstances where a MH cannot be installed, but a large HB can be installed.

2. Pathways using HBs shall not be designed to expose an HB to deliberate vehicular traffic. HBs may be placed within sidewalks and other walkways or areas otherwise restricted to occasion traffic by University light vehicles. HBs may be installed in grass and wooded areas. All locations shall be approved by Homewood Plant Operations.

3. Designers may use an existing HB to provide needed pathways. Designers shall not use an existing HH to provide needed pathways. A HH location may be used, if the HH is replaced by a new HB. An existing HB shall be upgraded with respect to integral parts and grounding as specified in the installation of a new HB. If a single new conduit is installed into a HB/HH, the entire HB/HH shall be addressed with respect to integral parts and grounding.

4. Plant Operations may require a HB or HH to be replaced entirely if incorporated into a new cable installation. Designers shall not assume existing HBs and HHs may be used. Installation of cable into existing conduits terminating in a HB or HH shall require a review of the HB/HH and its possible replacement.

5. HHs shall not to be used to house splice cases. HBs may be used to house splice cases. This use for a HB is an acknowledge deviation from BICSI methodology. Designers may classify these HBs as splice enclosures. Designers may propose the use of a pedestal for this purpose.

6. Designers shall provide butterfly drawings indicating planned cable pathways, racking, location and type of splice case(s), entry configuration for a new HB and use of existing HB/HH, when and where appropriate. HBs shall be designed with cable racks (for large HB) and grounding as required. HBs should also have drainage provisions (e.g., drain holes, open bottom, sump-hole).

7. HBs shall not be:

a. Larger than 1.2 m (4.0 ft) in length by 1.2 m (4.0 ft) in width by 1.2 m (4.0 ft) height.

b. Shared with electrical installations other than those used for network cabling/telecommunications.
8. Divided boxes may be considered by Homewood Plant Operations for specific applications (remotely located devices requiring power and communications cabling) and shall be pre-approved by Homewood Plant Operations.

9. Divided boxes shall not contain cable splices or any possible exposure of conductors within the communications side of the box. A separate “communications-only” HB shall be required to house necessary fiber splices.

10. Horizontal penetrations of the box shall be made using knockout locations, when available. The sidewalls of the HB shall not be penetrated in other locations without pre-approval from Plant Operations. Conduits may “stub up” into the box. Conduits entering this way shall be within 2” of a sidewall.

11. Conduit entering a HB should be aligned on opposite walls at the same elevation. Some HBs are available without bottoms for drainage. When installed without bottoms, these HBs should be equipped with a 102 mm (4.0 in) layer of small rock in the bottom to prevent mud from intruding into the HB.

12. Label and document all space elements in accordance with the Johns Hopkins OSP Administrative Specification.

13. Specify a HB with sufficient rating to withstand the necessary load for the location. All new HBs shall be Strongwell UL-listed QUAZITE boxes. HBs shall be “PG” style, Tier 15 or greater. The use of other QUAZITE boxes shall be pre-approved by Homewood Plant Operations.

14. QUAZITE HB covers shall be HA-rated covers labeled “Communications” (covers shall be HH-rated for areas with anticipated vehicular traffic). Covers located off the main body the campus shall have locking covers. Contact Plant Operations for determination of this need.

15. QUAZITE boxes and lids shall be standard gray. QUAZITE boxes and lids in grass or planting beds may be green. The use of other QUAZITE colors shall be pre-approved by Homewood Plant Operations.

16. Large boxes shall have two QUAZITE pulling eyes installed on the shorter sides of the box (or opposite sides of a square box).

17. HB sides 24” or greater shall have QUAZITE galvanized steel racking.

18. Any HB designed to house a splice case shall be grounded. The HB shall have an 8 ft ground rod.

19. Compacted aggregate to be used to form a bed under HBs may be crushed stone, or gravel fill of the type specified below by the materials section.

20. Compacted aggregate shall not be sand or gravel dust.

21. HBs shall rest on a bed of gravel or crushed rock measuring six or more inches deep and extending six or more inches beyond the sides of the HB.

22. Specify 4”-6” of gravel or crushed rock outside HBs prior to backfilling to grade.

23. HBs shall be installed with covers flush with the final grade. HBs shall match any slope in the final grade. HBs may be installed with a partially exposed side on steep grades. Plant Operations shall pre-approve non-flush designs.

24. Using Existing Hand Boxes
a. Plant Operations shall approve the use of an existing HB. An existing HB may have to be replaced if the conditions of the HB are beyond remediation. Plant Operations shall determine the status of the HB. Replacement HBs shall be installed to the specifications of the previous section.

b. Existing conditions of conduits may not be able to be fully reconfigured to meet location specifications of the previous section. Plant Operations may allow deviations from conduit design specifications during design approval.

c. If available for use, enter an existing HB horizontally through knockouts. If pre-manufactured knockouts are not available, enter the HB by sweeping under the sidewall and “stubbing up” into the box within 2” of a sidewall.

d. HB sides 24” or greater without racking shall be retrofitted with appropriate racking. Plant Operations may waive this specification depending on the existing conditions.

e. Ground rods shall be installed, as needed. Correct any improper or missing grounding within the HB.

f. Excavate within the HB such that 6” of gravel or crushed rock can be placed into the box. The box shall be raised or lowered to existing grade as needed. This specification may be waived if existing conduit conditions block such modifications.

25. Using Existing Hand Holes

a. Plant Operations shall approve the use of an existing HH. Designers may have to specify replacement of an existing HH with a HB, if the conditions of the HH are unacceptable. Plant Operations shall determine the status of the HH. Replacement HBs shall be installed to the specifications of the previous section.

b. Enter the HB by sweeping under the sidewall and “stubbing up” into the HH within 2” of a sidewall. Plant Operations may waive this specification depending on the existing conditions.

c. Excavate within the HH such that 6” of gravel or crushed rock can be placed in to the hole. The HH shall be raised or lowered to existing grade as needed. This specification may be waived if existing conduit conditions block such modifications.

26.

PART 2 PRODUCTS

2.01 MATERIALS

A. Maintenance Holes

1. Minimum load rating- H-10

2. Higher rating- H-20; for roadways or asphalt-based walkways

   a. 20 ton GVW vehicles under ASTM C-857

3. Pre-cast, Type A, off-center wall penetrations/windows

   a. Type J, L, or T with prior approval

4. Additional "knock-out" windows may be pre-manufactured

5. MH with horizontal seams- bonding ribbon clamped or welded to embedded reinforcing steel for connection of MH sections

6. Watertight joint sealer, by MH manufacturer when available
7. Dimensions
   a. Minimum size: Height- 6'-6"; Width- 6'; Length- 8'
   b. Smaller sizes, when needed, must be pre-approved by Johns Hopkins

8. Pre-formed sump and sump cover

B. Maintenance Hole Collars
   1. Standard 30" opening
   2. Manufacturers
      a. East Jordan Iron Works
      b. Other acceptable manufacturers offering equivalent products

C. Maintenance Hole Covers
   1. Labeled "COMMUNICATIONS" in raised letters
   2. Standard size for a 30" opening
   3. Adheres to ASTM A48/A48M-00 Standard Specification for Gray Iron Castings
   4. Manufacturers
      a. East Jordan Iron Works
      b. Other acceptable manufacturers offering equivalent products

D. Maintenance Hole Accessories
   1. Stanchions and Brackets
      a. Heavy duty, non-metallic
      b. Stanchions- 36" with mounting holes at 4" intervals
      c. Bracket load rating: 8" arms- 450 lbs, 14" arms- 350 lbs, 20" arms- 250 lbs
      d. Manufacturers
         1) Underground Devices
            (a) Adjustable arm cable rack arms- RA08, RA14, RA20
            (b) Stanchions- CR36
         2) Other acceptable manufacturers offering equivalent products
   2. Ladder
      a. UL-listed, non-conductive, designed for electrical maintenance hole installations
      b. Manufacturers
         1) M.A. Industries, Peachtree, GA, Tel. 800-241-8250
         2) Other acceptable manufacturers offering equivalent products
   3. Pulling irons and loops
      a. galvanized or treated to prevent rust or corrosion
      b. embedded by maintenance hole manufacturer
   4. Ground rod
      a. Copper clad steel or solid copper
      b. 8' minimum length
c. 5/8" minimum thickness
d. Manufacturers
   1) Harger
   2) Other acceptable manufacturers offering equivalent products

5. Ground wire
   a. a. #6 AWG copper stranded wire, bare or green insulated

E. Sump pump
   1. Low water pump (pump down to 1/2" or less)
   2. Designed to pump water with debris
   3. Designed for permanent installation
   4. Float switch

F. Handboxes
   1. QUAZITE brand handbox, PG-style, Tier 15 or greater
   2. QUAZITE cover, HA-rated, labelled "Communications", locking cover for locations beyond contiguous campus (e.g. locations on City streets/sidewalks)
   3. Gray handbox and lid, green acceptable in grass
   4. Large handboxes
      a. QUAZITE pulling eyes (handbox sides 3' or larger)
      b. QUAZITE racking (handbox sides 2' or larger)
   5. Manufacturers
      a. Strongwell
      b. No equivalent products

G. Aggregate
   1. Crushed stone or gravel fill
   2. Percent composition by dry weight as determined by laboratory sieves (U.S. series)

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Passing Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2 inches</td>
<td>100 %</td>
</tr>
<tr>
<td>1 inch</td>
<td>90-100 %</td>
</tr>
<tr>
<td>#4</td>
<td>0-5 %</td>
</tr>
</tbody>
</table>

H. Concrete
   1. - 3/8" maximum size
   2. Nominal compressive strength: 3000 PSI at 28 days
I. Steel reinforcing bars
   1. Size- standard size #5

J. Water-proofing material
   1. Elastomeric water-proof material for exterior, below-grade concrete surfaces.
   2. Manufactured explicit, but not necessarily exclusive, purpose of waterproofing concrete.

K. Cable Support Structures
   1. Cable raceway
      a. Cable Management Solutions Snake Tray (501 series wall snake, 201 series overhead
         snake, and 101 series underfloor raceway)
   2. Steel support wires
      a. Size: 10М (3/8" dia.), galvanized steel with mounting hardware
      b. Conform to ASTM A475-98 Standard Specification for Zinc-Coated Steel Wire Strand
   3. Vertical cable supports
      a. Erico CADDY CableCat CAT600 series
   4. Steel cable ties
      a. Panduit Stainless Steel System
      b. Band-It steel strapping
      c. Other acceptable manufacturers offering equivalent stainless or galvanized steel
         products

L. Conduits
   1. See Section 27 0543 Underground Ducts and Raceways for Communications Systems

PART 3 EXECUTION

3.01 INSTALLATION

A. Communications Underground Ducts

B. Tunnels
   1. All space elements shall be labeled in accordance with the OSP specifications.
   2. Tunnel Penetrations
      a. Contractors shall penetrate tunnels walls in such a position to allow broad sweeps of
         cables into the tunnel space while minimizing interference to the passage and access
         to adjacent utilities. Vertical (roof) penetrations may be allowed in certain instances
         for small ductbanks.
      b. All ductbanks abutting a tunnel shall be concrete encased for a minimum of ten
         horizontal feet from the tunnel. The ductbank shall be constructed as specified by this
         document.
      c. When abutting a ductbank to a tunnel wall, Contractors shall provide dowel holes in
         the exterior surface of the tunnel for reinforcing bars. These bars shall extend into the
         tunnel wall without penetrating the wall and be embedded in the concrete ductbank.
Contractors are not required to provide dowel holes for reinforcing bars when penetrating the roof of the tunnel.

d. Contractors shall core drill all penetrations. Contractors shall be responsible to consult structural engineers and to maintain the structural integrity of the tunnel at the point of penetration and the surrounding area. Any damage to the tunnel or its contents shall be repaired by the Contractors or by Johns Hopkins at Contractor’s expense. Contractors may be liable for any costs or damages associated with loss of service resulting from tunnel damage.

e. Contractors shall provide and install framing as necessary for pouring ductbank abutting the tunnel. Contractors shall remove this framing when the concrete has properly set.

f. Contractors shall shape the concrete in such a way as to slope water away from the ductbank-tunnel seam. Alternately, Contractors shall purge the area around the seam as to slope water away.

g. Contractors shall provide and install framing as necessary to prevent the penetration of concrete into the interior space of the tunnel. Contractors shall remove this framing after the concrete has properly set and backfilling is complete.

h. Contractors shall provide waterproofing material to provide a permanent, waterproof coating. Contractors may use a protective membrane, sprayed/brushed product, or any combination. The proposed product shall be manufactured for the explicit, but not necessarily exclusive, purpose of waterproofing concrete. Contractors shall submit manufacturer-produced product information sheets for proposed products to be used.

i. Contractors shall install, per manufacturer’s specification, a waterproofing material to the sides and top of a horizontal ductbank extending no less than 4 feet from the tunnel wall. Contractors shall install, per manufacturer’s specifications, a waterproofing material to the tunnel wall extending a minimum of 18 inches (wrapping over and onto tunnel roof if required) from the ductbank. The waterproofing shall be applied to all surfaces except the bottom of the ductbank where poured on aggregate bed.

j. Contractors shall install, per manufacturer’s specification, a waterproofing material to all sides of a vertical ductbank extending no less than 6 vertical feet from the tunnel roof. Contractors shall install, per manufacturer’s specifications, a waterproofing material to the tunnel roof extending 18 inches (or to the edge of the tunnel roof) from the ductbank, and to any curved part of the ductbank within 6 feet of the roof. The waterproofing shall be applied to all surfaces.

3. Existing support structures

   a. Contractors shall using existing pathways and support mechanisms within tunnels, when possible. These include existing raceways, chases, and support strands. All cable installations must be supported off the tunnel floor.

   b. Contractors may be asked to re-engineer an existing support structure to accommodate the current cabling as well as the new cabling. If the existing support structure is inadequate for new installations, Contractors shall consult with Plant Operations as to the need for re-engineering the structure.

4. New open support structures

   a. Contractors may install new open support structures as needed. Support structures shall be installed to minimally impact open space and access to other utilities within the tunnels. Support structures shall be placed against, or as close as possible, to
walls and ceilings. Any supports or protrusions shall be rounded or padded to minimize injury to people, if impacted. Final placement of support structures shall be pre-approved by Homewood Plant Operations. All cable installations shall be supported off the tunnel floor.

b. The Contractor shall provide and install Snake Tray products for cable support. Contractors shall use Snake Tray cable turn out and cable turning fence parts as needed. Contractors shall not substitute connectors or other Snake Tray-specific parts designed for the Snake Tray series installed.

c. Other products must be pre-approved by Homewood Plant Operations.

d. Cables shall be placed into open support structures in a loose and random fashion, when possible. Cables shall not be secured into an open support structure, unless required to remain in the structure, to support vertical rises, or to maintain bend radii.

e. Contractors shall use Panduit Stainless Steel System cable ties, Band-It steel strapping, or equivalent to connect to support wires. The cable ties are to be installed per manufacturer’s instructions. The locking mechanism shall be placed towards the wall or ceiling as to minimize its exposure to contact. All sharp corners or edges created by cutting excess length shall be rounded and smoothed.

5. New support wires

a. Contractors may install support wires onto existing or installed structures for the attachment of cables. Support wires shall be installed to minimally impact open space and access to other utilities within the tunnels. Support wires and any other support structure needed to install support wires shall be placed against, or as close as possible, to walls and ceilings. Any support structure needed to install support wires shall be rounded or padded to minimize injury to people, if impacted. Final placement of support structures shall be pre-approved by Homewood Plant Operations.

b. Support wires shall be 10M (minimum size) galvanized steel. They shall be supported every 8 feet (maximum interval). Messenger supported wiring shall be grounded per NEC1999 Section 321-7, which considers them to be conductor enclosures per NEC1999 Section 250-86. Grounding within the tunnels shall be coordinated with Plant Operations.

6. Cable Lashing

a. When using existing support strands, Contractors shall attach cables directly to the support strand. Contractors shall not attach new cables directly to existing cables. Contractors may wrap around a single existing cable and support strand provided the support strand bears the weight of the cable. New cables shall not add any strain to existing cables.

b. Contractors shall use Panduit Stainless Steel System cable ties, Band-It steel strapping, or equivalent to connect to support wires. The cable ties are to be installed per manufacturer’s instructions. The locking mechanism shall be placed towards the wall or ceiling as to minimize its exposure to contact. All sharp corners or edges created by cutting excess length shall be rounded and smoothed. Lashing may be tight, but shall not deform the cable.

c. Cables installed into open support structures shall not be lashed to the support structure. The following are exceptions to this specification: lashing required to keep the cables within the confines of the structure and lashing required to provide support for vertical cables.
7. Vertical exits
   a. Cables leaving the tunnel beneath a building, vertically into the building, shall be
      supported by vertical backbone cable supports. Equivalent products must be
      galvanized, have a similar locking mechanism, and be pre-approved by Homewood
      Plant Operations.

8. Nonmetallic flexible raceway (Innerduct)
   a. Innerduct shall not be placed into existing or new enclosed raceways, including "open"
      raceways like Snake Tray. Innerduct may be use to transition into and out of these
      raceways. Innerduct may be used for mechanical protection when support wires are
      used for optical fiber cables. Innerduct is not required within the tunnels in any
      location, unless specified by Homewood Plant Operations for a given installation.
   b. Fire alarm cable shall be installed in accordance with NFPA 70 National Electric Code.

9. Splices
   a. Locations of splice cases are to be pre-approved by Homewood Plant Operations.
      Splice cases shall be fully supported off the tunnel floor.
   b. Splice specifications are detailed later in this specification.

C. Maintenance Holes
1. Contractors shall label and document all space elements.
2. Contractors shall install maintenance holes at the location and in the orientation specified
   by Johns Hopkins and project documentation.
3. Contractors shall locate conduit penetrations into a maintenance hole as specified by Johns
   Hopkins and construction document. Contractors shall not install conduits into the neck of
   a MH for any purpose including lighting, sump pump drains, and/or sump pump power.
   Contractors shall avoid ceiling penetrations of any kind. Contractors may install conduits
   into the ceiling of a MH for sump pump drain or power lines, with prior approval from Plant
   Operations.
4. Contractors shall provide and install a level bed of compacted aggregate onto which a MH
   is to be installed. The bed shall extend 1 foot beyond the exterior of the MH when in final
   position. The aggregate bed shall be a minimum of 6" thick (post-compaction) and shall
   be compacted to not less than 95% density compared to maximum laboratory tests by
   weight per ASTM D1557-64T, method A.
5. Contractors shall provide water-tight joints in pre-cast MH sections.
6. Contractors shall have all brick joints in all of the brick courses (neck) between the MH box
   and the collar (cover cone) fully mortarad inside and outside. Brick necks constructed on
   site shall have the inner and outer surfaces completely purged to prevent water penetration
   of the neck.
7. Contractors shall install the MH cover flush with the final grade of the surrounding area. If
   the distance from the final grade to the maintenance hole ceiling is 24" or greater,
   Contractors shall provide and install permanent steps into the neck.
8. Contractors shall keep the MH opening covered to prevent rain and runoff from penetrating
   into the MH during construction and until watertight measures are complete.
9. Contractors shall use pre-formed openings for penetrations into the MH. Contractors may
   core drill MH walls or may cut a window to provide space for new conduits.
10. Contractors shall install new conduits in a neat arrangement, with horizontal and vertical rows. Contractors shall not install conduits in a random, clustered fashion. The integrity and appearance of the walls shall be restored after conduit installation to original conditions. Plywood frames used to pour concrete around conduits shall be removed at the end of the job. New penetrations shall be sealed against moisture and gas penetration around conduits.

11. Contractors shall install a sump pump. The power cable for this pump shall be provided using a separate pathway to the MH. Power cables shall not be installed into a communication ductbank. Sump pump discharge shall be routed to the nearest available storm drain. The discharge hose shall not be installed into a communications ductbank, but shall have an independent pathway out of the MH.

12. If Plant Operations pre-approves not installing a sump pump, Contractors shall cover and watertight seal the sump for future use, if needed. The cover shall be sealed in a removable manner enabling future access to the sump.

13. Contractors shall provide and install MH racking on all four sides. Stanchions shall be installed at a minimum of two vertical locations on each wall. Stanchions shall be stacked at each location to provide a minimum of 6 feet of height. Two spare cable rack arms of equal size to those planned for use shall be installed at each vertical location used.

14. Contractors shall provide and install a permanent ladder in a maintenance hole.

15. Contractors shall provide and install an 8 ft ground rod (per 1997 NESC 94.B.2) into the floor of each MH. Contractors shall seal the space around the ground rod to prevent water penetration around the rod. Bonding ribbon between pre-cast sections shall be bonded to the ground rod or grounding conductor.

16. Contractors shall provide and install an insulated (green), stranded #6 (minimum) copper grounding conductor from the ground rod to each wall. Contractors may install a single conductor encircling the space. The conductor(s) shall run the entire length of each long wall and shall be securely anchored to the wall.

17. Contractors shall provide exothermic welds for all grounding conductor bonds within a maintenance hole.

18. Contractors shall bond to ground all existing conductive racking, stanchions, and ladders.

19. Contractors shall not make any permanent attachments to pulling irons or loops. Cables are not to be permanently supported by pulling irons or loops.

20. Use of Existing Maintenance Holes
   a. Contractors shall follow all specifications above when using existing maintenance holes, unless waived by Homewood Plant Operations.
   b. Contractors shall strictly follow above specifications regarding conduit placement, arrangement, and penetration.
   c. Contractors shall install a sump pump, power, and drain as specified above, if standing water or evidence of past flooding is evident in the MH.
   d. Contractors shall install racking on any side without racking. Johns Hopkins may waive this specification for certain MH walls based on current maintenance hole configuration. Contractors shall provide and install racking of manufacturer and type specified above.
   e. Contractors are not required to install a ladder into an existing maintenance hole lacking a ladder.
f. Contractors shall provide and install grounding into an existing maintenance hole without proper grounding as required by codes, standards, methodologies, and specifications referenced in Appendix 2, including this document.

g. Contractors shall bond to ground all existing conductive racking, stanchions, and ladders. Contractors shall notify Johns Hopkins of any pre-existing splice cases not bonded to ground.

h. Contractors are not required to install pulling irons and loops into existing MH, unless needed by the Contractor.

D. Handholes and Handboxes

1. Contractors shall label and document all space elements.

2. Handboxes shall be installed per manufacturer’s instructions.

3. Handboxes shall rest on a bed of gravel or crushed rock measuring six or more inches deep and extending six or more inches beyond the sides of the HB. Sand and gravel dust are not acceptable.

4. The Contractor shall install 4”-6” of gravel or crushed rock outside handboxes prior to backfilling to grade. Sand and gravel dust are not acceptable.

5. Handbox color and lid type shall be coordinated with Johns Hopkins.

6. Handboxes shall be installed with covers flush with the final grade. Handboxes may match any slope in the final grade. Handboxes may be installed with a partially exposed side on steep grades. Plant Operations shall pre-approve non-flush installations.

7. Horizontal penetrations of the box shall be made using knockout locations, when available. The sidewalls of the handbox shall not be penetrated in other locations with pre-approval from Plant Operations. Conduits may “stub up” into the box. Conduits entering this way shall be within 2” of a sidewall.

8. Using Existing Handboxes

a. Plant Operations must approve the use of an existing handbox. Contractors may have to replace an existing handbox, if the conditions of the handbox are beyond remediation. Plant Operations shall determine the status of the handbox. Replacement handboxes shall be installed to the specifications of the previous section.

b. Existing conditions of conduits may not be able to be fully reconfigured to meet location specifications of the previous section. Plant Operations may allow deviations from conduit placement specifications prior to installation.

c. If available for use, Contractors shall enter an existing handboxes horizontally through knockouts. If pre-manufactured knockouts are not available, the Contractors shall enter the handbox by sweeping under the sidewall and “stubbing up” into the box within 2” of a sidewall.

d. Handbox sides 24” or greater without racking shall be retrofitted with appropriate racking. Plant Operations may waive this specification depending on the existing conditions.

e. Ground rods shall be installed, as needed. Contractors shall correct any improper or missing grounding within the handbox.
f. Contractors shall excavate within the handbox such that 6" of gravel or crushed rock can be placed into the box. The box shall be raised or lowered to existing grade as needed. This specification may be waived if existing conduit conditions block such modifications.

9. New Handholes
   a. New handholes shall not be installed.

10. Using Existing Handholes
   a. Plant Operations must approve the use of an existing handholes. Contractors may have to replace an existing handhole with a handbox, if the conditions of the handhole are unacceptable. Plant Operations shall determine the status of the handhole. Replacement handboxes shall be installed to the specifications of the previous “New Handboxes” section.
   b. Contractors shall enter the handbox by sweeping under the sidewall and “stubbing up” into the handhole within 2” of a sidewall. Plant Operations may waive this specification depending on the existing conditions.
   c. Contractors shall excavate within the handhole such that 6" of gravel or crushed rock can be placed in to the hole. The handhole shall be raised or lowered to existing grade as needed. This specification may be waived if existing conduit conditions block such modifications.

END OF SECTION
SECTION 33 8129

COMMUNICATIONS VAULTS, PEDESTALS, AND ENCLOSURES

PART 1  GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. Pedestals

1. There are no specific safety information or restrictions for pedestals.

2. Pedestals & cabinets shall have very limited use at Johns Hopkins campuses. Contractors shall not use pedestals or cabinets without design approval from Plant Operations. Certain fringe areas or areas with sufficient concealment may utilize them, if pre-approved. Areas of the campus beyond the contiguous core may use pedestals, if pre-approved.

3. Pedestals and cabinets may be mounted directly in the ground or on concrete pads, mounting feet, floor stands, walls, or on poles. These housings may include:
   a. Locking device or hasp.
   b. Adjustable mounting bracket/panel to secure taps.
   c. Splitters.
   d. Couplers.
   e. Line extenders.
   f. Amplifiers.
   g. Interdiction devices.
   h. Mounting hardware.
   i. Reels for cable storage.
   j. Warning labels.
   k. Grounding/bonding provisions.
   l. Identification.
   m. Manufacturers markings.
   n. Cable knockouts.
   o. Grommets.

4. When selecting pedestals and cabinets, the designer should consider:
   a. Cable bend radii >15x cable diameter.
   b. Capacity to accommodate four cables for current and future requirements.
c. Capacity to accommodate both inline and butt splice closures.

d. Security—special bolts, keys, and security alarm monitoring.

e. Flood control provisions.

f. Weather-tight seals/gaskets/grommets.

g. Optical cable storage to permit moving the splice closure to a working location.

h. Ventilation for environmental control and/or heat extraction (forced air fan optional).

i. Resistance to rodent and insect intrusion.

j. Environmentally controlled cabinets (fans, heaters, and thermostats included).

k. Color options.

l. Impact resistance (vandalism).

m. Resistance to dust intrusion.

n. Resistance to water spray.

o. Chemical resistance.

5. Pedestals and cabinets shall be designed so that there is a minimum of 3 ft of clearance in front and on both sides.

B. Enclosures

1. Designers shall limit the use of direct-buried spaces. These spaces are primary locations for direct-buried splices. The use of direct-buried pathways is discussed above.

2. Direct-buried locations shall not necessitate the installation of a ground rod. Electrical ground continuity through any device in the space shall be maintained and insulated from the surrounding space.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pedestals

1. Manufacturers

   a. Emerson Network Products (formerly Marconi), Energy Systems- North America, 1122 F Street, Lorain, OH 44052, Tel: 1-800-800-1280

      1) ACCESS 360 Metallic Pedestal

   b. Other acceptable manufacturers offering equivalent products

B. Enclosures

1. Manufacturers

   a. 3M Better Buried Closures

   b. Preformed Line Products REDDI Seal closures

   c. Other acceptable manufacturers offering equivalent products

2. Buried closures shall use re-enterable encapsulant specified by the closure manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.

B. Pedestals
   1. New pedestals shall not be installed, except in exception circumstances.

C. Enclosures, direct-buried
   1. Direct-buried spaces shall be at a minimal depth of 30 inches to the device in the space, where possible. Deviations from this specification must be pre-approved by Homewood Plant Operations.
   2. Contractors shall excavate in and around the final space location such that 6" of gravel or crushed rock can be placed below and around any direct buried device in the space. Contractors shall cover any direct buried devices in the space with 6" of gravel or crushed rock.
   3. Direct-buried locations shall not necessitate the installation of a ground rod. Electrical ground continuity through any device in the space shall be maintained and insulated from the surrounding space.

D. 

END OF SECTION
SECTION 33 8213

COPPER COMMUNICATIONS DISTRIBUTION CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 1313: Communications Copper Backbone Cabling (Intrabuilding Backbone Cabling).

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000: Communications General.

1.04 DESIGN REQUIREMENTS

A. There are several physical networks on Johns Hopkins campuses. The primary networks are the data, voice, fire alarm, parking, and mechanical control networks. Backbone cables to buildings have been used to provide voice and data service to other locations. While not ideal, it may be more practical to evaluate available backbone capacity in neighboring buildings. Field devices (e.g. emergency phones, security cameras, kiosks, etc.) will likely be cabled to the nearest building for voice and/or data service, when needed.

B. Underground - Underground cable is subject to some of the same environmental problems as those of direct-buried cable. Moisture and lightning are a problem, but rodent damage is less likely. Both are subject to excavation damage, although underground cable has some mechanical protection by the conduit that encases it.

C. Direct-Buried - Direct-buried OSP cables are subject to different environmental conditions than those of aerial cables. Moisture, rodent damage, and lightning are some of the more critical areas that are addressed in the manufacture of direct-buried OSP cables.

D. Aerial - There are three methods for placing cable on pole lines:

1. Lash new cable to a support strand.
2. Lash new cable to an existing support strand/cable.
3. Use self-supporting-type cable that contains a support strand.

E. Copper Voice Backbone Cabling

1. The voice network is based on a variety of OSP backbone cables. The network is also a hierarchical star with several major and several minor concentration points. Plant Operations, in conjunction with Telecommunications, shall assist designers in determining end points for backbone designs. As a deviation from BICSI methodologies, a "primary" backbone to a building may be composed of two cables with a splice at a star location. Buildings may also be cabled from high-count copper splice cases functioning as a secondary star at a strategic location.

2. Plant Operations, in conjunction with Telecommunications, shall assist designers in determining the number of pairs and type of copper cable to be installed.

4. Other voice cables may be 24 AWG, Superior-Essex SEALPIC-84 self-supporting cable, as specified below.

5. Other AWG sizes may be used for specific applications and shall be pre-approved by Homewood Plant Operations.

6. Material of similar design and specifications may be approved by Homewood Plant Operations. Substitutions shall be pre-approved.

7. The voice network may have dead pairs in one or more splices that may be used to extend service. Designers should check with Plant Operations regarding the location and use of dead pairs as an alternative and potentially better source for voice service.

8. Refer to the BICSI CO-OSP manual for guidelines on copper cable requires under different conditions.

9. The physical design of the system should minimize splices whenever possible. Splices cannot always be avoided due to the cable plant layout, length, raceway congestion, and unplanned requirements (e.g., cable damaged during the installation or accidental damage to existing cable).

F. Fire Alarm Backbone Cabling

1. Plant Operations shall be contacted for specific guidance on fire alarm cabling. Fire alarm signals may use copper or optical fiber cables, dependant upon the equipment being installed and the location of the equipment.

G. Parking Backbone Cabling

1. Plant Operations shall be contacted for specific guidance on parking lot lift gate cabling. Plant Operations, in conjunction with the Security Department Parking Office, shall assist designers in determining the best design for this type of cabling.

H. Mechanical Control Backbone Cabling

1. Designers shall not design a separate mechanical network element without prior approval of Plant Operations. The existing mechanical network is being phased out as building systems become IP-based and use the data network.

I. Other Backbone Cabling

1. Plant Operations shall be contacted prior to planning the introduction of any additional cable plant elements (e.g. coax backbone cable). Expansion of the OSP into other media shall be very limited and shall have justification beyond the existing infrastructure’s ability to support the new service.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underground voice cable

1. 24 AWG copper

2. Pair count:

3. Manufacturers

   a. Superior-Essex

      1) SEALPIC-FSF cable

      2) SEALPIC-84 self-supporting cable

   b. General Cable
PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Copper (Voice) Backbone Cabling

1. Underground voice cables shall be SEALPIC-FSF.

2. Aerial voice cables may be 24 AWG, Superior-Essex SEALPIC-84 self-supporting cable. SEALPIC-FSF may be used with a separate support strand.

3. Voice cables shall not be spliced in the OSP, except as required by the limitations of manufactured cable lengths. Oversized cables may be installed over part of the pathway and downsized at a splice to the final size for the project. (This would leave dead pairs within the splice or as a stub for future development from this branch splice point.)

4. All cables installed in maintenance holes and large handboxes with racking must be supported by racking arms. Cables shall not be secured directly to stanchions by cable ties or other means unless the full weight of the cable is also supported by an arm.

5. Additional information on splicing can be found under OSP devices- copper enclosures.

6. Where possible, splice conductors by using the foldback splice method. Conductors are folded into the splice to provide slack in the conductors for maintenance, rearrangement, or transfer of conductors.

C. Other Backbone Cabling

1. Other cable types shall be project specific and detailed in project documentation.

END OF SECTION
SECTION 33 8213.13

COPPER SPLICING AND TERMINATIONS

PART 1 GENERAL

1.01 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS

A. Splices may be made in MHs, tunnel locations, or with HBs (in certain circumstances, noting this as a deviation from BICSI methodologies). All splice locations and configurations shall be pre-approved by Homewood Plant Operations. No dead copper pairs shall remain within a sealed splice case. Designers shall specify stubs for unused pairs. Exceptions may be made for large backbone cables spliced to provide multiple branches for future installation.

B. Copper closures shall be re-enterable, watertight or vented depending on the specific situation. They may be used on poles, strands, buildings, underground, direct-buried, and above-ground pedestals.

C. OSP cables shall not be spliced within a building. All OSP cables shall terminated in buildings on building entrance terminals. Splices may be used to connect OSP cables to manufacturer-installed BET stubs.

D. All splices shall use high pair count splice modules.

E. Copper closures shall be capable of:
   1. Storing and organizing splices (whether individually spliced or mass spliced).
   2. Providing bonding and grounding facilities.
   3. Restoring the mechanical integrity and electrical properties of the sheath.
   4. Protecting splices from moisture. Closures shall be filled with re-enterable encapsulant, unless otherwise specifically instructed otherwise by the closure manufacturer.

F. Closures shall be sized to accommodate the maximum number of splice modules for the feeder backbone cable.

G. When designing for a branch splice, the last available opening in the endplates cannot be used if any unspliced pairs would remain unused within the enclosure. If only one opening in the endplates is available and if unspliced pairs would remain with the enclosure, design for a single short cable spliced to the available pairs. This cable shall terminate in a new enclosure from which the needed pairs for the final installation may be spliced. If all pairs cannot be spliced onto a single cable, contact Plant Operations. A new enclosure, or custom endplates may be required.

H. All splices shall maintain grounding continuity between all non-transmitting, conductive elements within the cables within the enclosure. All splices shall be bonded to ground per codes, standards, and methodologies.

I. 
1.04 PROJECT CONDITIONS

A. There is no specific safety information for devices.

B. The location and orientation of OSP devices shall be strictly controlled by Johns Hopkins. Contractors shall confirm all proposed locations and orientations of OSP devices. Visible devices or visible elements of devices, including any supporting structure for OSP devices, shall be pre-approved by Homewood Plant Operations.

C. Restrictions on OSP devices are on a case-by-case basis without general campus specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers

1. 3M
   a. 2-Type Fire Retardant Closures
   b. 2-Type Series Pressurized Closures (larger splices)

2. Preformed Line Products
   a. ARMADILLO Series

3. Other acceptable manufacturers offering equivalent products

B. 3M MS2 or 710 modules or appropriate hardware, as determined by the enclosure manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Proper installation of a splice/termination shall require remediation of any past improper installation procedures that would impact the proper installation of the device (e.g. proper grounding).

B. Install in accordance with manufacturer's instructions.

C. Copper cable splicing shall be performed with high pair count modular connectors.

D. The splice and stripped cable shall be protected by a rated splice closure.

E. Closures shall be sized to accommodate the maximum number of splice modules for the feeder backbone cable.

F. When installing a branch splice, Contractors shall not use the last available opening in the endplates for a spliced backbone cable if any unspliced pairs would remain unused within the enclosure.

G. If only one opening in the endplates is available and if unspliced pairs would remain with the enclosure, Contractors shall provide a single short cable spliced to the available pairs. This cable shall terminate in a new enclosure from which the needed pairs for the final installation may be spliced. If all pairs cannot be spliced onto a single cable, Contractors shall contact Plant Operations before proceeding. A new enclosure, or custom endplates may be required.

H. All splices shall maintain grounding continuity between all non-transmitting, conductive elements within the cables within the enclosure. All splices shall be bonded to ground per codes, standards, and methodologies in Appendix 2.
01  I. OSP cables shall not be spliced within a building. All OSP cables shall terminated in buildings
02  on building entrance terminals.

03  END OF SECTION
SECTION 33 8223

OPTICAL FIBER COMMUNICATIONS DISTRIBUTION CABLING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 13 Optical Fiber Backbone Cabling (Intrabuilding Backbone Cabling).

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. There are several physical networks on Johns Hopkins campuses. The primary networks are the data, voice, fire alarm, parking, and mechanical control networks. Backbone cables to buildings have been used to provide voice and data service to other locations. While not ideal, it may be more practical to evaluate available backbone capacity in neighboring buildings. Field devices (e.g. emergency phones, security cameras, kiosks, etc.) will likely be cabled to the nearest building for voice and/or data service, when needed.

B. Underground - Underground cable is subject to some of the same environmental problems as those of direct-buried cable. Moisture and lightning are a problem, but rodent damage is less likely. Both are subject to excavation damage, although underground cable has some mechanical protection by the conduit that encases it.

C. Direct-Buried - Direct-buried OSP cables are subject to different environmental conditions than those of aerial cables. Moisture, rodent damage, and lightning are some of the more critical areas that are addressed in the manufacture of direct-buried OSP cables.

D. Aerial - There are three methods for placing cable on pole lines:

   1. Lash new cable to a support strand.
   2. Lash new cable to an existing support strand/cable.
   3. Use self-supporting-type cable that contains a support strand.

E. Optical Fiber Backbone Cabling

   1. The existing data network is a optical fiber-based network in a hierarchical star with one major and several minor concentration points. The majority of the physical cable has been manufactured by Corning, but several other manufacturers have been used in the past.

   2. Plant Operations, in conjunction with Networking, shall assist designers in determining end points for backbone designs. As a deviation from BICSI methodologies, a “primary” backbone to a building will likely be composed of two cables with a cross-connect at a star location. Buildings may also be cabled from high-count fiber splice cases functioning as a secondary star at a strategic location.

   3. Plant Operations, in conjunction with Networking, shall assist designers in determining the number of strands and type of optical fiber cable to be installed.
4. Buildings may be connected using traditional cables or may be connected using air-blown fiber cables, as determined by Plant Operations. All intra-campus backbone cables passing through non-JHU spaces (DPW conduits, etc.) adjacent to the Homewood campus shall be air-blown fiber cables, including aerial installations.

5. Optical fiber cables shall be Corning interlocking armored FREEDM cables or Sumitomo air-blown fiber, unless specially noted. Optical fiber cables may be Corning (unarmored) FREEDM cables, Corning ALTOS armored cables, Corning ALTOS All-Dielectric cables, or Sumitomo air-blown fiber cables, as specified by Plant Operations. Sumitomo air-blown fiber is the preferred product for the Homewood Campus.

6. Optical fiber cables installed within the utility tunnels for any length shall be Corning interlocking armored FREEDM cables or Sumitomo air-blown fiber cables.

7. Optical fiber cables installed without entering the utility tunnels may be Corning FREEDM cables or Sumitomo air-blown fiber cables with pre-approval from Plant Operations.

8. Optical fiber cables installed over long distances (inter-campus) without entering the utility tunnels may be Corning ALTOS cables. These cables are subject to the 50-foot rule.

9. Aerial cables shall be Sumitomo air-blown fiber cables.

10. Optical fiber cables shall not be spliced in the OSP, except as required by the limitations of manufactured cable lengths. Fiber distribution panels and/or branch splices may be allowed in special circumstances. ALTOS cables may need to be spliced to FREEDM cables within structures under the 50-foot rule. Tunnels at the Homewood campus are not subject to the 50-foot rule.

11. All cables installed in MHs and large HBs with racking shall be supported by racking arms. Cables shall not be secured directly to stanchions by cable ties or other means unless the full weight of the cable is also supported by an arm unless pre-approved by Plant Operations.

12. The designer may substitute equivalent Berk-Tek or CommScope cable. All equivalents shall be pre-approved by Homewood Plant Operations.

13. An interbuilding backbone may be a comprised of both multimode and single mode fiber is preferred to satisfy present and future needs in the backbone.
   a. Single mode optical fiber cable
   b. 62.5/125 micron multimode optical fiber cable (JH has not adopted the use of 50 micron multimode fiber)

14. Plant Operations, in conjunction with Networking, shall assist designers in determining the type of fiber cable to be installed. In most Homewood applications, air-blown fiber cables shall be installed.

15. The physical design of the system should minimize splices, whenever possible. Splices cannot always be avoided due to the cable plant layout, length, raceway congestion, requirements for a transition splice between non-listed OSP cables and listed cable at the building entrance point, and unplanned requirements (e.g., cable damaged during the installation or accidental damage to existing cable).

F. Fire Alarm Backbone Cabling

1. Plant Operations shall be contacted for specific guidance on fire alarm cabling. Fire alarm signals may use copper or optical fiber cables, dependant upon the equipment being installed and the location of the equipment.

G. Parking Backbone Cabling
1. Plant Operations shall be contacted for specific guidance on parking lot lift gate cabling.
   Plant Operations, in conjunction with the Security Department Parking Office, shall assist
designers in determining the best design for this type of cabling.

H. Mechanical Control Backbone Cabling

1. Designers shall not design a separate mechanical network element without prior approval of
   Plant Operations. The existing mechanical network is being phased out as building
   systems become IP-based and use the data network.

I. Other Backbone Cabling

1. Plant Operations shall be contacted prior to planning the introduction of any additional
cable plant elements (e.g. coax backbone cable). Expansion of the OSP into other media
shall be very limited and shall have justification beyond the existing infrastructure’s ability
to support the new service.

PART 2 PRODUCTS

2.01 MATERIALS

A. Indoor/outdoor optical fiber cable

1. Corning Cable Systems, FREEDM cable
   a. Interlocking armored
   b. Listed NEC OFNR, riser-rated
   c. Loose tube, gel-free
   d. Multimode- 62.5/125 micron
   e. Single Mode

2. Berk-Tek, ADVENTUM cable
   a. Listed NEC OFNP, plenum rated
   b. Loose tube, DryGel
   c. Multimode- 62.5/125 micron
   d. Single Mode

B. Outdoor optical fiber cable

1. Corning Cable Systems, ALTOS cable
   a. All-dielectric cables

2. Corning Cable Systems, ALTOS cable
   a. Double-Jacket/Single-Armor cable

C. Air-blown optical fiber cable

1. Sumitomo Electric Lightwave
   a. Tubing cables
      1) All-dielectric, TCxxMSO series, (xx="02", "04", "07", "19" tubes)
      2) Armored, TCxxTLA, (xx="07", "19" tubes)
   b. Optical Fiber Bundles
      1) Mode, up to 18 fibers per bundle
2) Multimode- 62.5/125 micron, up to 18 fibers per bundle

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Optical Fiber (Data) Backbone Cabling

1. Unlisted cables are subject to the 50-foot rule when entering a building and must have a transition splice within the entrance facility.

2. OSP air-blown fiber cables are subject to the 50-foot rule and can transition to ISP tubes using a Sumitomo housing or a standard splice enclosure. All incoming tubes shall be connected to the same numbered outgoing tubes.

3. Optical fiber cables shall not be spliced in the OSP, except as required by the limitations of manufactured cable lengths. Fiber distribution panels and/or branch splices may be allowed in special circumstances. ALTOS cables may need to be spliced to FREEDM cables within structures under the 50-foot rule.

4. All cables installed in maintenance holes and large handboxes with racking must be supported by racking arms. Cables shall not be secured directly to stanchions by cable ties or other means unless the full weight of the cable is also supported by an arm.

5. Additional information on splicing can be found under OSP devices- fiber enclosures.

6. Optical fiber cables shall not be spliced in maintenance holes under any circumstances.

C. Other Backbone Cabling

1. Other cable types shall be project specific and detailed in project documentation.

END OF SECTION
SECTION 33 8223.13

OPTICAL FIBER SPLICING AND TERMINATIONS

PART 1 GENERAL

1.01 REFERENCES
C. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS
A. Splices may be made in MHs, tunnel locations, or with HBs (in certain circumstances, noting this as a deviation from BICSI methodologies). All splice locations and configurations shall be pre-approved by Homewood Plant Operations. No dead copper pairs shall remain within a sealed splice case. Designers shall specify stubs for unused pairs. Exceptions may be made for large backbone cables spliced to provide multiple branches for future installation.
B. Fiber splices do not need to provide a stub, provided the case can physically hold the eventual splicing of all strands. A second fiber splice case may be needed based on available end cap space for additional cables.
C. Splice point locations should be chosen only after considering the requirements for performing optical fiber splicing:
   1. To effectively perform a splice, the cable ends shall reach a satisfactory work surface (preferably a vehicle or table that is clean and stable). The distance can be as much as 9 m (30 ft). The chosen location should have provisions for storing the slack cable after splicing is completed.
   2. Physical protection of all slack is recommended, although not required.
   3. Splicing and racking slack should be considered when making cable length calculations. Optical fiber splice closures typically require 2.4 to 3 m (8 to 10 ft) of stripped cable inside the closure.
D. Optical fiber cables shall not be spliced in maintenance holes under any circumstances.
E. The designer should allow for cable slack, normally 9 m (30 ft), allowing for easy mid-span access, cable repair or relocation, and future cable drop points.
F. Fusion or mechanical splicing is approved.
G. The splice and stripped cable shall be protected by a rated splice closure.
H. Optical fiber closures shall be re-enterable, watertight, or vented depending on the specific situation. They may be used on poles, strands, buildings, underground, direct-buried, and above-ground pedestals.
I. Fiber closures shall be capable of:
   1. Storing and organizing the fibers.
   2. Storing and organizing splices (whether individually spliced or mass spliced) generally through the use of splicing trays.
3. Providing bonding and grounding facilities.
4. Maintaining minimum bend radius for the individual fibers.
5. Protecting splices from moisture. When air pressure systems are not used, closures shall be filled with re-enterable encapsulant. The use of an inner closure shall be used to simplify the reentry process.
6. Supporting up to a maximum of four cable entries, where possible.

J. Closures shall be sized to accommodate the maximum number of splice modules for the feeder backbone cable.
K. When designing for a branch splice, the last available opening in the endplates cannot be used for a spliced backbone cable if any unspliced strands would remain unused within the enclosure. If only one opening in the endplates is available and if unspliced strands would remain with the enclosure, design for a single short cable spliced to the available strands. This cable shall terminate in a new enclosure from which the needed strands for the final installation may be spliced. If all strands cannot be spliced onto a single cable, contact Plant Operations. A new enclosure, or custom endplates may be required.

L. All splices shall maintain grounding continuity between all non-transmitting, conductive elements within the cables within the enclosure. All splices shall be bonded to ground per codes, standards, and methodologies.

M. Splice Trays
1. Splice trays are required to protect and organize fibers and splices at splice points.
2. Splice trays are sized for either multimode or single mode applications due to their different bend radii requirements. Single mode or multimode fibers may be spliced in the larger single mode trays. The single mode trays are preferred due to their larger, craft-friendly size. Accordingly, most splice hardware is designed around the single mode splice tray.
3. The completed splices shall be placed in the organizer and coated with a room temperature vulcanization (RTV) compound to protect the bare fibers, unless otherwise instructed by the enclosure manufacturer instructions.
4. Splice trays shall include clear, plastic covers for easy visual inspection.

N. Fiber Distribution Panel
1. Fiber distribution panels may be used within the utility tunnels, but not within MHS. Panels shall provide a weather-tight seal and a NEMA rating appropriate for the installation location.

O. Air-blown fiber tube cable splices
1. Air-blown fiber tube cables shall only be spliced when limited by cable length from the manufacturer.
2. The preferred method of splicing air-blown fiber tube cables is by using copper splice enclosures to for a water-tight splice environment.
3. Where possible, the Contractor shall splice air-blown fiber tube cables in non-flooding area (e.g. tunnels, basements, areaways). Splices in non-flooding areas may use distribution housings or copper splice enclosures.
4. Splicing in a flooding area (e.g. maintenance holes) must be pre-approved by JH. Splices in flooding areas shall use copper splice enclosures.
5. Air-blown fiber tube cables shall be straight splices with all tubes entering and leaving the splice without branching. Branch splices may be installed if pre-approved by JHU. Dead tubes shall be plugged and marked as dead in a splice case.

6. Air-blown fiber tube splices shall not be re-entered unless absolutely required. The Contractor shall provide a water-tight seal upon re-sealing the enclosure to the degree of a "new enclosure" seal where "new enclosure" is defined as the initial sealing of a new enclosure as instructed by the manufacturer to ensure maximum performance of the enclosure. All old sealing material shall be totally removed. Only new sealing materials, including gaskets, shall be used. The Contractor shall replace any hardware, up to and including the entire enclosure assembly, if required to achieve a "new enclosure" seal.

1.04 PROJECT CONDITIONS

A. There is no specific safety information for devices.

B. The location and orientation of OSP devices shall be strictly controlled by Johns Hopkins. Contractors shall confirm all proposed locations and orientations of OSP devices. Visible devices or visible elements of devices, including any supporting structure for OSP devices, shall be pre-approved by Homewood Plant Operations.

C. Restrictions on OSP devices are on a case-by-case basis without general campus specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fiber Distribution Panel

1. NEMA 4X

2. Accepts Corning Cable Systems CCH fiber modules

3. Manufacturers

   a. Corning Cable Systems, Environmental Distribution Center

   b. Other acceptable manufacturers offering equivalent products

B. Fiber Splice Closures

1. Manufacturers

   a. 3M

      1) 2178-series Optical Splice Case

      2) Quante BPEO Splice-Protection Closures

   b. Tyco Electronics

      1) Tyco FOSC series closures

2. Additional hardware from the same manufacturer, as needed to complete splicing

PART 3 EXECUTION

3.01 INSTALLATION

A. Proper installation of a splice/termination shall require remediation of any past improper installation procedures that would impact the proper installation of the device (e.g. proper grounding).

B. Fiber Distribution Panel
1. Install in accordance with manufacturer's instructions.

2. Installation of fiber distribution panels with the utility tunnels shall follow pathway requirements for tunnel installations as described by this specification on tunnel usage.

C. Fiber Splice Closures

1. Install in accordance with manufacturer's instructions.

2. Fusion or mechanical splicing is approved. Fiber splice loss shall be a maximum of 0.1 dB.

3. Closures shall be sized to accommodate the maximum number of splice trays for the feeder backbone cable.

4. When installing a branch splice, Contractors shall not use the last available opening in the endplates for a spliced backbone cable if any unspliced strands would remain unused within the enclosure.

5. If only one opening in the endplates is available and if unspliced strands would remain in the enclosure, Contractors shall provide a single short cable spliced to the available strands. The Cable shall terminate in a new enclosure from which the needed strands for final installation may be spliced. If this option is not feasible, Contractors shall contact Plant Operations before proceeding.

6. All splices shall maintain grounding continuity between all conductive elements within the cables within the enclosure. All splices shall be bonded to ground per codes, standards, and methodologies in Section 27 0000 Communications General.

D. Air-blown fiber tube cable splices

1. Air-blown fiber tube cables shall only be spliced when limited by cable length from the manufacturer.

2. The preferred method of splicing air-blown fiber tube cables is by using copper splice enclosures to for a water-tight splice environment.

3. Where possible, the Contractor shall splice air-blown fiber tube cables in non-flooding area (e.g. tunnels, basements, areaways). Splices in non-flooding areas may use distribution housings or copper splice enclosures.

4. Splicing in a flooding area (e.g. maintenance holes) must be pre-approved by JH. Splices in flooding areas shall use copper splice enclosures.

5. Air-blown fiber tube cables shall be straight splices with all tubes entering and leaving the splice without branching. Branch splices may be installed if pre-approved by JHU. Dead tubes shall be plugged and marked as dead in a splice case.

6. Air-blown fiber tube splices shall not be re-entered unless absolutely required. The Contractor shall provide a water-tight seal upon re-sealing the enclosure to the degree of a "new enclosure" seal where "new enclosure" is defined as the initial sealing of a new enclosure as instructed by the manufacturer to ensure maximum performance of the enclosure. All old sealing material shall be totally removed. Only new sealing materials, including gaskets, shall be used. The Contractor shall replace any hardware, up to and including the entire enclosure assembly, if required to achieve a "new enclosure" seal.

E.

END OF SECTION
SECTION 33 8233

COAX COMMUNICATIONS DISTRIBUTION CABLEING

PART 1  GENERAL

1.01 RELATED SECTIONS

A. Section 27 1333: Communications Coax Backbone Cabling (Intrabuilding Backbone Cabling).

1.02 DESIGN REQUIREMENTS

A. Currently, there is no COAX distribution system on the Homewood Campus. Designers shall not anticipate being able to tap into an existing infrastructure. There is limited infrastructure near the residential buildings adjacent to North Charles Street. Expansion of the COAX infrastructure beyond residential buildings is not planned for Homewood.

B. Underground - Underground cable is subject to some of the same environmental problems as those of direct-buried cable. Moisture and lightning are a problem, but rodent damage is less likely. Both are subject to excavation damage, although underground cable has some mechanical protection by the conduit that encases it.

C. Direct-Buried - Direct-buried OSP cables are subject to different environmental conditions than those of aerial cables. Moisture, rodent damage, and lightning are some of the more critical areas that are addressed in the manufacture of direct-buried OSP cables.

D. Aerial - There are three methods for placing cable on pole lines:

1. Lash new cable to a support strand.

2. Lash new cable to an existing support strand/cable.

3. Use self-supporting-type cable that contains a support strand.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION - NOT USED

END OF SECTION
SECTION 33 8243

GROUNDING AND BONDING FOR COMMUNICATIONS DISTRIBUTION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 27 0526: Grounding and Bonding for Communications Systems for inside cable plant grounding and bonding.

1.02 REFERENCES

B. See Section 01 4219 - Reference Standards.

1.03 DEFINITIONS

A. See Section 27 0000 : Communications General.

1.04 DESIGN REQUIREMENTS

A. Historically, proper protection, grounding, and bonding has not taken place at Johns Hopkins campuses. Any design of new cable to a building shall trigger upgrades to all cable plant elements in the area to address any violations to current codes. This may include the design of lightning protectors, grounding busbars, and bonding backbones.

B. Establishing a suitable network ground is critical in grounding network equipment. A network ground is always required. Refer to ANSI-J-STD-607-A standard.

C. The telecommunications grounding system shall have a single point of attachment at the main electrical grounding electrode conductor. Other attachments to the system are made (to electrical service panels, cold water pipes, etc.), but these only serve as supplemental connections and shall be considered primary connections..

D. Without electrical service, specify a driven ground rod which is a minimum of ½” in diameter and 8 ft long. (Refer to NEC section 800-40.)

E. All grounding and bonding systems shall be carefully reviewed and pre-approved by Homewood Plant Operations. Any design may need to be enhanced for additional capacity beyond the scope of a current project to address the overall building needs.

F. This specification does not address overall lightning protection of a structure, with respect to air terminals, surge arrestors on power lines, etc.

G. Outside Cable Plant

1. MHs and HBs with splice cases shall have grounding systems designed as specified by this document. New MHs shall have grounding systems installed at the time of construction. HBs shall be retrofitted with a grounding system should the need arise.

2. Cables and support strands on utilities poles shall be grounded per code requirements. On Johns Hopkins-owned utility poles carrying network cable only, a grounding system may need to be designed for the poles. Design of new cables onto existing poles may require improvements to the existing grounding system to meet code requirements. The existence of a proper grounding system for utility poles cannot be assumed.

3. Pedestals shall have a properly designed grounding system for all locations, given a single cable run is unlikely to have multiple pedestals.
4. Copper ground wire shall be green insulated. Designers may specify bare wire for larger size conductors. Conductors may be solid or stranded.

1.05 PROJECT CONDITIONS

A. Contractors shall not attach grounding conductors from the telecommunications busbar or protectors to the main electrical building grounding busbar, grounding electrode conductor, or any element of the main electrical service distribution panel. Contractors shall provide the conductor and connector in a position to allow a Johns Hopkins electrician to make the final connection of an Information Transport System grounding system to the electrical grounding system.

B. Contractors shall not make modifications to the telecommunications grounding system without notifying Plant Operations, Networking, and Telecommunications in advance.

C. Contractors shall not attach grounding conductors to aerial (utility pole) grounding systems. Contractors shall notify the appropriate utility (or Plant Operations for Johns Hopkins poles with an existing grounding system) to make the connection. Contractors installing aerial grounding systems for a Johns Hopkins pole without an existing grounding system shall provide all connections at the pole and shall notify Plant Operations of any other ungrounded cables in need of remedial grounding.

D. Protectors and grounding and bonding hardware shall be of manufacturers specified by this document.

E. All grounding conductors shall be sized such that if the maximum current possible for the grounding electrode conductor passes through the telecommunications grounding system, the voltage drop over the grounding conductors shall not exceed 40 volts. Contractors shall provide the sizing calculations based on the grounding electrode conductor to Johns Hopkins or shall request these calculations from Johns Hopkins.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conductors

1. Bare copper conductor, stranded

2. Insulated copper conductor, insulated, green, stranded or solid

3. Manufacturers
   a. Harger, Grayslake, IL, www.harger.com, Tel: 800-842-7437

B. Exothermic weld materials

1. Manufacturers
   a. Erico; Cadweld products
   b. Continental Industries; Thermoweld products

C. Connectors

1. two-lug connectors, UL-listed, irreversible compression

2. single-lug connectors, UL-listed, irreversible compression

3. exothermic weld connectors, UL-listed

D. Other materials as needed to form a complete grounding system.
PART 3  EXECUTION

3.01 INSTALLATION

A. Install all grounding components in compliance with NEC and NESC code requirements.

B. Install all grounding components in compliance with manufacturer's instructions.

C. Entrance Facility Installations.

1. All OSP cables entering buildings shall be protected, with all conductive elements terminating in building entrance terminals or bonded directly to ground. All OSP cables shall be considered exposed.

2. Install BETs in accordance with manufacturer's instructions.

3. The Contractor shall provide and install an insulated (green), stranded #6 copper ground wire from a network room busbar to each of any BETs within each network room.

D. Testing

1. The Contractor shall test the impedance of all bonds of the grounding system, including cable armor bonding to ground. The impedance of a two-point bonding test across any bond shall not exceed 0.1 ohms. The Contractor shall remediate any bond(s) over this limit or which contribute to a total impedance exceeding 0.1 ohms from any point in the network room to the busbar in that room.

2. All bonds installed by the contractor shall be tested for impedance with an earth ground resistance test in its two-point setup, such as a LEM Handy GEO tester. Place a QA label (with date and inspector) in proximity to each bond tested.

3. Test all grounding conductors, once installed, for current. Measure AC and bi-directional DC current. Report any AC current over 1 Amp. Report any DC current, in either direction, over 500 milliamps.

END OF SECTION
COMMUNICATIONS DEVICES

PART 1 GENERAL

1.01 REFERENCES
B. See Section 01 4219 - Reference Standards.

1.02 DEFINITIONS
A. See Section 27 0000 : Communications General.

1.03 DESIGN REQUIREMENTS
A. OSP devices include, but are not limited to, splice cases, cameras, kiosks, card readers, dialers, sensors, etc.
B. Electronic device design and installation are not controlled by this document with respect to the device itself. Location may be controlled by this document in that a pathway to the device may be required. Cabling to electronic devices is controlled by this document for that portion which resides in the outside cable plant.
C. Non-electronic devices (e.g. splices) in the OSP are controlled by this document.

1.04 PROJECT CONDITIONS
A. There is no specific safety information for devices.
B. The location and orientation of OSP devices shall be strictly controlled by Johns Hopkins. Contractors shall confirm all proposed locations and orientations of OSP devices. Visible devices or visible elements of devices, including any supporting structure for OSP devices, shall be pre-approved by Homewood Plant Operations.
C. Restrictions on OSP devices are on a case-by-case basis without general campus specifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION
A. Proper installation of a device shall require remediation of any past improper installation procedures that would impact the proper installation of the device (e.g. proper grounding).
B. Install in accordance with manufacturer's instructions.
C. Camera
   1. Exterior surveillance cameras shall be installed as directed by of the Security Department.
   2. Installation of poles or other support structures shall be pre-approved by Homewood Plant Operations. Any visible, overt installation structures shall be pre-approved by Homewood Plant Operations.
D. Dialer
   1. No general installation notes. Contact Plant Operation for application-specific instructions.
E. Emergency Telephone
1. No general installation notes. Contact Plant Operation for application-specific instructions.

F. Kiosk
1. No general installation notes. Contact Plant Operation for application-specific instructions.

G. Payphone
1. No general installation notes. Contact Plant Operation for application-specific instructions.

H. Reader
1. No general installation notes. Contact Plant Operation for application-specific instructions.

I. Wall Phone
1. No general installation notes. Contact Plant Operation for application-specific instructions.

END OF SECTION
Administrative Specifications- Labeling & Records

Administrative specifications include labeling requirements and installation records. This section includes requirements and guidelines for OSP and ISP cable plant elements.

1 Safety and Restrictions

There are no specific safety information for this section.

2 Design Considerations

This specification is based on the ANSI/TIA/EIA-606-A - “Administration Standard for Commercial Telecommunications Infrastructure” standard for a Class 4 environment (multiple buildings, multiple campuses). The ANSI/TIA/EIA standard does not adequately address the outside plant elements to the satisfaction of the Johns Hopkins University.

This standard provides designers, installers and University staff with the guidelines to be used to document the Outside and Inside Cable Plants. Plant Operations requires adherence to this standard for all OSP cabling. It is recommended that designers meet with Plant Operations to review labeling. Most identifiers are set by Homewood Plant Operations and a review meeting would enable identifiers to be resolved during planning and design.

This standard will apply an application independent administrative process for identifying and characterizing cabling. Given the number of vendors and cabling projects at Johns Hopkins campuses, a uniform standard is required and strictly enforced to maximize the understanding of the cabling infrastructure.

This document is to replace all references to ANSI/TIA/EIA-606-A.

2.1 Administration

2.1.1 General

The ANSI/TIA/EIA-606A standard covers four levels of administration. This standard is based on Class 4, multiple network rooms within multiple buildings at multiple campuses. It is the most extensive class.

Within this class, there are requirements for identifiers, records, and labeling. Identifiers are unique designations that indicate each element of the infrastructure. Records comprise the information associated with each identifier, stored electronically for ready access. Labeling is the physical representation of the identifier that is attached to each element of the infrastructure.

2.1.2 Records

Plant Operations shall maintain a system by which records can be readily retrieved for any identifier. The software shall provide flexible reporting options on the OSP. These records shall exist in bound form as periodic reporting from the digital records. The digital records shall be considered the authoritative version.

Installers shall provide these records to Plant Operations at completion of new installations as well as moves/adds/changes. These records shall be provided in digital format as a text-based file.

2.1.3 Drawings

Drawings in AutoDesk AutoCAD and schematics in Microsoft Visio shall accompany the physical, paper-based records. All project records shall be in a single file, with JH architectural drawings linked as external references (XREF). The Contractor shall coordinate the final layout of all digital records with JH. The digital version of JH architectural drawings shall be considered the current version. Users of print drawings should confirm the accuracy of those drawings against the current digital records. Updates to drawings shall be done by Homewood Plant Operations or other JH entities as determined by the JH project manager.
2.1.4 Labels

All identifier labels shall be of a size, color, and contrast to be readily visible by those maintaining the system. Labels should be resistant to environmental conditions likely to be encountered where they are installed, such as moisture or heat, and should be designed to have a useful life equal or greater to that of the component labeled. Where possible, industrial grade adhesive should be used on labels. Plant Operations shall approve a sample label for all cabling installations. Lack of pre-approval may result in re-labeling at the vendor’s expense.

Building network rooms identifier labels shall be installed by Homewood Plant Operations. Network room identifier labels may be installed on the interior of a room at the primary access point at the discretion of Plant Operations.

Space identifier labels shall be installed by Homewood Plant Operations or by vendors, when provided with labels by Homewood Plant Operations. Conduits, cable trays, ladder trays, innerducts, and other cabling pathway elements shall be labeled with the pathway identifier at pathway openings and every 25 feet along the element, when possible.

Device labels shall be installed on the exterior of all devices, when possible. Device labels may be installed on the interior of a device at the primary access point. Plant Operations shall decide label positioning. Plant Operations and vendors may install these labels.

Cable labels shall be installed in such a position as to be visible during the installation and normal maintenance of the infrastructure. Labels shall be installed on cables every 25 feet when visible. Labels shall be installed at every point of transition between conduits, raceways, cable trays, and access points. Plant Operations and vendors may install these labels.

All backbone cables shall be labeled with physical, logical, and pathway identifiers. Physical identifier labels shall use black lettering on a white background. Logical identifier labels shall use red lettering, red background color, or be placed on a red tag. Pathway identifier labels shall use blue lettering, blue background color, or be placed on a blue tag. Color requirements may be waived if all identifiers are on a single label. When on a single label, the printed order shall be physical identifier, logical identifier, and pathway identifier, from top to bottom. Logical identifiers may be optional.

To maximize legibility, all labels shall be printed or generated by a mechanical device, and shall not be written by hand. Labels shall be able to withstand high and low temperatures without detaching. Labels in exterior spaces shall be able to withstand extended submersion.

2.1.5 Reports

Required Linkages

Each identifier shall be linked to each record or report in which it appears.

Required Reports

Plant Operations shall make available to IT@JH or other JH entities, at Plant Operations’ discretion, reports comprising information from groups of records. Each report shall list all records of the selected identifier and all information in those records, or any desired subset of the records and of the information in those records.

H3. Identifiers

The primary identifier for an element in the infrastructure shall uniquely identify that element of the infrastructure. Secondary, non-unique identifiers are allowed for cable elements. This allows each physical segment of cable to be identified by a primary identifier. It also allows a secondary identifier for a cable, a logical identifier, to be used that can be carried over multiple segments. This logical identifier allows the original pairs/strands to be tracked from the source of the service.

Each building has a unique identifier. These identifiers were originally based on the building number designations of the Office of Facilities Management at the time this document was prepared. Changes in the designation of buildings by the Office of Facilities Management shall not be reflected in this standard. It is preferable to have discrepancies between two lists than to have to re-label cables to reflect changes in designation by Facilities Management. Plant Operations shall maintain a separate list within this document of building identifiers for the purposes of OSP administration. Vendors and Johns Hopkins staff shall use this list for administrative purposes.

A summary of identifier formats is in a table later in this document. A sample map is provided that illustrates combinations of primary (physical) and secondary (logical) identifiers.
All letters used in identifiers are in upper case.

2.2 Identifiers

Johns Hopkins campuses have a variety of identification schemes in place. While it is easy to implement the following identification scheme to new construction, it is difficult to use this scheme in current locations using a different scheme. For small projects and MAC work (moves, adds, and changes), it is likely to be better to extend the existing labeling scheme to the new infrastructure. New construction of buildings or network rooms shall adhere to the new administrative standard unless directed otherwise by JH project managers. Designers and contractors shall coordinate labeling with JH project managers.

2.2.1 Campus & Building Identifiers

Campus identifiers are pre-determined by Homewood Plant Operations. Campus identifiers are two letters (e.g. HW, EC).

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>Applied Physics Laboratory</td>
</tr>
<tr>
<td>BC</td>
<td>Baltimore City pathways (used for DPW pathways)</td>
</tr>
<tr>
<td>BGE</td>
<td>Baltimore Gas &amp; Electric pathways</td>
</tr>
<tr>
<td>BV</td>
<td>Bayview Campus</td>
</tr>
<tr>
<td>CC</td>
<td>Columbia Center</td>
</tr>
<tr>
<td>CS</td>
<td>Camp Singewald, Washington County field station</td>
</tr>
<tr>
<td>DC</td>
<td>Washington, D.C.</td>
</tr>
<tr>
<td>DN</td>
<td>Downtown Center</td>
</tr>
<tr>
<td>EB</td>
<td>East Baltimore Medical Campus</td>
</tr>
<tr>
<td>EC</td>
<td>JHU@E, Eastern Campus</td>
</tr>
<tr>
<td>EV</td>
<td>Evergreen House</td>
</tr>
<tr>
<td>HW</td>
<td>Homewood</td>
</tr>
<tr>
<td>MC</td>
<td>Montgomery Campus</td>
</tr>
<tr>
<td>MW</td>
<td>Mt. Washington</td>
</tr>
<tr>
<td>PB</td>
<td>Peabody</td>
</tr>
<tr>
<td>VZ</td>
<td>Verizon pathways</td>
</tr>
</tbody>
</table>

“BGE” is an exception to the two-digit rule on campus identifier length.

Each building shall have a unique identifier. Building identifier shall have the following format:

s-b       HW-0001, HW-0002, EC-0001

Building identifiers are pre-determined by Homewood Office of Facilities Management, Space Planning. New building identifiers may be added by the Office of Facilities Management. The number element of a building identifier is four digits with leading zeros as needed (e.g. 0001, 0010). Campus and building elements of an identifier are always separated by a hyphen.
Table 2: Building Identifiers

Numbers not shown may represent demolished buildings with those numbers being reserved for historical reference. Numbers are assigned by the Office of Facilities Management Space Planning. Cable plant codes may not correspond with Space Planning site codes. Cable plant campus codes are based on geographic considerations.

Multiple sections of a building may have different building codes, especially if constructed separately. If the cable plant is continuous between the sections and if the electrical service shares a common ground, the sections of the building shall be considered a single location for the implementation of cable plant identifiers. Gray entries in the identifier table indicate former buildings or sections of buildings covered by another identifier.

<table>
<thead>
<tr>
<th>ARCHIBUS/FM Data Transfer</th>
<th>Building Name</th>
<th>Building Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Baltimore Medical Campus</td>
<td>EB-0100 Welch Medical Library</td>
<td>EB-0300 BSPH - Teaching/Research 1</td>
</tr>
<tr>
<td>EB-0101 Biophysics Building</td>
<td>EB-0301 BSPH - Teaching/Research 2</td>
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</tr>
<tr>
<td>EB-0102 Physiology Building</td>
<td>EB-0302 BSPH - Wolfe Street Building</td>
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</tr>
<tr>
<td>EB-0103 Woods Basic Science Building</td>
<td>EB-0303 BSPH - Teaching/Research 3</td>
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<tr>
<td>EB-0104 Hunterian II</td>
<td>EB-0304 BSPH - Teaching/Research 4</td>
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<tr>
<td>EB-0105 Pre-Clinical Teaching Building</td>
<td>EB-0305 Hampton House</td>
<td></td>
</tr>
<tr>
<td>EB-0106 Taylors Building</td>
<td>EB-0306 2007 E. Monument St.</td>
<td></td>
</tr>
<tr>
<td>EB-0107 Turner Auditorium</td>
<td>EB-0307 411 N. Caroline St.</td>
<td></td>
</tr>
<tr>
<td>EB-0108 Reed Hall - West Wing</td>
<td>EB-0308 621 N. Washington St.</td>
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</tr>
<tr>
<td>EB-0109 Reed Hall - East Wing</td>
<td>EB-0310 613 N. Washington St.</td>
<td></td>
</tr>
<tr>
<td>EB-0110 Med School Admin Bldg</td>
<td>EB-0311 627 N. Washington St.</td>
<td></td>
</tr>
<tr>
<td>EB-0111 Richard Ross Research Bldg</td>
<td>EB-0312 2021 E. Monument Street</td>
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</tr>
<tr>
<td>EB-0112 Denton Cooley Athletic Center</td>
<td>EB-0313 1830 Monument St.</td>
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</tr>
<tr>
<td>EB-0113 Alumni Swimming Pool</td>
<td>EB-0314 1235E. Monument St.</td>
<td></td>
</tr>
<tr>
<td>EB-0114 Pinkard Bldg. - Nursing</td>
<td>EB-0315 2017 E. Monument St.</td>
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</tr>
<tr>
<td>EB-0115 Hunting-Blaustein Cancer Research Bldg</td>
<td>EB-0327 BSPH- Teaching/Research 5</td>
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</tr>
<tr>
<td>EB-0116 Temporary Admin. Building</td>
<td>EB-0328 BSPH- Teaching/Research 6</td>
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<tr>
<td>EB-0117 Broadway Research Building</td>
<td>EB-0912 2024 E. Monument St.</td>
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<tr>
<td>EB-0118 CRB - Tower 2 - Cancer Research</td>
<td>EB-0916 2027 E. Monument St.</td>
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<tr>
<td>EB-0200 Woods Building</td>
<td>EB-0917 2007 E. Monument St.</td>
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</tr>
<tr>
<td>EB-0201 Wilmer Building</td>
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<tr>
<td>EB-0202 Maintenance Building</td>
<td>EB-0919 2007 E. Monument St.</td>
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</tr>
<tr>
<td>EB-0204 Houch Building</td>
<td>EB-0920 2007 E. Monument St.</td>
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<tr>
<td>EB-0205 Billings Building</td>
<td>EB-0921 2007 E. Monument St.</td>
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<tr>
<td>EB-0206 CMSC</td>
<td>EB-0922 2007 E. Monument St.</td>
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</tr>
<tr>
<td>EB-0208 Marburg Building</td>
<td>EB-0923 2007 E. Monument St.</td>
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<tr>
<td>EB-0209 Parks Building</td>
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<td>EB-0210 Brady Building</td>
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<td>EB-0211 Blalock Building</td>
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<td>EB-0212 Radiology Building</td>
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<td>EB-0213 Halsted Building</td>
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<td>EB-0214 Hurd Hall</td>
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<td>EB-0215 New Auditorium</td>
<td>EB-0930 2007 E. Monument St.</td>
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<tr>
<td>EB-0216 Osler Building</td>
<td>EB-0931 2007 E. Monument St.</td>
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<tr>
<td>EB-0217 Carnegie Building</td>
<td>EB-0932 2007 E. Monument St.</td>
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<tr>
<td>EB-0218 Pathology Building</td>
<td>EB-0933 2007 E. Monument St.</td>
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<tr>
<td>EB-0219 Adolf Meyer Building</td>
<td>EB-0934 2007 E. Monument St.</td>
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<tr>
<td>EB-0220 Parking Garage</td>
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<tr>
<td>EB-0221 Jefferson St Building</td>
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<tr>
<td>EB-0222 Central Power Plant</td>
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<td>EB-0223 Nelson/Harvey Building</td>
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<td>EB-0225 Maurenne Building</td>
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<td>EB-0226 MRI Building</td>
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<tr>
<td>EB-0227 Johns Hopkins Out-Patient Center</td>
<td>EB-0942 2007 E. Monument St.</td>
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<td>EB-0228 Weinberg Cancer Center</td>
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<tr>
<td>Code</td>
<td>Description</td>
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<tr>
<td>HW-0019</td>
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<tr>
<td>HW-0020</td>
<td>AMRII</td>
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<tr>
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<td>Dunning Hall</td>
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<tr>
<td>HW-0022</td>
<td>Macaulay Hall</td>
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<td>HW-0023</td>
<td>Owen House</td>
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<td>HW-0024</td>
<td>Faculty Club</td>
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<td>HW-0025</td>
<td>Greenhouse</td>
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<td>HW-0026</td>
<td>Nichols House</td>
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<td>Athletic Center</td>
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<td>ROTC Building</td>
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<td>HW-0029</td>
<td>Merrick Barn Theatre</td>
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</tr>
<tr>
<td>HW-0031</td>
<td>Bradford Apartments</td>
<td></td>
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<tr>
<td>HW-0032</td>
<td>Wolman Hall</td>
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<td>Homewood Garage</td>
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<tr>
<td>HW-0034</td>
<td>McCoy Hall</td>
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<td>HW-0035</td>
<td>3505 N. Charles Street &amp; Annex</td>
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<td>HW-0036</td>
<td>3506 Greenway [Rogers House]</td>
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<td>HW-0037</td>
<td>Carnegie Embryological Center</td>
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<td>HW-0038</td>
<td>Athletic Strands</td>
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<td>JHU Press Warehouse</td>
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<td>Levi Hall</td>
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<td>HW-0041</td>
<td>Biology Ill</td>
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<td>HW-0042</td>
<td>Tool House [Homewood House Outbuilding]</td>
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<td>HW-0043</td>
<td>2933 N Charles Street [Baltimorecon]</td>
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<td>HW-0044</td>
<td>Gate House</td>
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<td>HW-0045</td>
<td>Mudd Hall</td>
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<td>Bloomberg Research Center</td>
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<td>HW-0047</td>
<td>Homewood Apartments</td>
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<td>HW-0048</td>
<td>2948 Wyman Park</td>
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<td>HW-0049</td>
<td>3001 N. Charles Street</td>
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<tr>
<td>HW-0050</td>
<td>Steven Muller Building - STSCI</td>
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<tr>
<td>HW-0051</td>
<td>Bloomberg Instruction Center</td>
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<td>HW-0052</td>
<td>Olin Hall</td>
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<td>HW-0053</td>
<td>New Engineering Building [NEB]</td>
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<td>AMRIII</td>
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<td>AMRIII - B Building</td>
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<td>HW-0060</td>
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<td>HW-0061</td>
<td>Belward Research Ctr. - Banks</td>
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<td>HW-0062</td>
<td>Ivy Hall [10-12 E. 33rd St]</td>
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<td>HW-0065</td>
<td>4 East 33rd Street [3301 Carriage]</td>
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<td>HW-0066</td>
<td>3213 N. Charles Street [Wolman House]</td>
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<td>HW-0067</td>
<td>3509 N. Charles Street [Bunting-Meyerhoff Center]</td>
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<td>HW-0068</td>
<td>Moravia Park Warehouse</td>
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<td>HW-0069</td>
<td>9 W. 29th Street</td>
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<tr>
<td>HW-0070</td>
<td>Schelle Pavilion (New Athletic Stands)</td>
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<td>HW-0071</td>
<td>Mattin Center (Students Arts Center)</td>
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<td>3001 Remington Ave.</td>
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<td>Clark Hall</td>
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<td>Hodson Hall</td>
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<td>HW-0078</td>
<td>Recreation Center</td>
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<td>HW-0079</td>
<td>3109 N. Charles Street [Hillel]</td>
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<td>HW-0080</td>
<td>5003 N. Charles Street [Homewood Apts. Annex]</td>
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<tr>
<td>HW-0081</td>
<td>Chemistry Building</td>
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<td>HW-0082</td>
<td>Chemistry Parking Deck</td>
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<td>HW-0083</td>
<td>Storage Building-Athletic Field</td>
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<tr>
<td>HW-0084</td>
<td>San Martin Center-Snell/Garage</td>
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<td>HW-0085</td>
<td>Seton Hall</td>
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<td>HW-0086</td>
<td>Charles Street Building</td>
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<tr>
<td>HW-0087</td>
<td>St. Paul Street Building</td>
<td></td>
</tr>
<tr>
<td>HW-0088</td>
<td>800 Wyman Park Drive [Kirk-Steiff]</td>
<td></td>
</tr>
<tr>
<td>HW-0089</td>
<td>San Martin Center-Carnegie</td>
<td></td>
</tr>
<tr>
<td>HW-0090</td>
<td>Broadview Apts. - Univ. Parkway</td>
<td></td>
</tr>
<tr>
<td>HW-0091</td>
<td>5401 Greenway Rd - Eden Hall Condominium</td>
<td></td>
</tr>
<tr>
<td>HW-0092</td>
<td>Wyman Park Center-Building 1</td>
<td></td>
</tr>
<tr>
<td>HW-0093</td>
<td>2216 N. Charles St. - WYPR</td>
<td></td>
</tr>
<tr>
<td>HW-0094</td>
<td>Montgomery Campus</td>
<td></td>
</tr>
<tr>
<td>HW-0095</td>
<td>Montgomery County Ctr. II</td>
<td></td>
</tr>
<tr>
<td>HW-0096</td>
<td>DC Ctr. Rockville, MD</td>
<td></td>
</tr>
<tr>
<td>HW-0097</td>
<td>Montgomery County Ctr.</td>
<td></td>
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<tr>
<td>HW-0098</td>
<td>Mt. Washington</td>
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<tr>
<td>HW-0099</td>
<td>Davis</td>
<td></td>
</tr>
<tr>
<td>HW-0100</td>
<td>McAuley</td>
<td></td>
</tr>
<tr>
<td>HW-0101</td>
<td>Conference Center</td>
<td></td>
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<tr>
<td>HW-0102</td>
<td>Founders Building</td>
<td></td>
</tr>
<tr>
<td>HW-0103</td>
<td>Power House</td>
<td></td>
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<tr>
<td>HW-0104</td>
<td>Childrens Guild</td>
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<tr>
<td>HW-0105</td>
<td>Peabody</td>
<td></td>
</tr>
<tr>
<td>HW-0106</td>
<td>Peabody - Leakin Hall</td>
<td></td>
</tr>
<tr>
<td>HW-0107</td>
<td>Peabody - Conservatory</td>
<td></td>
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<tr>
<td>HW-0108</td>
<td>Peabody - Record Library</td>
<td></td>
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<tr>
<td>HW-0109</td>
<td>Peabody - Shapiro House</td>
<td></td>
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<tr>
<td>HW-0110</td>
<td>Peabody - Dorm &amp; Cafeteria</td>
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</tr>
<tr>
<td>HW-0111</td>
<td>Peabody - Towson Prep. Bldg.</td>
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</tr>
<tr>
<td>HW-0112</td>
<td>Music Academic Building</td>
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<tr>
<td>HW-0113</td>
<td>Peabody - Elder Hostel</td>
<td></td>
</tr>
<tr>
<td>HW-0114</td>
<td>Peabody - 3-5 Centre St.</td>
<td></td>
</tr>
<tr>
<td>HW-0115</td>
<td>Peabody - 7-9 Centre St.</td>
<td></td>
</tr>
<tr>
<td>HW-0116</td>
<td>Misc. Building Codes</td>
<td></td>
</tr>
<tr>
<td>HW-0117</td>
<td>0056 Villa Spelman - Italy</td>
<td></td>
</tr>
<tr>
<td>HW-0118</td>
<td>0318 Henderson House</td>
<td></td>
</tr>
<tr>
<td>HW-0119</td>
<td>0320 Alive/Eastern Health Clinic</td>
<td></td>
</tr>
<tr>
<td>HW-0120</td>
<td>0321 Candler Building - 111 Market Place</td>
<td></td>
</tr>
<tr>
<td>HW-0121</td>
<td>0322 Expansion Property</td>
<td></td>
</tr>
<tr>
<td>HW-0122</td>
<td>0323 Storage Building</td>
<td></td>
</tr>
<tr>
<td>HW-0123</td>
<td>0324 403 Washington St.</td>
<td></td>
</tr>
<tr>
<td>HW-0124</td>
<td>0326 JHU/Lighthouse - 1629E Balto.</td>
<td></td>
</tr>
<tr>
<td>HW-0125</td>
<td>0900 GSH - O'Neil Labs</td>
<td></td>
</tr>
<tr>
<td>HW-0126</td>
<td>0901 GSH - Associates Bldg.</td>
<td></td>
</tr>
<tr>
<td>HW-0127</td>
<td>0903 GSH - Professional Office Bldg.</td>
<td></td>
</tr>
<tr>
<td>HW-0128</td>
<td>0904 Children's Hosp. - Pierce Bldg.</td>
<td></td>
</tr>
<tr>
<td>HW-0129</td>
<td>0905 GSH - POB II - Morgan Bldg.</td>
<td></td>
</tr>
<tr>
<td>HW-0130</td>
<td>0906 201 N. Charles St.</td>
<td></td>
</tr>
<tr>
<td>HW-0131</td>
<td>0907 509 W. Washington St.</td>
<td></td>
</tr>
<tr>
<td>HW-0132</td>
<td>0908 Pro-Hlth-1849 Gwyn Oak Ave. Balto, MD</td>
<td></td>
</tr>
<tr>
<td>HW-0133</td>
<td>0909 808 N. Chester St.</td>
<td></td>
</tr>
<tr>
<td>HW-0134</td>
<td>0910 SPSBE Catonsville, MD</td>
<td></td>
</tr>
<tr>
<td>HW-0135</td>
<td>0917 Maryland Athletic Bldg. - Timonium, MD.</td>
<td></td>
</tr>
<tr>
<td>HW-0136</td>
<td>0919 1627 Thames Street</td>
<td></td>
</tr>
<tr>
<td>HW-0137</td>
<td>0920 1629 Thames Street</td>
<td></td>
</tr>
<tr>
<td>HW-0138</td>
<td>0921 901 S Bond Street</td>
<td></td>
</tr>
<tr>
<td>HW-0139</td>
<td>0941 White Marshal Bldg.</td>
<td></td>
</tr>
<tr>
<td>HW-0140</td>
<td>0942 Lancaster Square</td>
<td></td>
</tr>
<tr>
<td>HW-0141</td>
<td>0943 Tindeco Wharf</td>
<td></td>
</tr>
<tr>
<td>HW-0142</td>
<td>0945 World Trade Center - Baltimore</td>
<td></td>
</tr>
<tr>
<td>HW-0143</td>
<td>0947 Lighthouse Point</td>
<td></td>
</tr>
<tr>
<td>HW-0144</td>
<td>0959 Hagerstown Hlth Ctr</td>
<td></td>
</tr>
<tr>
<td>HW-0145</td>
<td>0967 Johns Hopkins Asthma &amp; Allergy Center</td>
<td></td>
</tr>
<tr>
<td>HW-0146</td>
<td>0968 Brown's Wharf</td>
<td></td>
</tr>
<tr>
<td>HW-0147</td>
<td>0970 1631E. Balto. St.</td>
<td></td>
</tr>
<tr>
<td>HW-0148</td>
<td>0972 550 N. Broadway</td>
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</tr>
<tr>
<td>HW-0149</td>
<td>0974 Levenson &amp; Klein - Biddle St.</td>
<td></td>
</tr>
<tr>
<td>HW-0150</td>
<td>0976 JHU Regional Ofc - Calif.</td>
<td></td>
</tr>
<tr>
<td>HW-0151</td>
<td>0978 Greenspring Station</td>
<td></td>
</tr>
<tr>
<td>HW-0152</td>
<td>0979 Nanging Center</td>
<td></td>
</tr>
<tr>
<td>HW-0153</td>
<td>0981 503 N. Chester St. - Coflac Cl</td>
<td></td>
</tr>
<tr>
<td>HW-0154</td>
<td>0984 JH Health Plan - Eager St.</td>
<td></td>
</tr>
<tr>
<td>HW-0155</td>
<td>0985 ARIC Ctr. - Hagerstown, MD</td>
<td></td>
</tr>
<tr>
<td>HW-0156</td>
<td>0989 JH Patient Billing @ White Marsh</td>
<td></td>
</tr>
<tr>
<td>HW-0157</td>
<td>0990 CNR - 509 Washington St.</td>
<td></td>
</tr>
<tr>
<td>HW-0158</td>
<td>0992 Pediatrics - Severna Park</td>
<td></td>
</tr>
<tr>
<td>HW-0159</td>
<td>0995 JH Suburban Hlth - Falls Road</td>
<td></td>
</tr>
<tr>
<td>HW-0160</td>
<td>0996 Walter Reed - Forest Glen, MD</td>
<td></td>
</tr>
<tr>
<td>HW-0161</td>
<td>0998 Parkway Center</td>
<td></td>
</tr>
</tbody>
</table>
2.2.2 Space Identifiers

A space is an area used for housing the installation and termination of network equipment and cables. Spaces include tunnels, maintenance holes, handholes, handboxes, utility poles, and direct-buried locations. Each space shall have a unique identifier for the physical space. Tunnels, maintenance holes, handholes, and handboxes will have a sign within the space indicating the identifier for the space. Maps will provide identifiers for direct-buried locations and non-Johns Hopkins utility poles. Non-Johns Hopkins spaces may be identified by the owner identification with Johns Hopkins records.

Space identifiers shall have the following format:

*s-[b-f]*-ABnnn

s = site or campus abbreviation (two letter code)
b = building code (three digit number), spaces within buildings only
f = network room floor (one or two alphanumeric characters), spaces within buildings only
*brackets may be omitted if space is not within a building and b-f is not used
a = code from column A below
b = code from column B below
nnn = sequential number for space type AB

Space identifiers are for physical spaces. Some equipment may be a space and a device. A splice case may have a space identifier of HW-PBR012. The splice case is also a device, with the same identifier.

Table 3: Space Identifier Element Table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Pathway</td>
<td>BG Bridge</td>
</tr>
<tr>
<td>BR Branch Splice Case</td>
<td></td>
</tr>
<tr>
<td>BS Bridge Splice Case</td>
<td></td>
</tr>
<tr>
<td>CB Cabinet</td>
<td></td>
</tr>
<tr>
<td>CN Conduit</td>
<td></td>
</tr>
<tr>
<td>CT Cable Tray</td>
<td></td>
</tr>
<tr>
<td>DB Direct Buried locale/pathway</td>
<td></td>
</tr>
<tr>
<td>HB Handbox</td>
<td></td>
</tr>
<tr>
<td>HH Handhole</td>
<td></td>
</tr>
<tr>
<td>ID Innerduct</td>
<td></td>
</tr>
<tr>
<td>MH Maintenance Hole</td>
<td></td>
</tr>
<tr>
<td>PB Pull Box</td>
<td></td>
</tr>
<tr>
<td>PE Pedestal</td>
<td></td>
</tr>
<tr>
<td>PN Penetration</td>
<td></td>
</tr>
<tr>
<td>RK Rack</td>
<td></td>
</tr>
<tr>
<td>RT Roof Top</td>
<td></td>
</tr>
<tr>
<td>SL Sleeve</td>
<td></td>
</tr>
<tr>
<td>SS Straight Splice Case</td>
<td></td>
</tr>
<tr>
<td>TN Tunnel</td>
<td></td>
</tr>
<tr>
<td>UP Utility Pole</td>
<td></td>
</tr>
<tr>
<td>VL Vault</td>
<td></td>
</tr>
</tbody>
</table>

Examples of space identifiers are:

- **HW-PMH001** Homewood campus, maintenance hole 1
- **HW-PCT001** Homewood cable tray pathway 1, likely in tunnel (no b-f code)
- **HW-PBR002** Homewood branch splice case 2
- **HW-PWF036** Homewood wall field 36
- **HW-[0001-1]-PPB001** Homewood, building one, 1st floor, pull box 1

Space identifiers are pre-determined by Homewood Plant Operations. New space identifiers may be added by Homewood Plant Operations.
2.2.3 Device Identifiers

Devices include any physical device into or onto which cable terminates or is housed. It also includes supporting hardware for the cable plant. Each device shall have a unique identifier.

Device identifiers shall have the following format:

*s-[b-f]*-ABnnn.sd

- *s* = site or campus abbreviation (two letter code)
- *b* = building code (three digit number), spaces within buildings only
- *f* = network room floor (one or two alphanumeric characters), spaces within buildings only
- *brackets may be omitted if device is not within a building*
- *a* = code from column A below
- *b* = code from column B below
- *nnn* = sequential number for space type AB
- *sd* = element subdivision, when applicable

<table>
<thead>
<tr>
<th>Table 4: Device Identifier Element Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Copper</td>
</tr>
<tr>
<td>CA Case</td>
</tr>
<tr>
<td>CC Cross Connect</td>
</tr>
<tr>
<td>ET Entrance Terminal</td>
</tr>
<tr>
<td>FP Feed Pair</td>
</tr>
<tr>
<td>HP House Pair</td>
</tr>
<tr>
<td>MS Mechanical Splice</td>
</tr>
<tr>
<td>PL Panel</td>
</tr>
<tr>
<td>PT Port</td>
</tr>
<tr>
<td>SH Sheath</td>
</tr>
<tr>
<td>ST Stub</td>
</tr>
<tr>
<td>TM Termination</td>
</tr>
<tr>
<td>F Fiber</td>
</tr>
<tr>
<td>FS Fusion Splice</td>
</tr>
<tr>
<td>MS Mechanical Splice</td>
</tr>
<tr>
<td>PL Panel</td>
</tr>
<tr>
<td>PT Port</td>
</tr>
<tr>
<td>SH Sheath</td>
</tr>
<tr>
<td>TM Termination</td>
</tr>
<tr>
<td>X Coax</td>
</tr>
<tr>
<td>TM Termination</td>
</tr>
<tr>
<td>A Active Devices</td>
</tr>
<tr>
<td>DLR Dialer</td>
</tr>
<tr>
<td>ETL Emergency Telephone</td>
</tr>
<tr>
<td>FAX Fax</td>
</tr>
<tr>
<td>GBR Glass Break</td>
</tr>
<tr>
<td>HNS Handset</td>
</tr>
<tr>
<td>KSK Kiosk</td>
</tr>
<tr>
<td>MDM Modem</td>
</tr>
<tr>
<td>MIC Microphone</td>
</tr>
<tr>
<td>MNT Monitor</td>
</tr>
<tr>
<td>PAY Payphone</td>
</tr>
<tr>
<td>PC PC</td>
</tr>
<tr>
<td>PB Pull box</td>
</tr>
<tr>
<td>RDR Reader</td>
</tr>
<tr>
<td>SNS Sensor</td>
</tr>
<tr>
<td>SPK Speaker</td>
</tr>
<tr>
<td>STR Strike</td>
</tr>
<tr>
<td>TEL Telephone</td>
</tr>
<tr>
<td>TV Television</td>
</tr>
<tr>
<td>WLP Wall Phone</td>
</tr>
</tbody>
</table>
Devices may have an additional element to indicate a division within the device. The format for division is to add ".ddd" to the device identifier, where ".ddd" is a sequential number.

Examples of device identifiers are:

- HW-CMS001: Homewood copper mechanical splice 1
- HW-CMS001.004: Homewood copper mechanical splice 1, splice module 4
- HW-ADLR001: Homewood dialer 1 (e.g. emergency phone)
- HW-[0004-G]-APAY001: Homewood, building 4, ground floor, payphone 1

Device identifiers are pre-determined by Homewood Plant Operations. New device identifiers may be added by Homewood Plant Operations only. Vendors shall contact Plant Operations for device identifiers.

2.2.4 Pathway Identifiers

Pathways shall be identified by the space of origin, the space of destination, and the specific pathway element. Pathways include conduits, direct-buried pathways, and aerial pathways.

Pathway identifiers shall have the following format:

```
s-[sp1]/[sp2]-pe(sz).sd
```

or

```
[s1-sp1]/[s2-sp2]-pe(sz).sd
```

(inter-campus pathways)

- *s* = site or campus abbreviation (two letter code)
- *s1* = site or campus abbreviation (two letter code)
- *s2* = site or campus abbreviation (two letter code)
- *sp1* = space identifier of origin or destination
- *sp2* = space identifier of origin or destination
- *pe* = pathway element
- *sz* = size of pathway element, when applicable (e.g. 4"
- *sd* = element subdivision, when applicable (e.g. innerduct)

Pathway elements are identified as:

```
A  B
P  Pathway  BG  Bridge
BR  Branch Splice Case
BS  Bridge Splice Case
CB  Cabinet
CN  Conduit
CT  Cable Tray
DB  Direct Buried locale/pathway
HB  Handbox
HH  Handhole
ID  Innerduct
MH  Maintenance Hole
PB  Pull Box
PE  Pedestal
PN  Penetration
RK  Rack
RT  Roof Top
SL  Sleeve
SS  Straight Splice Case
```

Space identifier for the element plus a sequential number, plus a pathway size, where applicable. These identifiers are specific for a given pathway. For example, PDB001 can be used to describe a direct-buried pathway between two points. The same identifier can be used between two other point since the initial parts of the pathway identifier shall be different (e.g. HW-[004-1A]/PDB002-PDB001 and HW-[006-GA]/PDB003-PDB001).
Example of pathway identifiers are:

- **HW-PMH004/PTN001-PCN001(4")**
  (path from Homewood maintenance hole 4 to tunnel 1 using the 1st conduit, which is a 4" conduit, between these 2 points)

- **HW-[004-1A]/PDB002-PDB001**
  (path from Homewood Bldg 4, 1st floor, network room A to direct-buried location 2 using direct-buried path 1 between these 2 points)

- **HW-PBR003/PMH003-CST001**
  (path from Homewood branch splice 3 to maintenance hole 3 to copper stub 1- this is a stub out of the splice case in the maintenance hole)

- **HW-PTN001/PTN001-PCT001(9")**
  (path from Homewood tunnel 1 to tunnel 1 using cable tray 1 which is 9" wide- path within a single tunnel segment)

- **HW-PMH003/PMH004-PCN002(4").PID1**
  (path from Homewood maintenance hole 3 to maintenance hole 4 using innerduct 1 of the 2nd conduit which is a 4" conduit).

Vendors should confirm pathway identifiers with Plant Operations during planning and design of an installation.

### 2.2.5 Interbuilding Backbone Cabling Identifier

#### Physical Labeling

Backbone cabling shall be identified by the building and network room of origin and destination and a sequentially numbered identifier, to accommodate multiple cables running between these two network rooms. Backbone cabling shall be identified by a logical identifier indicating the specific pairs/strands from the source of service (section 4.3.2.).

The physical identifier shall have the following format:

- If the cable originates and ends on the same campus and runs between two buildings’ network rooms: `s-[b1-ft1]/[b2-ft2]-nnn`
- If the cable originates and ends on the same campus and runs between a building and a splice: `s-[b1-ft1]/dv-nnn`
- If the cable originates and ends on the same campus and runs between two splices: `s-dv1/dv2-nnn`
- If the cable originates and ends on different campuses and runs between two buildings’ network rooms: `[s1-b1-ft1]/[s2-b2-ft2]-nnn`
- If the cable originates and ends on different campuses and runs between a building and a splice: `[s1-b1-ft1]/[s2-dv]-nnn`
- If the cable originates and ends on different campuses and runs between two splices: `[s1-dv1]/[s2-dv2]-nnn`

- `s` = site or campus abbreviation
- `s1` = site or campus abbreviation (two letter code)
- `s2` = site or campus abbreviation (two letter code)
- `b` = building code
- `f` = network room floor
- `t` = network room identifier
- `dv` = OSP device or space
- `nnn` = sequential cable number

Examples of physical identifiers:
The label elements on either side of the slash are positioned in alphabetical order. This rule applies to all labels within this standard when two label elements are separated by a slash.

Logical Labeling

Backbone cables shall be identified by the originating cable identifier, including pair/strand count. This label does not have to be unique to a physical cable. For example, a single logical label may follow several physical segments of a cable run connected by straight splices. This label will track the path of each pair/strand from the origin of service to the ultimate point of service.

The logical identifier shall have the following format:

`s-[b-tf]-nnn.d1-d2`

- `s` = site or campus abbreviation
- `b` = building code for source of service
- `f` = network room floor
- `t` = network room identifier
- `nnn` = sequential cable number for cable leaving source building
- `d1` = initial or only pair/strand number
- `d2` = last pair/strand number (if applicable)

Examples of logical identifiers:

- `HW-[0001-GA]-[0002-1A]-002` (Cable from building to building)
- `HW-[0001-GA]/PBR001-001` (Cable from building to splice)
- `HW-PBR001/PSS001-001` (Cable from splice to splice)
- `[EC-PSS002]/[HW-PSS001]-001` (Cable from one campus to splice one second campus)
- `HW-[0001-GA]/ARDR005-001` (Cable from building to parking lot card reader)

When labeling hybrid optical fiber, strand 1 is multimode fiber with additional multimode fibers sequentially numbered. The first single mode fiber takes the next sequential number and does not restart the numbering sequence at 1.

Plant Operations may waive logical labeling as a requirement for new installations.
Network rooms identifiers shall have the following format:

\[ s-b-ft \]

\( s = \) site or campus abbreviation (two letter code)
\( b = \) building code (three digit number)
\( f = \) network room floor (one or two alphanumeric characters)
\( t = \) network room identifier (single sequential letter)

Floor identifiers can be numbers, letters, or a number/letter combination and can be two digits, if needed. This will accommodate 99 floors and includes ground \([g]\), basement \([b]\), mezzanine \([m]\), penthouse \([p]\), lobby \([l]\), and sub-basement \([s]\) (second sub-basement \([s2]\), etc.). Additional floor identifiers may be added by Homewood Plant Operations only.

Network room identifiers are sequential letters starting at \([A]\). Network rooms include any space housing network equipment, device, and means of cable termination including splice cases and wall fields. Additional network room identifiers may be added by Homewood Plant Operations only. Vendors shall contact Plant Operations for network room identifiers.

### 2.2.7 Intrabuilding Backbone Cabling Identifier

#### Physical Labeling

Intra-building backbone cabling may be identified by the building and network room of origin and destination and a sequentially numbered identifier, to accommodate multiple cables running between these two network rooms. Intra-building backbone cablings may be identified by a logical identifier indicating the specific pairs/strands from the source of service (section 4.6.1.2.).

The physical identifier may have the following format:

\[ s-b-f1t1/ f2t2-nnn \]

\( s = \) site or campus abbreviation
\( b = \) building code
\( f = \) network room floor
\( t = \) network room identifier
\( nnn = \) sequential cable number

Examples of physical identifiers:

- HW-0001-GA/1A-002

  (Cable from Homewood building 1, ground floor, network room A to 1st floor, network room A, 2nd physical cable between these 2 points)

#### Logical labeling

Intra-building backbone cables may be identified by the originating cable identifier, including pair/strand count. This label does not have to be unique to a physical cable. For example, a single logical label may follow several physical segments of a cable run connected by straight splices. This label will track the path of each pair/strand from the origin of service to the ultimate point of service. Not all intra-building backbone cables may have a logical label. For example, optical fiber connecting two switches does not have a logical identifier. Only optical fiber directly cross-connected to optical fiber within an inter-building backbone cable would have a logical label.

The logical identifier may have the following format:

\[ s-[b-tf]-nnn.d1-d2 \]

\( s = \) site or campus abbreviation
\( b = \) building code for source of service
\( f = \) network room floor
\( t = \) network room identifier
\( nnn = \) sequential cable number for cable leaving source building
\( d1 = \) initial or only pair/strand number
\( d2 = \) last pair/strand number (if applicable)
Examples of logical identifiers:

- HW-[0006-1A]-001.301-400
  (Logical pairs 301-400 of the 1st cable leaving Homewood building 6, 1st floor, network room A)
- HW-[0001-GA]-002.1-36
  (Logical strands 1-36 of the 2nd cable leaving Homewood building 1, ground floor, network room A)

When labeling hybrid optical fiber, strand 1 is multimode fiber with additional multimode fibers sequentially numbered. The first single mode fiber takes the next sequential number and does not restart the numbering sequence at 1.

Networking or Telecommunications may waive logical labeling as a requirement for new installations.

### 2.2.8 ISP Pathway Identifiers

Pathways shall be identified by the space of origin, the space of destination, and the specific pathway element.

Pathway identifiers shall have the following format:

```
s-b-f1t1/ f2t2-pe(sz).sd
```

- `s` = site or campus abbreviation
- `b` = building code
- `f` = network room floor
- `t` = network room identifier
- `pe` = pathway element
- `sz` = size of pathway element, when applicable (e.g. 4“)
- `sd` = element subdivision, when applicable (e.g. innerduct)

Pathway elements are identified as:

- Space identifier for the element plus a sequential number, plus a pathway size, where applicable.

Example of pathway identifiers are:

- HW-0001-1A/2A-PCN001(4“)
  (path from building 1, network room 1A to network room 2A. It is conduit #1 between these spaces and is 4“)
- HW-0001-2A/2B-PCT001(9“)
  (path from building 1, network room 2A to network room 2B. It is cable tray #1 between these spaces and is 9“ wide)
- HW-0001-1A/2A-PCN001(4“).PID1
  (path from building 1, network room 1A to network room 2A. It is conduit #1, innerduct 1 between these spaces and is 4“)

### 2.2.9 Horizontal Cable Identifiers

#### Physical Labeling

Horizontal links may be identified by the network room of origin and a sequentially numbered identifier based on termination location. Horizontal links may be identified by a logical identifier indicating the specific pairs/strands from the source of service (section 5.9.2.1.2).

The physical identifier may have the following format:

```
f-t-annn
```

- `f` = network room floor
- `t` = network room identifier
- `a` = one or two letters uniquely identifying the single patch panel, group of patch panels, termination block, or group of termination blocks
nnn = number uniquely identifying the port or block section within the single patch panel, group of patch panels, termination block, or group of termination blocks where the cable terminates

Examples of physical identifiers:

**GA-B002**  (Cable from ground floor, network room A, termination device B, location 2)

Termination devices shall be number continuously in a vertical stack of the same type of termination device. Patch panels on the same rack shall be identified with the same single letters (rack A, B, C…). A set of two 48-port panels would be labeled as A001 through A096. Termination blocks shall also be identified as groups with sequential numbering within a group. A set of two 300-pair 110 blocks would be labeled B001 through B144. Sequential lettering is to include all forms of cabling termination and be mutually exclusive between patch panels, termination blocks, and any other form of cable termination.

The horizontal link identifier shall be the work area outlet identifier. A “-V” for voice or a “-D” for data may be added to the end of the work area outlet identifier, but not to the horizontal link identifier. The “*(-f*)” portion of the horizontal link identifier may be omitted from the work area outlet identifier, if a building has a single network room. This portion should not be omitted from the horizontal link identifier, just the work area outlet identifier (on the faceplate).

Examples of optional work area outlet identifiers:

**A002**  (Optional format for work area outlet wired from the only building network room, termination device A, location 2)

**B002-V**  (Optional format for work area outlet wired from the only building network room, telecommunication termination device B, location 2)

**A002-D**  (Optional format for work area outlet wired from the only building network room, patch panel A, port 2)

**Logical labeling**

Horizontal link may be identified by the originating cable identifier, including pair/strand count. This label does not have to be unique to a physical cable. For example, a single logical label may follow several physical segments of a cable run connected by straight splices. This label will track the path of each pair/strand from the origin of service to the ultimate point of service.

The logical identifier may have the following format:

\[ b-tf-nnn.d_1-d_2 \]

- **b** = building code for source of service
- **f** = network room floor
- **t** = network room identifier
- **nnn** = sequential cable number for cable leaving source building
- **d_1** = initial or only pair/strand number
- **d_2** = last pair/strand number (if applicable)

Examples of logical identifiers:

**0006-1A-001.301**  
(Logical pairs 301 of the 1st cable leaving Homewood building 6, 1st floor, network room A)

**0001-GA-002.1-2**  
(Logical strands 1-2 of the 2nd cable leaving Homewood building 1, ground floor, network room A)

When labeling hybrid optical fiber, strand 1 is multimode fiber with additional multimode fibers sequentially numbers. The first single mode fiber takes the next sequential number and does not restart the numbering sequence at 1.

Networking or Telecommunications may waive logical labeling as a requirement for new installations.

**2.2.10 Firestopping Identifier**

A firestopping location identifier shall identify each installation of Firestopping material.

The firestopping location identifier shall have the following format:
Each firestopping location shall be labeled on both sides, where possible, of the penetration with the firestopping identifier. Each firestopping location shall be identified with a firestopping warning label similar to this label. The label shall include the manufacturer of the product, the installer and company name, the UL number for the product, the rating of the material, the installation date, and the number and type of cables passing through the opening.

![Sample Firestopping Label](image)

```plaintext
s-[b-f]-FSLn(h)  HW-[0001-1]-FSL01(2)
```

| s = site or campus abbreviation |
| b = building code for source of service |
| f = building floor (one or two alphanumeric characters) |
| n = two to four numeric characters identifying one firestopping location |
| h = one numeric character specifying the hour rating of the firestopping system |

The firestopping warning label can include the firestopping location identifier, eliminating the need for a separate label. The firestopping label shall be located within 12 inches of the penetration and, when possible, on both sides of the penetration.

Penetration modifications requiring the repair/re-installation of the firestopping material require the addition of a new firestopping warning label. No previous firestopping warning labels shall be removed or obscured by new labels. In the event the penetration is completely cleaned of existing firestopping material and new material installed, the previous label shall be removed or obscured completely.

### 2.2.11 Grounding and Bonding Identifiers

#### 2.2.11.1 TMGB Identifier

The Telecommunications Main Grounding Busbar is the main busbar for a building. The TMGB identifier is used to identify the single TMGB present in a single building system. The TMGB shall be labeled with the TMGB identifier.

TMGB identifier shall have the following format:

```plaintext
s-bf*r*-TMGB  HW-[0001-1A]-TMGB
```

| s = site or campus abbreviation |
| b = building code (three digit number) |
| f = optional network room floor (one or two alphanumeric characters)* |
| t = optional network room identifier (single sequential letter)* |

---

*Figure 1: Sample Firestopping Label*
* As each building shall only have one TMGB, no network room identifier is required. It may be added as an option to
act as a reminder to its location in a building with multiple network rooms. Entrance facilities with a TMGB shall be
labeled as a network rooms.

2.2.11.2 TGB Identifier

The Telecommunication Grounding Busbar is a point of contact for telecommunication and network equipment to the
building ground by way of the TMGB. Each network room should have a TGB, if it is not a building’s main cross-
connect (campus intermediary cross-connect for a specific building) with a TMGB. The TGB shall be labeled with the
TGB identifier.

The TGB identifier shall have the following format:

\[ s-[b-ft]-TGB \quad HW-[0002-1A]-TGB \]

\( s = \text{site or campus abbreviation} \)
\( b = \text{building code (three digit number)} \)
\( f = \text{network room floor (one or two alphanumeric characters)} \)
\( t = \text{network room identifier (single sequential letter)} \)

2.2.11.3 TBB Identifier

The Telecommunication Bonding Backbone is a conductor that interconnects the TMGB to one or more
telecommunication bonding backbones within a building system. A building system may have multiple
telecommunication bonding backbones. The TBB shall be labeled with a TBB identifier.

Contiguous buildings may share network grounding, if the buildings share a common electrical ground. Otherwise, each
section of an overall building shell shall have its own network grounding system matching the building electrical power
grounding system topology.

The TBB identifier shall have the following format:

\[ s-b1-ft1/ft2-TBB \quad HW-0001-1A/2A-TBB \]

\[ s-[b1-ft1]/[b2-ft2]-TBB \quad HW-[0001-1A]/[0002-2A]-TBB \]

\( s = \text{site or campus abbreviation} \)
\( b = \text{building code (three digit number)} \)
\( f = \text{network room floor (one or two alphanumeric characters)} \)
\( t = \text{network room identifier (single sequential letter)} \)

2.2.11.4 GE Identifier

The Grounding Equalizer is a conductor that interconnects two telecommunication bonding backbones within a building
system. A building system may have multiple GEs. The GE shall be labeled with a GE identifier.

Contiguous buildings may share network grounding, if the buildings share a common electrical ground. Otherwise, each
section of an overall building shell shall have its own network grounding system.

The GE identifier shall have the following format:

\[ s-b1-ft1/ft2-GE \quad HW-0001-1A/1B-GE \]

\[ s-[b1-ft1]/[b2-ft2]-GE \quad HW-[0001-3A]/[0002-3B]-GE \]

\( s = \text{site or campus abbreviation} \)
\( b = \text{building code (three digit number)} \)
\( f = \text{network room floor (one or two alphanumeric characters)} \)
\( t = \text{network room identifier (single sequential letter)} \)

2.3 Records

Plant Operations shall maintain all cable plant records for OSP elements. Any changes to the cable plant shall be
reported to Plant Operations for record entry/modification.
Required Linkages
Each identifier shall be linked to each record or report in which it appears.

Required Reports
Homewood Plant Operations shall make available to IT@JH or other JH entities, at Plant Operations discretion, reports comprising information from groups of records. Each report shall list all records of the selected identifier and all information in those records, or any desired subset of the records and of the information in those records.

2.3.1 Campus/Building Records
The site or campus records shall contain the following information:
- site or campus name
- site or campus location (e.g.: street address)
- contact information for local administrator(s) of infrastructure
- list of all buildings at the site or campus
- location of main cross-connect, if applicable
- access hours, if applicable
- comments

The building records shall contain the following information:
- building name
- building location (e.g.: street address)
- a list of all network rooms and their locations in the building
- contact information for access
- access hours
- comments
2.3.2 **Space Records**

Space records shall contain the following information based on space type:

<table>
<thead>
<tr>
<th>X- Required</th>
<th>O- Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building identifier</td>
<td>X</td>
</tr>
<tr>
<td>Comments</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Contact information for local administrator(s)</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Dead conductors</td>
<td>X</td>
</tr>
<tr>
<td>Environmental information</td>
<td>O O X X X X X X X</td>
</tr>
<tr>
<td>Grounding (Y/N)</td>
<td>X X</td>
</tr>
<tr>
<td>Hours of access</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Key information</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Location description</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Logical cable identifiers in space</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Maintenance records (date and service)</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Model</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Non-network/telecom cabling/systems/equipment present (Y/N)</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Physical cable identifiers in space</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Site or campus identifier</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Size</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Space Identifier</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Stub present (Y/N)</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Type of Space</td>
<td>X X X X X X X X X X X X X X X</td>
</tr>
<tr>
<td>Firestop identifier</td>
<td>X X</td>
</tr>
</tbody>
</table>

**Table 6: Space Record Requirements**
### 2.3.3 Device Records

Device records shall contain the following information based on device type:

<table>
<thead>
<tr>
<th>X- Required</th>
<th>Copper</th>
<th>Fiber</th>
<th>COAX</th>
<th>Active Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>O- Optional</td>
<td>Block</td>
<td>Case</td>
<td>Cross Connect</td>
<td>Mechanical Splice</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Building identifier | X x x x x x x x x | x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x
• firestop information/identifier
• maintenance records (date and service)
• comments

2.3.5  **Backbone Cabling Records**

The backbone cable records shall contain the following information:

• backbone cable identifier (the primary indexing identifier, e.g.: 2A/3A1)
• backbone cable logical identifier
• pathway(s) identifiers(s)
• space(s) identifiers(s)
• type of cable (e.g.: 600pr 24ga shielded riser cable)
• type of connecting hardware, first network room (e.g.: 36 SC duplex coupler panel)
• type of connecting hardware, second network room (e.g.: 36 SC duplex coupler panel)
• table relating each backbone cable pair or strand to other backbone cable pairs or strands or to a horizontal link, to which it is cross-connected
• all test information, including tests performed and results
• comments

2.3.6  **Intra-Building Backbone Records**

The intra-building backbone cable records may contain the following information:

• intra-building backbone cable identifier (the primary indexing identifier, e.g.: HW-0001GA/1A-002)
• intra-building backbone cable logical identifier (HW-0001GA-0002.1-36)
• campus and building identifiers, as separate data fields
• type of cable (e.g.: 36 strand, 50/125µm, gel filled, copper armor)
• type of connecting hardware, first network room (e.g.: 36 SC duplex coupler panel)
• type of connecting hardware, second network room (e.g.: 36 SC duplex coupler panel)
• table relating backbone terminations to other backbone terminations or horizontal links, to which they are cross-connected
• all test information, including tests performed and results
• comments

2.3.7  **Horizontal Link Records**

The horizontal link records may contain the following information:

• horizontal link identifier  (primary indexing identifier, e.g.: GA-B002)
• campus and building identifiers, as separate data fields
• horizontal link logical identifier (HW-001GA-001.601-602)
• cable type  (e.g.: 4 pr, UTP, category 5e, plenum)
• location of telecommunications outlet/connector  (room, office, or grid location)
• outlet connector type  (e.g.: 8 position modular, T568A, category 5e)
• cable length  (e.g.: 51m/154ft)
• cross-connect hardware type  (e.g.: 48 port modular patch panel, T568A, category 5e)
• all test information, including tests performed and results
• service record of link  (e.g.: passed category 5e at installation 1/12/99, re-terminated and re-tested at cross-connect 4/22/99 due to broken wire)
• comments

Additional items of information may be added at the end of the record, such as:

• location of test results
• location of outlet within room or office
• color of the connector or icon on the connector (e.g.: orange icon; or blue outlet)
• other telecommunications outlet/connectors at same location (generally, the other outlet connectors in the same faceplate)
• faceplate configuration (e.g.: single gang, four port, telco ivory)
• position of outlet connector on faceplate or MUTOA (e.g.: top left)
• pathway to outlet (e.g.: fishable wall or surface raceway)
• presence or absence of MUTOA (is there a MUTOA in this link, yes or no)
• length of work area cord if MUTOA is present
• presence or absence of CP (is there a CP in this link, yes or no)
• equipment circuit currently using link (e.g.: 100BaseT switch port #16)
• current user name (e.g.: Max Headroom)

2.3.8 **Firestopping Records**

The firestopping records shall contain the following information:

• firestopping location identifier (primary indexing identifier, e.g.: 3-FSL02(3))
• location of the firestopping installation (e.g.: room number and location within room)
• type and manufacturer of firestopping installed
• UL number for firestopping material
• date of firestopping installation
• name of installer of firestopping material
• number and cable-type description of cables in pathway
• service record of firestopping location (e.g.: 4/22/99 firestopping removed and replaced with same type by ABC Cabling to add cabling runs)
• comments

2.3.9 **Grounding and Bonding Records**

2.3.9.1 **TMBG Records**

The TMBG record shall contain the following information:

• telecommunications main grounding busbar identifier (primary indexing identifier, e.g.: HW-001-TMBG)
• location of the TMGB (network room identifier)
• size of the TMGB
• location of attachment of TMGB to electrical system ground or building structural steel
• location of test results for any tests performed on the TMGB, such as resistance to ground
• comments

2.3.9.2 **TGB Records**

The TGB records shall contain the following information:

• telecommunications grounding busbar identifier (primary indexing identifier, e.g.: HW-0032A-TGB)
• location of TGB (network room identifier)
• size of the TGB
• TBB identifier
• GE identifier, if present
• Comments

2.4 **Color Coding Identification**

This section is taken with minimal adjustment from the ANSI/TIA/EIA-606-A, draft1j.

This section describes requirements for color coding in administration of a cabling system.

Areas of cabling system infrastructure addressed are termination fields and horizontal cabling.

2.4.1 **Color Coding of Termination Fields**

Color coding of termination fields can make administration more efficient by making the cabling system more intuitive and easily understood for those maintaining the system.
The color coding of termination fields specified in this Standard is based on the topology of backbone and horizontal cabling specified in ANSI/TIA/EIA-568-B.1 which allows one level of cross-connection in horizontal cabling and two levels of cross-connection in backbone cabling.

Cross-connections generally connect termination fields of different colors.

- A demarcation point, for example, a central office termination, shall be identified by the color orange (Pantone 150C).
- Network connections on the system-owner side of a demarcation point shall be identified by the color green (Pantone 353C).
- Connections from common equipment, for example, PBXs, computers, LANs, or multiplexers, shall be identified by the color purple (Pantone 264C).
- Connections to key telephone systems shall be identified by the color red (Pantone 184C).
- Terminations at both ends of intra-building backbone cables originating in the main cross-connect shall be identified by the color white.
- Terminations at both ends of intra-building backbone cables not originating in the main cross-connect shall be identified by the color gray (Pantone 422C).
- Terminations at both ends of inter-building backbone cables shall be identified by the color brown (Pantone 465C).
- Terminations of horizontal cable in the network room shall be identified by the color blue (Pantone 291C).
- Terminations of other circuits, including, but not limited to, alarms, security, or energy management, shall be identified by the color yellow (Pantone 101C).

A summary and illustration of these requirements are shown below.

<table>
<thead>
<tr>
<th>Table 8: Summary of Termination Color Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Termination Type</strong></td>
</tr>
<tr>
<td>demarcation point</td>
</tr>
<tr>
<td>network connection</td>
</tr>
<tr>
<td>common equipment</td>
</tr>
<tr>
<td>key system</td>
</tr>
<tr>
<td>first level backbone</td>
</tr>
<tr>
<td>second level backbone</td>
</tr>
<tr>
<td>Inter-building backbone</td>
</tr>
<tr>
<td>horizontal</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Refer to the ANSI/TIA/EIA-606-A standard, figure 2, for an illustration of this.

### 2.4.2. Color coding in horizontal cabling

#### 2.4.2.1 Horizontal Cabling Components

Color coding may be used to differentiate horizontal cable runs, to identify services connected by patch cords, or to identify various services available in a work area outlet. To be of most value, such color coding should be consistent throughout the system.

#### 2.4.2.2 Optical Fiber Cabling Components

**Optical Fiber Patch Cords**

Most communications circuits using optical fiber as a transmission medium require two strands of fiber. Patch cords and station cords with simplex connectors should use different color connectors or strain relief boots to assist in maintaining proper polarity. Refer to ANSI/TIA/EIA-568-B.1 for recommendations on maintaining polarity.
Optical Fiber Types and Connector Types

Cabling systems may contain optical fiber with different core sizes, or different bandwidth specifications within the same core size. System operators may find it desirable to identify terminations by color to assist in maintaining compatibility when making connections.

Angled PC, or APC, optical fiber connectors are not compatible with other types, and system operators may find it desirable to identify these terminations by color to assist in maintaining compatible connections.

3 Installation Specifications

Records are maintained by Homewood Plant Operations for OSP elements. Required record information for all spaces, pathways, devices, and cables are included in this document. Required information for grounding and firestopping elements are also included.

Campus drawings and maps are maintained by Homewood Plant Operations.

Identifiers for labels are determined by Homewood Plant Operations. Specifications for these identifiers are included in this specification and include all spaces, pathways, devices, and cables. Identifiers for grounding elements are also included.

The Contractor shall confirm the labeling plan with JHU prior to labeling. Questions about labeling shall be brought to JHU prior to labeling. Incorrect labels shall be corrected at the Contractor’s expense.

Records shall be presented in electronic format. Records may be presented in text-based, tab-delimited format. Records may be presented in Microsoft Excel spreadsheets. The Contractor shall coordinate the format for delivery of records with Johns Hopkins.

The Contractor shall provide as-built drawings upon completion. The Contractor shall format these drawings as AutoCAD files compatible with AutoCAD 2000 (DWG or DXF file).
Figure 2: Intra-building labels

TR Space/Device Identifiers

Grounding and Bonding Identifiers

Building HW-0002
<table>
<thead>
<tr>
<th>Table 9: Identifier Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buildings</strong></td>
</tr>
<tr>
<td>s-b</td>
</tr>
<tr>
<td>Network Rooms</td>
</tr>
<tr>
<td>s-b-ft</td>
</tr>
<tr>
<td>EC-0001-1A</td>
</tr>
<tr>
<td><strong>Spaces</strong></td>
</tr>
<tr>
<td>s-{b-f} - ABnnn</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>HW-PCT001</td>
</tr>
<tr>
<td>HW-PBR002</td>
</tr>
<tr>
<td>HW-{0001-1}-PPB003</td>
</tr>
<tr>
<td><strong>Devices</strong></td>
</tr>
<tr>
<td>s-{b-f} - ABnnn</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>HW-CMS001.004</td>
</tr>
<tr>
<td>HW-{0004-G}-ADLR001</td>
</tr>
<tr>
<td><strong>Pathways</strong></td>
</tr>
<tr>
<td>[s-sp1]/{s2-sp2}-pe(sz).sd – inter-campus</td>
</tr>
<tr>
<td>s-[sp1]/[sp2]-pe(sz).sd – intra-campus</td>
</tr>
<tr>
<td>HW-[0004-1A]/PDB002-PDB001</td>
</tr>
<tr>
<td>HW-PTN001/PTN001-PCT001(9&quot;)</td>
</tr>
<tr>
<td><strong>Backbone Cabling-Physical</strong></td>
</tr>
<tr>
<td>s-[b1-ft1]/[b2-ft2]-nnn – inter-building</td>
</tr>
<tr>
<td>(Cable from Homewood building 1, ground floor, network room A to building 2, 1st floor, network room A, 2nd physical cable between these 2 points)</td>
</tr>
<tr>
<td>s-[b1-ft1]/dv-nnn – building to device/space</td>
</tr>
<tr>
<td>(Cable from Homewood building 1, ground floor, network room A to branch splice 1, 1st cable between these 2 points.)</td>
</tr>
<tr>
<td>s-dv1/dv2-nnn – device/space to device/space</td>
</tr>
<tr>
<td>[s-b1-ft1]/[s-b2-ft2]-nnn – inter-campus, building to device/space</td>
</tr>
<tr>
<td>(Cable from Eastern building 1, 1st floor, network room A to Homewood building 1, ground floor, network room A, 2nd physical cable between these 2 pts.)</td>
</tr>
<tr>
<td>[s-b2-ft1]/[s-dv1]-nnn – device/space to device/space</td>
</tr>
<tr>
<td>(Cable from Eastern building 1, 1st floor, network room A to Homewood branch splice 4, 1st physical cable between these 2 points.)</td>
</tr>
<tr>
<td>[s-dv1]/[s-dv2]-nnn – device/space to device/space</td>
</tr>
<tr>
<td>(Cable from Eastern straight splice 2 to Homewood straight splice 1, 1st cable between these 2 points)</td>
</tr>
<tr>
<td>s-[b1-ft1]/[b2-ft2]-TRACERnnn – inter-building tracer wire</td>
</tr>
<tr>
<td>(Tracer wire from Homewood building 1, ground floor, network room A to building 2, 1st floor, network room A, 2nd)</td>
</tr>
<tr>
<td><strong>Backbone Cabling-Logical</strong></td>
</tr>
<tr>
<td>s-[b-tf]-nnn.d1-d2</td>
</tr>
<tr>
<td>(Logical pairs 301-400 of the 1st cable leaving Homewood building 6, 1st floor, network room A)</td>
</tr>
<tr>
<td>HW-[0001-GA]-002.1-36</td>
</tr>
<tr>
<td><strong>Firestopping</strong></td>
</tr>
<tr>
<td>s-[b-f]-FSLn(h)</td>
</tr>
<tr>
<td>(First floor, firestopping location 3, 2 hour rating)</td>
</tr>
<tr>
<td><strong>TMGB</strong></td>
</tr>
<tr>
<td>s-b^*^*-TMGB</td>
</tr>
<tr>
<td>(optional network room located)</td>
</tr>
<tr>
<td><strong>TBB</strong></td>
</tr>
<tr>
<td>s-b-ft/{b2-ft}-TBB</td>
</tr>
<tr>
<td>s-[b1-ft1]/[b2-ft2]-TBB</td>
</tr>
<tr>
<td><strong>GE</strong></td>
</tr>
<tr>
<td>s-b-ft/{b2-ft}-GE</td>
</tr>
<tr>
<td>s-[b1-ft1]/[b2-ft2]-GE</td>
</tr>
<tr>
<td><strong>Intra-building Backbone Cabling-Physical</strong></td>
</tr>
<tr>
<td>s-b-fst1/{f2-st}-nnn</td>
</tr>
<tr>
<td>(Cable from Homewood building 1, ground floor, network room A to 1st floor, network room A, 2nd physical cable between these 2 points)</td>
</tr>
<tr>
<td><strong>Intra-building Pathways</strong></td>
</tr>
<tr>
<td>s-b-fst1/{f2-st}-pe(sz).sd</td>
</tr>
<tr>
<td>(path from building 1, network room 1A to network room 2A. It is conduit #1 between these spaces and is 4&quot;)</td>
</tr>
<tr>
<td>HW-0001-2A/2B-PCT001(9&quot;)</td>
</tr>
<tr>
<td>HW-0001-1A/2A-PCN001(4&quot;,PID1</td>
</tr>
<tr>
<td>Intra-building Backbone Cabling-Logical</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Horizontal Links-Physical</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Horizontal Links-Logical</td>
</tr>
</tbody>
</table>
POLICY

It shall be the policy of the Johns Hopkins Institutions to limit the entry of personnel into areas posing special dangers due to their configuration or other features. Such areas, known as confined spaces, are defined as any space that is large enough and so configured that an employee can bodily enter and perform assigned work; and has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults and pits); and is not designed for continuous employee occupancy.

REFERENCES

This policy is necessary to insure the safety of personnel performing service or maintenance activities in confined spaces and to comply with OSHA 1910.146, Permit-Required Confined Spaces and COMAR 09.12.35.

DEFINITIONS

Attendant means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant’s assigned duties.

Authorized entrant means an employee who is authorized by the employer to enter a permit space.

Confined space means a space that;

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and
(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits); and
(3) Is not designed for continuous employee occupancy.

Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuring work activities in that space and is considered to have occurred as soon as any part of the entrant’s body breaks the plane of an opening into the space.

Entry permit means the written or printed document that is provided by the employer to allow and control enter into a permit space.

Entry supervisor means the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at the permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

Hazardous atmosphere means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury or acute illnesses from one or more of the following causes;
(1) Flammable gas or vapor or mist in excess of 10 percent of its lower flammable limit (LFL).
(2) Airborne combustible dust at a concentration that meets or exceeds its LFL.
(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
(4) Atmospheric concentration of any substance above its PEL.
(5) Any other atmospheric condition that is immediately dangerous to life or health.

_Immediately dangerous to life or health (IDLH)_ means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual’s ability to escape unaided from a permit space.

_Permit required confined space (PRCS)_ means a confined space that has one or more of the following characteristics;

(1) Contains or has a potential to contain a hazardous atmosphere; or
(2) Contains a material that has the potential for engulfing an entrant; or
(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
(4) Contains any other recognized serious safety or health hazard.

**RESPONSIBILITIES**

**Supervisors:**
- Know the hazards that may be encountered during entry including the mode, signs and symptoms and consequences of over-exposure.
- Verify that all atmospheric tests have been conducted, necessary equipment (including rescue equipment) for the entry is present, and the entry permit is completely filled out and approved before entry begins.
- Verify that rescue services are available before entry is attempted.
- Ensure that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained whenever responsibility for a permit space entry operation is transferred.
- Terminate the entry and void the permit if circumstances warrant.

**Attendants:**
- Know the hazards that may be encountered during entry including the mode, signs and symptoms and consequences of over-exposure.
- Continuously maintain an accurate count of authorized entrants in the permit space and ensure that the means used to identify authorized entrants accurately identifies who is in the permit space.
- Remain outside the permit space during entry operations until relieved by another attendant.
- Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space.
Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.

Keep unauthorized personnel out of and away from the permit space.

Perform non-entry rescues where possible.

Perform no duties that might interfere with monitoring and protecting authorized entrants.

Entrants:

- Know the hazards that may be encountered during entry including the mode, signs and symptoms and consequences of over-exposure.
- Properly use equipment as required.
- Communicate with attendant as necessary to enable the attendant to monitor entrant status and alert entrant of the need to evacuate the space as required.
- Alert the attendant whenever;
  - any warning sign of a dangerous situation or symptom of over-exposure is recognized; or
  - the entrant detects a prohibited condition.
- Exit the permit space whenever;
  - an order is given to evacuate.
- any warning sign of a dangerous situation or symptom of over-exposure is recognized,
- a prohibited condition is detected.
- an evacuation alarm is activated.

Health, Safety & Environment (HSE):

- Develop and periodically review the policy for permit-required confined spaces.
- Identify and maintain an inventory of Permit Required Confined Spaces at JHI Facilities.
- Conduct atmospheric monitoring when requested and determine atmospheric testing frequency.
- Conduct a hazard assessment of each space.
- Approve all Entry Permits.
- Inspect confined space entries on a regular basis.
- Suspend entries that are in violation of OSHA, COMAR, or JH Policies.
- Retain each canceled permit for at least one year to facilitate an annual review of the program.
- Provide training for JH personnel as required.

Facilities:

- Ensure personnel are trained before they are assigned to work as supervisors, attendants or entrants in permit required confined spaces.
- Provide equipment necessary to work in confined spaces.
- Where practical, post signage on entrances to permit required confined spaces.
- Notify HSE when they or contractors will be conducting confined space work.
PROCEDURES

FOR WORK IN A PERMIT REQUIRED CONFINED SPACE:

- Facilities notifies HSE 24 hours in advance that permit required confined space work will be performed. Under normal conditions, entry will not be approved during non-business hours.
- An Entry Supervisor is appointed by Facilities.
- The Entry Supervisor will select employees to participate in the Confined Space operation and assign them the roles of Entrants or Attendants, ensuring that the employees have had the required training.
- On the day of the entry, the supervisor will complete Section I of the permit.
- A representative of HSE will conduct initial atmospheric monitoring and a hazard evaluation before signing Section II of the permit.
- The Entry Supervisor will review and sign Section III of the Permit.
- For most Permit Required Confined Space entries, the entrant shall wear a full body harness and retrieval line. If the entry involves a vertical type permit space over 5 feet in depth, a mechanical retrieval device is also required. On a case by case basis, HSE may waive these requirements if the retrieval equipment would increase the risk of entry or would not contribute to the rescue of the entrant.
- If the only hazard is an atmospheric hazard that can be controlled by forced air ventilation, alternative entry procedures may be authorized by HSE.
- If all hazards have been eliminated before entry operations begin, the space may be reclassified as a non-permit space by HSE. A written certification containing the date, the location of the space and the signature of the certifying individual must be made available to each employee entering the space.

PROCEDURES FOR CONCLUDING OPERATIONS

- All Entrants will exit the space, removing any equipment or tools that were taken into the space as part of the operation.
- Entrances to the space will be closed (and locked or secured as appropriate).
- The Entry Supervisor will terminate the permit, inform the rescue service that operations are complete and note any problems that occurred during Confined Space operations.
- Equipment will be cleaned, necessary maintenance performed, and returned to its proper storage location.

PROCEDURES FOR EMERGENCY SITUATIONS

Confined Space operations will normally continue until the work is completed. However, if emergencies occur, the following steps will be taken:

1. The Attendant, upon recognizing that an emergency situation exists, will notify all Entrants to evacuate the space.
2. The Attendant will contact The Baltimore City Fire Department (dial 911) for assistance, inform the dispatcher that a confined space emergency exists and request Rescue Company 1 be dispatched.
3. The Attendant will determine the need for entrant rescue.
4. The Attendant will attempt to rescue without entering the space.
5. The Attendant will assist emergency responders by providing them information that will be helpful to their rescue attempts, including:
   a. Information on the Entry Permit
   b. Observations of the situation
   c. Information provided to the Attendant by the Entrants
   d. Any other pertinent information
6. Once rescue of the Entrants is completed, the Entry Supervisor will obtain and forward to responders and medical personnel any information that would be helpful to them in providing medical treatment, including information such as Material Safety Data Sheets (MSDS) for any chemical to which Entrants have been exposed.
7. The Entry Supervisor will immediately cancel the Entry Permit, noting the nature of the problem.

CONTRACTOR INVOLVEMENT

When outside contractors will be involved in Confined Space operations, the following procedures will be followed:

1. Before a contractor begins any work involving a confined space at JHMI, a representative from HSE will ensure the contractor complies with 29 CFR 1910.146 including such items as a written permit system, training records, ventilation equipment, and rescue equipment.
2. The Contractor will inform HSE of all potential Permit Required Confined Space work. If the space is a PRCS, HSE will inform the contractor of the following:
   a. That the space is a "Permit-required" space and entry must be in compliance with OSHA 1910.146
   b. The space's known hazards
   c. Any past experience with hazards in the space
   d. Precautions and procedures that are necessary to protect personnel in and around the space
3. The contractor will be responsible for all air monitoring, both initial and periodic.
4. When the contractor's work is complete, a copy of the contractor's Entry Permit will be filed by the Contractor Entry Supervisor with HSE and any problems noted.
5. HSE will make periodic visits to worksites where confined space operations are being conducted.

EMPLOYEE TRAINING

Training shall be provided to employees to obtain the understanding, knowledge and skills necessary for the safe performance of duties in permit required confined spaces. Employees shall be retrained whenever there is a change in permit space operations, or employees appear to be deviating from required procedures.
The training programs for workers in and around confined spaces will contain the following:

1. General conduct for all employees
   a. hazard recognition
   b. specific types of confined spaces at the location
   c. reason for proper use and limitations of PPE and safety equipment
   d. ventilation
   e. atmospheric testing
   f. equipment use
   g. explanation of the permit system
   h. communication procedures
   i. First Aid/CPR

2. Training for emergencies, including the procedures to be followed and equipment to be used.
   a. Entrants
      1. equipment use
      2. evacuation
      3. isolation of hazards (JHH Facilities Lockout/Tagout Policy and Procedure)
   b. Attendants
      1. control of access
      2. observation of entrants behavior
      3. emergency procedures
   c. Supervisors
      1. determining acceptable entry conditions
      2. authorizing entry
      3. overseeing entry operations
      4. terminating entry

3. Training for personnel who will conduct atmospheric monitoring.
   a. Order of monitoring
   b. Permissible exposure levels
   c. Ventilation
   d. Hazard Assessment (Lock Out/Tag Out, Electricity, Heat Stress, etc)
   e. Monitoring equipment
SUGGESTED EQUIPMENT INVENTORY FOR PRCS ENTRY

- mechanical ventilator with flexible ducting
- oxygen meter
- combustible/toxic gas meter
- entry permits
- checklist
- flashlight
- tool bucket
- rope
- two-way communicator
- tank/hole entry tools
- hard hats
- insulated gloves
- safety glasses
- appropriate phone numbers
- safety barrier and cones
- mechanical retrieval device
- full body harness
- retrieval lanyard
- ladder

REVIEW

Every three years
Confined Space Entry Operations Log

The following "Entry Permits" have been issued for Confined Space work to be done in our facility. Each Permit is logged with the Permit Number, date and disposition of the project (canceled, completed satisfactorily, problems experienced, etc).

<table>
<thead>
<tr>
<th>Permit No.</th>
<th>Date Issued</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
<td></td>
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<td>6.</td>
<td></td>
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<td>7.</td>
<td></td>
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<td>8.</td>
<td></td>
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<tr>
<td>9.</td>
<td></td>
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<tr>
<td>10.</td>
<td></td>
<td></td>
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<tr>
<td>11.</td>
<td></td>
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<tr>
<td>12.</td>
<td></td>
<td></td>
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<tr>
<td>13.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CONFINED SPACE ENTRY PERMIT

**SECTION I** (Supervisor to complete each line and sign)

<table>
<thead>
<tr>
<th>Permit No</th>
<th>Permit No</th>
</tr>
</thead>
</table>

Space to be Entered: _____________________  Purpose of Entry: _____________________

Location: ________________________________  Authorized Duration of Permit: _____________________ to _____________________

**PREPARATION FOR ENTRY:**
- Identify hazards associated with entry:
  - Notification of affected departments of service interruption
  - Isolation methods/Permits completed (circle method or list other)
  - Hot work permit
  - Lockout/Tagout
  - Drain
  - Barriers
  - Ventilate

**PERSONNEL AWARENESS:**
- Pre-entry briefing on specific hazards and control methods
- Notify contractors of permit and hazard conditions

**EMERGENCY RESCUE SERVICE:**
- Rescue Service informed of entry: 410-396-1163/7

<table>
<thead>
<tr>
<th>Name of service</th>
<th>Emergency #</th>
<th>Method of Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCFD Rescue Co. 1</td>
<td>911</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

**COMMUNICATION PROCEDURES:**
- To be used by Entrants and attendants (radio, voice, cell, other)

<table>
<thead>
<tr>
<th>Authorized Entrant(s) (List by name)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Authorized Attendant(s) (List by name)</th>
</tr>
</thead>
</table>

**SECTION II** (HSE to complete and sign)

Air Monitoring:
- Acceptable limits: Oxygen 19.5-23.5%, flammable <10% LFL, Toxics < PEL/TLD/RLEL

<table>
<thead>
<tr>
<th>Time</th>
<th>O₂</th>
<th>LEL</th>
<th>CO</th>
<th>H₂S</th>
<th>Other</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Signature</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
</table>

**SECTION III**

**AUTHORIZATION BY ENTRY SUPERVISOR**

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space.

Printed Name: _____________________  Signature: _____________________  Date: _____________________  Time: _____________________

**THIS PERMIT MUST BE POSTED ON JOB SITE. GOOD ONLY FOR DATE AND TIME INDICATED**
# CONFINED SPACE ENTRY PERMIT

**SECTION I** (Supervisor to complete each line and sign)

<table>
<thead>
<tr>
<th>Permit No</th>
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<td>______________</td>
</tr>
<tr>
<td>Location:</td>
<td>______________</td>
</tr>
<tr>
<td>Authorized Duration of Permit:</td>
<td>Date: __________ to __________</td>
</tr>
<tr>
<td>Time: __________ to __________</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREPARATION FOR ENTRY:</th>
<th>COMMUNICATION PROCEDURES:</th>
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<tbody>
<tr>
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<td>______________</td>
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<td>Barriers</td>
<td>______________</td>
</tr>
<tr>
<td>Ventilate</td>
<td>______________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERSONNEL AWARENESS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>____ Pre-entry briefing on specific hazards and control methods</td>
<td></td>
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<td>____ Notify contractors of permit and hazard conditions</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>EMERGENCY RESCUE SERVICE:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>____ Rescue Service informed of entry- 410-396-5163/7</td>
<td></td>
</tr>
<tr>
<td>Name of service</td>
<td>BCFD Rescue Co. 1</td>
</tr>
<tr>
<td>Emergency #</td>
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<th>COMMUNICATION PROCEDURES:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>____</td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>SECTION II (HSE to complete and sign)</th>
<th></th>
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<table>
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<tr>
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<tbody>
<tr>
<td>LFL, Toxics &lt; PEL/TLV/REL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td></td>
</tr>
<tr>
<td>LEL</td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td></td>
</tr>
<tr>
<td>H2S</td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<table>
<thead>
<tr>
<th>Ventilation requirements:</th>
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<table>
<thead>
<tr>
<th>Personal protective equipment required:</th>
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</table>

<table>
<thead>
<tr>
<th>Self-rescue equipment required:</th>
<th></th>
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</table>

<table>
<thead>
<tr>
<th>HSE approval:</th>
<th>______________</th>
</tr>
</thead>
</table>

**SECTION III**

**AUTHORIZATION BY ENTRY SUPERVISOR**

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space.

<table>
<thead>
<tr>
<th>Printed Name</th>
<th>Signature</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
</table>

**THIS PERMIT MUST BE POSTED ON JOB SITE. GOOD ONLY FOR DATE AND TIME INDICATED**