

ADDENDUM NUMBER TWO

To the Drawings and Project Manual

Dated: 11 September 2024

Entitled: IN083 – Campus Center – E-Sports (IU20230101)
Indianapolis, Indiana

Owner:
Trustees of Indiana University
501 Indiana Ave., Suite 100
Indianapolis, IN 46202

Project Address:
Indiana University – Indianapolis Campus
Campus Center
420 University Blvd.
Indianapolis, IN 46202

Prepared By:



Chris W. Lake, AIA
Indiana Registration No. AR10400187

Addendum Dated: 11 September 2024

Project Number: 24-013

CHANGES TO THE PROJECT MANUAL

1. NOTICE TO BIDDERS
 - a. Bid date changed to September 17.
2. DIVISION 27
 - a. Added specification in its entirety.

CHANGES TO THE DRAWINGS

1. SHEET A121
 - a. Drawing 1/A121 – LOWER LEVEL – ARCHITECTURAL PLAN
 - (1) Added indication to extend drywall to deck on existing walls.
 - b. ARCH. PLAN KEYNOTES
 - (1) Added note #12 to read:
 - (a) “TYPICAL, EXTEND DRYWALL TO DECK ON ALL EXISTING WALLS AND COLUMN WRAPS”
2. SHEET A420
 - a. INTERIOR ELEV. KEYNOTES
 - (1) Revised Note #18 to read:
 - (a) “STAINLESS STEEL #4 PANELS TO MATCH EXISTING SIZE, SPACING, AND FINISH. WRAP ALL EXPOSED FACES. ALIGN HORIZONTAL REVEALS WITH EXISTING REVEALS. REFER TO ELEVATION FOR MORE INFORMATION.”
3. SHEET M001
 - a. Added RG-2 to diffuser schedule. Refer to supplemental drawing sheet M001, labeled Addendum #2 for additional information.
4. SHEET M101
 - a. Added notes to remove access panel in restroom. Refer to supplemental drawing sheet M101, labeled Addendum #2 for additional information.
5. SHEET M201
 - a. Added note to provide and install access panel. Refer to supplemental drawing sheet M201, labeled Addendum #2 for additional information.
 - b. Added RG-2. Refer to supplemental drawing sheet M201, labeled Addendum #2 for additional information.
6. SHEET E101
 - a. Refer to supplemental drawing sheet E101, labeled Addendum #2 for additional information.
7. SHEET E201
 - a. Refer to supplemental drawing sheet E201, labeled Addendum #1 for additional information.

GENERAL CLARIFICATIONS/QUESTIONS

1. AV/Technology documents provided for reference only. AV/Technology scope to be completed outside of General Construction scope.
2. Metal panels at room entry (see 1/A420) are to match existing adjacent metal panels. Existing building documentation indicates this as “stainless steel #4.”
3. The existing electrical distribution equipment for the building is Eaton.

END OF ADDENDUM NUMBER TWO

Attachments:

Spec Sections: Notice to Bidders, Division 27

Sheets: A121, A420, M001, M101, M201, E101, E201

NOTICE TO BIDDERS

Notice is hereby given that electronic bids will be received:

By: The Trustees of Indiana University
Indianapolis, Indiana

For: IN083 – Campus Center – E-sports
Indiana University – Indianapolis Campus
IU 20230101

At: Office of the Vice President for Capital Planning and Facilities

Via electronic bid submission on www.iuplanroom.com. Bidders must be registered on the plan room, and signed in to the plan room, in order to submit a bid.

Bids will be electronically opened via Zoom: <https://iu.zoom.us/j/82623978895>
Meeting ID: 826 2397 8895
Join By Telephone: 312-626-6799

Until: 2:00 P.M. (Eastern Time) on 17 September, 2024.

Bids received after that time will not be accepted. Bid results will be published on www.iuplanroom.com.

A Unified Bid is requested for all work in this project, including General, Mechanical, and Electrical Construction work.

See project specifications for electronic bid submission instructions.

All bid proposals shall be in full accord with the Bidding Documents, which are on file with the Owner and may be examined by prospective Bidders:

VPCPF Support Resources – Construction Procurement
Indiana University
bidtab@indiana.edu
812-855-5294

Bidding documents will be available August 15th, 2024. Please contact the Eastern Engineering Distribution Department, 9901 Allisonville Road, Fishers, Indiana 46038, Ph. 317-598-0661, www.iuplanroom.com for deposit and purchase information.

Each bid must be accompanied by:

- a completed Minority, Women's and Veteran's Business Enterprise Participation Plan, detailing the good faith efforts of the contractor to include minority, women and veteran-owned enterprises as subcontractors or material suppliers on the Project;

- a bid security for 5% of the total bid; and
- the contractor's written drug testing program, which must be in full compliance with IC 4-13-18.

The Owner reserves the right to accept or reject any bid and to waive any irregularities in bidding. The Owner may consider a bid to be incomplete if it does not provide the required documentation as described in this Notice, including but not limited to the Minority, Women's and Veteran's Business Enterprise Participation Plan. The Base Bid may be held for a period not to exceed sixty days before awarding Contracts. All Alternate Bids may be held for a period not to exceed ninety days before award and incorporation into the contract by proper Change Directive.

Should a successful Bidder withdraw his bid, or fail to execute a satisfactory Contract within ten days after notice of acceptance of bid, the Owner may declare the Bid Security forfeited as liquidated damages, not as penalty.

An in-person Pre-bid meeting is scheduled for 9:00 am., Eastern Time, on August 28th, 2024. All interested parties should meet in the lower level of the campus center building outside the space.

IN083 – Campus Center – E-sports
Indiana University – Indianapolis Campus
IU 20230101

SECTION 270000 – COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. See attached Division 27 “Communications” specifications published by the University Information Technology Services (UITS) for communications work. Note that not all the attached specifications are applicable to this project; refer to plans for communications work. All communications work on this project shall conform to these specifications.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. See attached Division 27 “Communications” specifications published by the University Information Technology Services (UITS) for communications products and equipment. Note that not all the attached specifications are applicable to this project; refer to plans for communications work. All communications work on this project shall conform to these specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See attached Division 27 “Communications” specifications published by the University Information Technology Services (UITS) for communications installation work. Note that not all the attached specifications are applicable to this project; refer to plans for communications work. All communications work on this project shall conform to these specifications.

END OF SECTION 270000

DIVISION 27
COMMUNICATIONS

27.00.00 COMMUNICATIONS

v.05012019

27.00.01 SCOPE OF WORK

1. This specification covers the furnishing and installation of materials for telecommunications system structured cabling, complete and in operating condition as indicated on drawings and/or as described herein, applicable to new building construction projects and major renovations on all Indiana University campuses. For smaller renovations, exceptions *may* be required, but only if approved by the appropriate UITs representative on a case-by-case basis. Potential exceptions are noted in this document and in the UITs document "IU Building Telecommunications Design Guidelines".

1.1. The telecommunication systems herein specified provides for Information outlets and other low voltage signaling functions (such as for energy management and security systems) through twisted pair, fiber optic, and coaxial cable.

1.2. The system shall provide acceptable outlets for any telecommunication device, which requires connection to other devices, networks or information services serving general university needs.

2. Products shall be as listed in this document or as directed by the Owner.

3. Installation procedures shall be in accordance with industry acceptable practices, product manufacturer's recommendations, federal, state and local codes and standards, and shall include demolition and removal of materials as required to support the work.

4. This section includes tools, materials, equipment and labor necessary to complete a turnkey installation, including but not limited to the following items, which will be supplied by contractor unless otherwise noted by the University:

- 4.1. Cable trays, hangers, and mounting hardware
- 4.2. Conduit
- 4.3. Connecting blocks
- 4.4. Cross connect cable
- 4.5. Cross connect rings or spools
- 4.6. Equipment racks, mounting hardware and wire management
- 4.7. Labels for cables and receptacles
- 4.8. Modular station receptacles
- 4.9. Mounting brackets
- 4.10. Fire Retardant plywood (preferred) or Fire Retardant Painted backboards
- 4.11. Riser cable
- 4.12. Station blocks
- 4.13. Station cables
- 4.14. Velcro Tie wraps, bushings, and miscellaneous

27.01.00 OPERATION AND MAINTENANCE

As a project nears Substantial Completion, telecommunications services must be ordered in a timely manner by the appropriate Indiana University representatives authorized to charge to the appropriate University accounts. The following is a representation of an average schedule for new construction on the Bloomington campus, to be adjusted as needed for individual projects. Other campuses should create a similar schedule that reflects their individual processes and contacts.

EXAMPLE: BLOOMINGTON CAMPUS - Telecom Service Orders Schedule				
ORDERS & SERVICE ACTIVATION	WHO	TO	LEAD TIME	<i>* Cable test results are required before circuits will be activated</i> NEEDED *
Provide updated port counts	Tel Consultant	UIITS Construct Rep	6 weeks	before Substantial Completion
Analog (Voice) Line Activations	User	telecom.iu.edu/services	4 weeks	User specified date(s), Jack IDs, Test Results
Elevator Phone Voice Line(s)	IU Construct Mgr	telecom.iu.edu/services	3 weeks	before State Inspection, Jack ID(s), Test Results
Fire Alarm Voice Line(2)	IU Construct Mgr	telecom.iu.edu/services	3 weeks	before State Inspection, Jack ID(s), Test Results
** Network switching equipment will NOT be installed until IDFs are secured				
Telecom Room Locks & Cores	IU Construct Mgr	Facility Operations Lock Shop	1 week	before turnover of IDFs to UIITS **
User Data Line Activations	IU Construct Mgr	telecom.iu.edu/services	3 weeks	User specified date(s), Jack IDs, Test Results
Emergency Phones Voice	IU Construct Mgr	telecom.iu.edu/services	3 weeks	before Building Occupancy
Emergency Phone Data/Camera	IU Construct Mgr	telecom.iu.edu/services	3 weeks	before Building Occupancy
Data based V-LAN Data Circuits, including:	IU Construct Mgr	phypltbl@indiana.edu <i>who will contact</i> bms-uiso@iu.edu	3 weeks	before needed, Jack ID(s), Test Results
<i>MDF and IDF Door Control</i>				
<i>Lighting Control Circuits</i>				
<i>Fire Alarm Circuit</i>				
<i>Climate Controls</i>				
<i>Security Cameras</i>				
<i>Card Readers</i>				
<i>(for each, specify if a Static IP is required)</i>				

27.02.00 REFERENCES

27.02.10 APPLICABLE CODES and STANDARDS

Telecommunication design shall comply with Federal and State codes, regulations, and standards with variances adopted as standards by Indiana University and the State of Indiana. Applicable state and national standards include the latest editions of:

1. ANSI/NFPA 70 National Electrical Code with Indiana Amendments, latest edition
2. BICSI CO-OSP Customer Owned Outside Plant Manual
3. BICSI Telecommunications Distribution Methods Manual
4. BICSI Customer Owned Outside Plant Design Reference Manual
5. TIA Standard TIA-230 Color Marking of Thermoplastic Wire
6. FCC Rules and Regulations
7. Indiana Administrative Code, Title 675, Article 22, Indiana Fire Prevention Codes
8. Joint Commission Accreditation of Hospitals Code
9. J-STD-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
10. UL 467 Standard for Grounding and Bonding Equipment

11. National Electrical Code
12. National Electrical Safety Code
13. NFPA 101: Life Safety Code
14. RUS Standards for Engineering, Construction, and Installation
15. TIA 526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7
16. TIA 526-14 Optical Power Loss Measurements for Installed Multimode Fiber Cable Plant – OFSTP-7
17. TIA 568 Commercial Building Telecommunications Cabling
18. TIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces
19. TIA 598 Optical Fiber Cable Color Coding
20. TIA Standard ANSI/TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
21. TIA 604 Standards on Fiber Optic Connector Intermateability
22. TIA 606 Administration Standard for Commercial Telecommunications Infrastructure
23. TIA 758 Customer Owned Outside Plant Telecommunications Cabling Standard
24. TIA Telecommunication Systems Bulletin TSB67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems
25. TSB-140 Additional Guidelines for Field Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
26. The “IU Building Telecommunications Design Guidelines” is part of the Division 27 specification

27.03.00 DEFINITIONS

1. OUTSIDE PLANT: Transmission facilities used in the distribution of voice, data, or video from point where it leaves one building and enters another, including copper, coax, fiber optics, and microwave.
2. ENTRANCE CABLE: The outside plant cable(s) that enter the building from the campus outside plant communication distribution network.
3. ENTRANCE FACILITY (telecommunications): An entrance to a building for both public and private network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.
4. BACKBONE: A facility (e.g. pathway, cable or conductors) between telecommunications rooms, or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.
5. BACKBONE CABLE (Riser Cable): Cabling from the Building Telecommunication Equipment Room (see below) to each Floor Telecommunication Equipment Room (see below), including copper, coax, and fiber optics cabling.
6. MAIN BUILDING TELECOMMUNICATION EQUIPMENT ROOM (IDF-1/Building MDF): The main telecommunication room located where the university outside plant cabling and university backbone cabling (risers) are interconnected; in other words, the Entrance Facility for university network cabling.
 - 6.1. This room may also serve as a telecommunication equipment room (IDF-2, see below).
 - 6.2. For new construction and major renovations, the telecommunications equipment rooms shall not house systems other than telecom systems. Excluded systems include:
 - 6.2.1. non UITS servers
 - 6.2.2. security system monitors
 - 6.2.3. fire alarm monitors
 - 6.2.4. building IP camera monitoring systems

- 6.2.5. audio systems
- 6.2.6. mechanical systems conduit and components
- 6.2.7. plumbing systems pipe, conduit and components
- 6.2.8. HVAC ducting and components
- 6.2.9. electrical equipment
- 6.2.10. door controller equipment other than that for IDF rooms
- 6.2.11. or any other systems requiring access by non-UIITS personnel.
- 6.3. For smaller renovations, refer to “**27.04.50 GENERAL INSTALLATION**” section, to the Appendix “IU Building Telecommunications Design Guidelines”, and special instructions provided in the specifications and plans.

- 7. **TELECOMMUNICATION EQUIPMENT ROOM (IDF-2):** A centralized space where telecommunications network equipment connects to backbone cable and station horizontal cabling.
 - 7.1. Telecommunication equipment rooms are normally provided a minimum of one per floor of a building.
 - 7.2. Floor equipment rooms must be located such that the cable length of any horizontal cable run shall not exceed 295 feet, wire length, termination to termination, and thus may require more than one telecommunication equipment room per floor.
 - 7.3. See also requirements listed under Item 6 (MDF) above.
- 8. **STATION OUTLET BOX:** The standard outlet box for telecommunications terminations shall be a double gang 5”x5”x2-7/8” minimum depth box, with mud ring sizes as required.
- 9. **INFORMATION OUTLET:** An assembly of interface ports for copper (data), coaxial (campus television), and fiber terminations (data); variations of arrangements are describe elsewhere in this document.
- 10. **GROUNDING:** See **27.05.26**

27.04.00 EXECUTION

27.04.10 QUALITY ASSURANCE

- 1. Contractor’s management team shall have demonstrated compliance with all applicable Indiana University UIITS installation requirements as a prime contractor or subcontractor on no less than three (3) Indiana University projects.
 - 1.1. The Contractor bears the burden of installing the telecommunications infrastructure described in the University specifications in such a manner that the final product is fully usable in the manner for which it is intended; that an installation merely meets the letter of the specifications is neither sufficient nor acceptable.
 - 1.2. The telecommunications contractor/subcontractor must be capable to and must perform all work on the telecommunications systems for which they are responsible, including testing and corrections, but excluding pathways which fall under the responsibilities of a separate electrical contractor/subcontractor.
 - 1.2. The University may, at its discretion, require the names, previous project list, and references for the Contractor’s management team and field personnel assigned to this project prior to the start of the work.
 - 1.3. The University maintains the right to ask for replacement of management or field staff at any time during the project.
- 2. All cabling shall meet ANSI/TIA-568.
- 3. Termination and testing of the telecommunication cabling shall be performed by a certified BICSI ITS Installer 2 Optical Fiber or ITS Technicians. It is required for technicians to be BICSI certified and have experience with Category 6 (e or A as applicable) installation.
 - 3.1. At the initial award of this contract and onsite during construction and installation, at least one technician

must be an ITS Installer 2 Optical Fiber and or ITS Technician.

3.1.1. Prior to final award of apparent low bidder, first and last name of certified personnel with appropriate certificates will be required as documentation.

3.1.2. Contractor shall provide certified personnel for the duration of the project, if substitution is required, the appropriate certificates shall be supplied.

3.2. All work shall follow NEC 2011, TIA Standards and follow BICSI installation practices.

3.2.1. Short cuts to any BICSI installation practices or NEC requirements will not be accepted unless previously authorized by a designated University representative in writing and shall be reworked at the contractor's expense.

3.2.2. This will include installing racks, overhead runway, patch panels, horizontal cable, fiber cable, grounding, termination blocks, and removal of dead and abandoned cabling and equipment. The cabling will include horizontal voice and data, thick net, thin net, coax, IBM cabling, fiber and any other dead or abandoned cables within the work area.

3.3. The contractor shall employ on onsite Building Industry Consulting Service International (BICSI) certified project manager for the telecom work.

3.4. Vendors and contractors shall employ a BICSI Registered Communications Distribution Designer (RCDD).

3.4.1. The Vendor shall provide the name and stamp number of the RCDD assigned to this project to the appropriate UITS representative.

3.4.2. The RCDD shall approve construction design and upon completion of installation, certify compliance with the standards and installation practices as specified by this document.

4. Prior to commencing the work of this section, the telecommunication contractor shall convene a meeting with Construction Manager, University Information Technology Services representative, and the consulting design engineer's representative.

4.1. The meeting will cover Project Specifications, Addendum, Change orders, IDF layouts, labeling, and other project work, documents and site conditions.

4.2. System testing procedures and requirements shall be confirmed at this time.

4.3. Test report forms and schedules shall be provided for University review.

4.4. Inspection milestones will be set and notifications scheduled.

4.5. Meeting minutes will be distributed and will include agreements, action items and responsible party(s), for this meeting and for future meetings when required.

5. Store materials and equipment in dry, environmentally controlled space. Do not install equipment and materials until spaces are enclosed, watertight, and dry. Protect equipment from dust and other airborne materials.

6. Contractor's regular job progress meetings with the Construction Manager and other university representatives shall include a University Information Technology Services telecommunications representative.

7. The Contractor shall perform all work according to University plans and specifications, manufacturers' specifications where given, and according to best industry practices otherwise.

8. University *Inspection*: Indiana University will provide advising as requested.

8.1. The Office of University Information Technology Services *may inspect* the job as it progresses.

8.2. Prior to final acceptance of the work, the Contractor (electrical/telecom) shall make arrangements with the appropriate authorized University personnel to *inspect* the construction areas, both to ensure satisfactory completion of the work and to ensure complete cleanup and restoration of areas affected by the work.

8.3. Temporary protection, coverings, and structures must be removed at or before time of *inspection*.

8.4. Examine areas and conditions with the Installer present for compliance with requirements and other conditions affecting the performance of telecommunication transmission media.

- 8.5. Areas such as ceilings, which will be enclosed permanently (ie, drywall) or accessible (ie, lay-in ceilings), and which contain telecommunications cabling, **must** be inspected by the appropriate University UITS representative before enclosure; if not, enclosing materials will be removed and replaced for inspection at no extra cost to the University.
- 8.6. Do not proceed with work until unsatisfactory conditions are corrected in a manner acceptable to the appropriate University personnel.

27.04.20 SUBMITTALS

1. Submit **shop drawings** and/or **manufacturer's product data** for telecommunications equipment, including termination equipment, copper cables, fiber optic cables, cable routing devices, and associated equipment and materials.
 - 1.1. Include cut sheets with rated capacities, operating characteristics, electrical characteristics and other measurements and descriptions that describe these items in detail.
2. Submit **manufacturer's test reports** and **test data** for each of the fiber optic cables installed.
 - 2.1. The test reports must clearly identify which fiber corresponds with the respective test measurement data so that the results can be verified prior to installation of the cable.
3. Submit a **schedule of material** and an **installation schedule** based on the construction schedule and construction phasing, to the Architect/Engineer, within three (3) weeks after contract award.
4. Submit qualifications data for material installers, supervisors, and the project RCDD (Registered Communications Distribution Designer).
5. Submit completed **cable records**, including floor plans, riser diagrams, manhole diagrams, footages on any cable other than horizontal cabling, and jack id's by location.
6. Submit **test reports** to the Owner's Representative for approval.
 - 6.1. Include in the test reports the test data taken and converted values.
 - 6.2. Prior to submittal for approval, have test reports signed by authorized witnesses present at tests.
 - 6.3. Submit electronic final copies of approved test reports in tester native format to the Owner's representative.
 - 6.4. No telecommunications services will be provided until verified reports are submitted, reviewed, and found to be acceptable by the appropriate University Information Telecommunication Services (UITS) representative.

27.04.30 DELIVERY, STORAGE and HANDLING

1. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.
2. Store wire and cable in clean dry space in original containers, following manufacturer's storage guidelines. Protect products from weather, damaging fumes, construction debris and traffic.
3. Handle wire and cable carefully to avoid abrading, puncturing, kinking, and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance and characteristic impedance integrity of transmission media are maintained.

27.04.40 SEQUENCING and SCHEDULING

1. Coordinate installation of wires/cables with installation of electrical boxes and fittings, cable trays, and raceways.
2. Sequence installation of optical-fiber cabling systems with other work to minimize possibility of damage during construction.
3. Interruptions to existing voice, data and video systems should be avoided where at all possible.
 - 3.1. If it becomes necessary to interrupt voice and/or data network services, then such interruptions must be approved by and scheduled with UITS Change Management.
 - 3.2. Approval is gained by submitting an MOP (Method of Procedure) to the UITS project contact person, containing the following information:
 - 3.2.1. Detailed account(s) of the work to be performed
 - 3.2.2. Proposed outage time(s)
 - 3.2.3. Estimated service restoral time(s)
 - 3.2.4. A contingency plan in case the work takes longer than anticipated, or doesn't go as scheduled.
 - 3.3. Change Management meetings are held on Wednesday of each week
 - 3.3.1. The MOP should be submitted to the UITS project contact person no later than 4:00 pm on the Tuesday of the week in which the work is to be performed.
 - 3.3.2. Outages and associated work should be performed outside of peak hours, such as on weekends, or after 5:00 pm and before 7:00 am during the week.
 - 3.3.3. Actual time(s) first should be approved by the parties affected by the outage(s).
 - 3.3.4. No outages may be scheduled during the first two weeks of a fall or spring semester, during which time there is a "Change Freeze" period.
 - 3.4. Approval from UITS Change Management must be granted before any scheduled outages can be performed.
 - 3.4.1. If the outage is disapproved, then an updated MOP will need to be resubmitted on the following Tuesday, to be reviewed the following day.
 - 3.5. Contractors are solely responsible for:
 - 3.5.1. making all necessary access arrangements in ample time before the work begins.
 - 3.5.2. notifying the affected parties of the scheduled outage(s).
 - 3.5.3. notifying repair@indiana.edu
 - 3.6. Interruptions to video systems should be coordinated with the IU Building Systems division at http://www.indiana.edu/~phyplant/building_systems.html and reported to repair@indiana.edu.
4. When new IDF's are constructed as part of the project, communications work must be completed, tested and accepted four (4) weeks in advance of the substantial completion date, to ensure that necessary communications circuits will be available for required building systems such as elevator phones, environmental systems monitoring and security systems.
 - 4.1. This includes all IDF associated electrical, HVAC, and door lock systems, as well as riser and outside plant copper and fiber cables, as necessary to allow the permanent installation of voice grade circuits and data network equipment.

27.04.50 GENERAL INSTALLATION

1. In new construction and major renovations, telecom rooms must be clear of mechanicals such as

ventilation ducts, water, sewer, or steam pipes, and high voltage electric.

1.1. In smaller renovations and older construction, where it is not possible to remove any or all of these systems, work should be coordinated with the University Architect's Office in order to meet all requirements necessary to ensure safety, security, and proper network system operation.

2. No cable shall be installed in any facilities other than those intended for that use.

2.1. Gas pipe and water pipes must not be used for conduit under any circumstances.

3. Install telecommunication transmission media as indicated, in accordance with manufacturer's written instructions, in compliance with applicable requirements of NEC, and in accordance with recognized industry practices.

4. CMP (Plenum) type cable will be used for all telecommunications cables.

5. Coordinate transmission media installation work, as necessary to properly interface installation of media with other work.

6. Do not install compressed, kinked, scored, deformed or abraded cable, or allow such damage to occur.

6.1. Damaged materials shall be removed from the job site immediately.

7. Use extreme care in handling, fishing, and pulling-in transmission media to avoid damage to conductors, shielding and jacketing/cladding.

7.1. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips, which will not damage media or raceway.

7.2. If power equipment is used to pull cable, the pull speed must not exceed 30 meters per minute.

7.3. Use water based lubricant approved by the cable manufacturer to ensure manufacturer's pulling tensions are not exceeded.

7.3.1. Compound used must not deteriorate conductor or insulation.

7.4. Cable bending radii must not be exceeded.

7.5. Pulling methods must not cause cable to twist.

7.6. Cables pulled through pull boxes shall be hand assisted to prevent the cable from being crushed, kinked, or scraped.

8. Provide pull strings in telecommunication conduit.

8.1 To facilitate future cable installations, install a nylon pull cord in each conduit simultaneously with the pull-in of cable.

9. Pull conductors simultaneously where more than one is being installed in same raceway.

10. Splices in building media runs are **NOT** permitted.

10.1. Building wiring must be continuous and undamaged from outlet to connecting block or connecting block to connecting block.

11. Terminations shall be made with the manufacturer's stated tools and in accordance with manufacturer's instructions and guidelines.

12. Tighten connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torque specified in UL Std.

13. When necessary within IDFs, horizontal Station cables shall be secured with Velcro tie wraps. Outside Fiber and Copper Entrance shall be secured with standard tie wraps. Observe the manufacturer's recommendations for distances between tie wraps and tightening tension from tie wraps and as specified in

ANSI/TIA-568.

13.1. Outside of IDFs, horizontal cabling, entrance cables, and riser cables must be installed within industry standard pathways, such as cable tray, J hooks, and rigid metal conduit or EMT.

14. Cables shall be permanently identified at each end with an industry approved label.

15. All wall penetrations for telecommunications cabling must be firestopped, either sleeved with bushings at each end and plugged with removable/reusable firestopping material that has a minimum 2 hour rating, with EZ Path Fire-Rated Pathway, or in accordance with other architectural details, unless otherwise noted.

15.1. Cables must not be installed through unsleeved holes drilled through walls.

15.2. Comply with Division 07 requirements for Firestopping.

15.3. Comply with TIA 569 on Firestopping.

15.4. Comply with UL1479 or ASTM E814, and label with the UL1479 or ASTM E814 reference number.

16.1. The 2017 NEC, Article 770, Article 800, and Article 820 warns that paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in the alteration of communications cable properties, and therefore must under no circumstances be purposefully or inadvertently applied to communications cables.

16.2. If any such contaminants are applied to communications cables, then without exception either during construction or as a warranty repair, the affected cables must be removed and replaced **immediately** with new cables according to the specifications of this document, and at no cost to the University.

17. For remodels and renovations in which jacks and/or station wire are to be removed or abandoned:

17.1. the jack/ports must be removed from the station end and the outlet covered with a blank plate,

17.2. the station wire/cabling must be removed in its entirety from the jack location to the telecommunications equipment room (IDF), and

17.3. the jack/port label(s) must be removed from the jackfield(s); if the associated jack/port is less than the current standard station wire Category rating, then the jack/port should also be removed from the jackfield.

27.04.60 TESTING and DOCUMENTATION

1. General

1.1. Acceptance testing shall be completed and documentation provided to the University as soon as possible in order to permit the installation of networking equipment necessary to bring the building online for security and equipment monitoring systems.

2. Testing

2.1. Acceptance testing by the University shall not occur until all work in the telecommunication closet area is completed, including but not limited to mounting and installation of fiber OSP and riser cables, backboards, terminating boxes and cabinets, and grounding blocks, and termination of fiber riser cables, copper backbone cables, station wires, or any other work necessary for the completion of the installation.

2.2. The University shall have the right to schedule acceptance testing at its convenience.

2.3. A University representative, at the option of the University, shall be present during testing.

2.4. Such acceptance testing shall in no way reduce the Contractors' obligations regarding restoration, cleanup, or warranty.

2.5. The telecommunications contractor/subcontractor shall perform tests necessary prior to acceptance testing to ensure that the installed cables will pass acceptance testing performed in conjunction with

University representatives.

2.5.1. Acceptance testing includes verifying that each cable and conductor is properly labeled and in agreement at each end, also known as continuity testing.

2.5.2. As such, the telecommunications contractor/subcontractor's personnel must perform their own testing; subcontracting testing to an outside entity is not permitted.

2.6. Contractor shall be responsible for performing, tracking, and recording the results of tests.

2.7. Contractor shall be responsible for providing equipment and materials necessary for as long a period of time as necessary to complete testing to the satisfaction of the University.

2.8. The University must agree to test record forms and methods prior to the commencement of acceptance testing.

3. Documentation

3.1. Provide record plant documentation, including jack type (Information outlet), jack location, circuit length, fiber riser cable lengths, and copper backbone cable lengths and any other information deemed to be useful.

3.1.1. Additionally, provide a list of all existing jacks removed during project demolition phase(s).

3.2. The documentation format(s) will be agreed upon between the campus telecommunication coordinator and the contractor.

3.2.1 Provide all documentation in University approved electronic format.

3.2.2. If it is agreed to use proprietary software to provide testing results, the contractor will be required to furnish licensed system software to run it unless the University already has a licensed version of the contractor's software.

27.04.70 RECORD DRAWINGS

1. Provide updated drawings of telecommunications systems in CAD format.

2. As a minimum, the data provided must include the following elements, where applicable:

2.1. Inside Plant

2.1.1. Cable routing.

2.1.2. Riser and OSP cable, pair (count), locations, and final cable lengths.

2.1.3. Supporting structures.

2.1.4. Terminal locations and IDs.

2.1.5. Telecommunications Room and terminal details.

2.1.6. Conduit and cable tray routing, elevations installed at and section lengths.

2.1.7. Pull box locations, elevations installed at and sizes.

2.1.8. Information Outlet locations, label ID's, types, and serving Telecommunications Room

2.1.9. For each change reflected on the Record Drawings, the Change Order Request number shall be shown.

2.2. Substantial Completion Requirement

2.2.1. One month before the contractual Substantial Completion date, Contractor shall provide updated floor plans showing all known Information Outlets in contractually affected areas to be working at time of Substantial Completion, with actual jack label IDs and port counts.

2.2.2. These floor plans are for use by University groups for coordinating FF&E, employee location assignments and telecommunications service orders, as well as testing documentation and verification.

- 2.3. **Outside Plant** (provide on an accurate and scaled site plan)
- 2.3.1. Location of underground routes, indicating type (conduit, direct buried, etc.) and quantities.
- 2.3.2. Location of manholes and handholes.
- 2.3.3. Deviations from minimum depth requirements.
- 2.3.4. XYZ coordinates from 'permanent' landmarks.
- 2.3.5. Footages of conduit between maintenance holes.
- 2.3.6. Crossings of other utilities uncovered, including type and size of utility.
- 2.3.7. .Location of outdoor emergency phone with conduit routing

27.04.80 WARRANTY

1. The warranty on labor and material installed by the Contractor shall be in effect for Five (5) years from the date of acceptance of the work.
2. Contractor shall repair, adjust, and/or replace, whichever the University determines to be in Its best interests, any defective equipment, materials, or workmanship, as well as such parts of the work damaged or destroyed by such defect, during warranty period, at the Contractor's sole cost and expense.
3. In the event that any of the equipment specified, supplied, and/or installed as part of the work should fail to produce capacities or meet design specification as published or warranted by the manufacturer of the equipment involved or as specified in this document, the Contractor shall, in conjunction with the equipment manufacturer, remove and replace such equipment with equipment that will meet requirements without additional cost to the University.
4. In the event that the Contractor does not affect repair within seven (7) days from the date of notification of such defect, the University may secure repair services from other sources and charge the Contractor for such costs without voiding the warranty.
5. Guarantees of material, equipment, and workmanship running in favor of the Contractor shall be transferred and assigned to the University on completion of the work and acceptance of said work by the University.

27.05.00 COMMON WORK RESULTS

27.05.05 SELECTIVE DEMOLITION

Not Applicable

27.05.09 RELATED SECTIONS

Section 26 – Common Work Result for Electrical
Section 26 – Low-Voltage Electrical Power Conductors and Cables
Section 26 – Grounding and Bonding for Electrical Systems
Section 26 – Hangers and Supports for Electrical Systems
Section 26 – Raceway and Boxes for Electrical Systems
Section 26 – Cable Trays for Electrical Systems

27.05.26 GROUNDING and BONDING

1. Products specified in this Section shall be manufactured by a company with a minimum of three years' documented experience specializing in manufacturing such products.

2. DEFINITIONS (additional—see also 27.03.00)

2.1. **Bonding**: The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed. All exposed metal parts of the telecommunications system which are not intended to carry current must be bonded to the CBN (Ground Electrode System).

2.2. **Common Bonding Network (CBN)** (Ground Electrode System): Per ANSI T1.333-2001, a CBN is the principal means for effecting bonding and grounding inside a telecommunication building. It is the set of metallic components that are intentionally or incidentally interconnected to form the principal bonding network (BN) in a building. These components include structural steel or reinforcing rods, plumbing, alternating current (ac) power conduit, ac equipment grounding conductors (ACEGs), cable racks, and bonding conductors. The CBN always has a mesh topology and is connected to the grounding electrode system.

2.3. **EMI (Electromagnetic Interference)** - The interference in signal transmission or reception resulting from the radiation of electrical or magnetic fields.

2.4. **Exothermic Weld**: A method of permanently bonding two metals together by a controlled heat reaction resulting in a molecular bond.

2.5. **Ground**: A conducting connection, whether intentional or incidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

2.6. **Grounding Electrode Conductor**: The conductor used to connect the grounding electrode to the equipment grounding conductor, to the grounded conductor, or to both, of the circuit at the service equipment, or at the source of a separately derived system.

2.7. **Mesh Bonding Network (Mesh-BN)**(Ground Electrode System): A bonding network to which all associated equipment (e.g., cabinets, frames, racks, trays, pathways) are connected using a bonding grid, which is connected to multiple points on the common bonding network.

2.8. **Primary Protector**: A surge protective device placed on telecommunications entrance conductors in accordance with ANSI/NFPA 70 and ANSI/ATIS 0600318. and listed under ANSI/UL 497.

2.9. **Telecommunications Main Grounding Busbar (TMGB)**: A busbar placed in a convenient and accessible location within the Building Telecommunication Main Equipment Room (IDF-1) which is in compliance with J-STD-607, and serves as a common point of connection for telecommunications system and equipment bonding to ground, as well as the common point of connection between other major building grounds and the Mesh Bonding Network (Ground Electrode System).

2.9.1. shall be pre-drilled copper or electro-tin plated busbar with holes to accommodate lug mounting holes, listed by a nationally recognized testing laboratory (NRTL).

2.9.2. shall be 0.25" thick x 4" wide with length sized for current applications and future growth.

2.9.3. shall be located to minimize ground wire lengths.

2.9.3.1. The TMGB mounting location shall be coordinated with University Information Technology Services representative and University electrical engineer.

2.9.4. shall be mounted at 18 inches above the floor in a location out of the way of other equipment.

2.9.5. shall be mounted to maintain a two (2) inch minimum clearance from the wall, using stand-off

insulators that comply with UL 891 for use in switchboards, 600V, made of Lexan or PVC impulse tested at 5000V.

2.9.6. shall be installed with clearances as required by applicable codes.

2.9.7. shall be mounted as close as practical to an electrical power panel if located in the same room, but no closer than 36" to a power panel or active electronics.

2.9.8. Unplated busbars shall be cleaned and have antioxidant applied before attaching grounding conductors.

2.9.9. shall have connections made with exothermic welding or two-hole compression lugs with a two-crimp minimum.

2.9.10. shall be bonded the building ground system ground or building structural steel with a copper ground wire of not smaller gauge than that used for the Telecommunications Bonding Backbone (TBB).

2.9.11. shall be bonded to the Alternating Current Electrical Ground (ACEG) with a copper ground wire of not smaller gauge than that used for the Telecommunications Bonding Backbone (TBB).

2.9.12. shall be bonded to any electrical panelboards that occupy the same room using a minimum #6 AWG copper conductor with a maximum length of 13 feet.

2.9.13. All ungrounded telecommunications racks and metallic raceways in the same room as the TMGB shall be bonded to the TMGB (see TEBC).

2.9.14. Telecommunications equipment racks shall have a grounding busbar connected to the TMGB.

2.9.15. Other connections to the TMGB include:

2.9.15.1. Primary protector

2.9.15.2. Outside plant cables

2.9.15.3. Backbone cables which contain a shield or metallic member

2.9.15.4. All metallic pathways for the telecommunications cabling located within the same room or space as the TMGB.

2.9.15.5. Cable tray

2.9.15.6. Ladder rack

2.9.15.7. Telecommunications equipment

2.9.15.8. TBB

2.9.15.9. TEBC

2.9.15.10. Primary protector grounding conductor, maintaining a minimum of 1 foot separation between this insulated conductor and any dc power cables, switchboard cable, or high frequency cables, even when placed in rigid metal conduit or EMT.

2.10. Telecommunications Grounding Busbar (TGB): A busbar placed in a convenient and accessible location within a Floor Telecommunication Equipment Room (IDF-2) that is in compliance with J-STD-607, and serves as a common point of connection for telecommunications system and equipment bonding to ground.

2.10.1. shall be pre-drilled copper or electro-tin plated busbar with holes to accommodate lug mounting holes, listed by a nationally recognized testing laboratory (NRTL).

2.10.2. shall be 0.25" thick x 2" wide with length sized for current applications and future growth.

2.10.3. shall be located to minimize ground wire lengths.

2.10.3.1. The TGB mounting location shall be coordinated with University Information Technology Services representative and University electrical engineer.

2.10.4. mount at 18 inches above the floor in a location out of the way of other equipment.

2.10.5. shall be mounted to maintain a two (2) inch minimum clearance from the wall, using stand-off insulators that comply with UL 891 for use in switchboards, 600V, made of Lexan or PVC impulse tested at 5000V.

2.10.6. shall be installed with clearances as required by applicable codes.

2.10.7. shall be mounted as close as practical to an electrical power panel if located in the same room, but no closer than 36" to a power panel or active electronics.

2.10.8. Unplated busbars shall be cleaned and have antioxidant applied before attaching grounding conductors.

2.10.9. shall have connections made with exothermic welding or two-hole compression lugs with a two-crimp minimum.

- 2.10.10. shall be bonded to any electrical panelboards that occupy the same room using a minimum #6 AWG copper conductor with a maximum length of 13 feet.
- 2.10.11. All ungrounded telecommunications racks and metallic raceways in the same room as the TGB shall be bonded to the TGB (see TEBC).
- 2.10.12. Telecommunications equipment racks shall have a grounding busbar connected to the TGB.

2.11. **Telecommunications Equipment Bonding Conductor (TEBC):** A conductor or conductors that connect the telecommunications main grounding busbar (TMGB) or telecommunications grounding busbar (TGB) to equipment racks and cabinets.

- 2.11.1. shall be a continuous copper conductor sized according to the conductor table under TBB.
- 2.11.2. shall be separated from ferrous materials by 2 inches, or be bonded to the ferrous material.
 - 2.11.2.1. may be routed within cable trays, or suspended 2 inches under or off the side of a cable tray or ladder rack.
- 2.11.3. shall be supported every 3 feet.
- 2.11.4. shall be installed with a minimum of 8-inch bend radii of no more than a 90 degree bend.
- 2.11.5. may contact other cable groups at a 90 degree angle only.
- 2.11.6. Metallic cable shields may not be used as a TEBC.
- 2.11.7. Includes RBCs and UBCs.

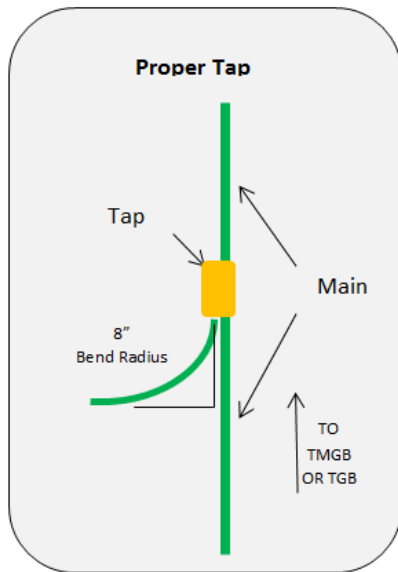
2.12. **Telecommunications Bonding Backbone (TBB):** A conductor that interconnects the Telecommunications Main Grounding Busbar (TMGB) in the MDF/IDF-1 to Telecommunications Grounding Busbars (TGBs) in the IDF-2(s).

- 2.12.1. The intended function of a TBB is to reduce or equalize potential differences between telecommunications systems; while the TBB will carry some current under ac power ground fault conditions, it is not intended to provide the only ground fault return path.
- 2.12.2. The TBB shall be constructed with copper ground wire solid or stranded, insulated or uninsulated as approved the University, and sized according to length, as detailed in J-STD-607, shown below:

WIRE LENGTH	WIRE SIZE (AWG)
<4 m / < 13 ft	6
4-6 m / 14-20 ft	4
6-8 m / 21-26 ft	3
8-10 m / 27-33 ft	2
10-13 m / 34-41 ft	1
13-16 m / 42-52 ft	1/0
16-20 m / 53-66 ft	2/0
> 20 m / > 66 ft	3/0

2.12.3. As sized above, a continuous ground wire shall be run from the TMGB in the outside plant cable entrance telecommunications room (MDF/IDF-1/BDF) to the TGB in the highest/last IDF in each of any stacks of IDFs; the TGB in each intermediate IDF in a given stack shall be H-tapped to the continuous grounding riser/TBB.

- 2.12.3.1. Connections to the Conductor shall be made with irreversible compression connectors.
- 2.12.3.2. Taps shall be UL & CSA listed.
- 2.12.3.3. Taps shall be able to accept 6 AWG to 3/0 AWG.
- 2.12.3.4. Taps shall have a traceable feature to ensure proper die size was used to make the crimp.
- 2.12.3.5. Taps require a minimum of (2) crimps for C Tap and H Tap, 1 crimp for I-Beam and busbar Tap.
 - 2.12.3.5.1. Crimp according to manufacturer's recommendation.
- 2.12.3.6. Minimize the amount of insulation removed for installing the compression connector.
- 2.12.3.7. Taps shall be installed as shown in the following diagram:



2.12.4. TBB conductors should be installed in metal conduit for protection and ease of replacement everywhere inside the building, except as follows:

2.12.4.1. inside MDF/IDF rooms.

2.12.4.2. between stacked MDF/IDF rooms where the sleeve through the floor is less than three (3) feet.

2.12.5. TBB conductors in metal conduit must utilize grounding bushings at both conduit ends.

2.12.6. Multiple TBB runs may be required as dictated by building size and layout.

2.12.7. Metallic cable shields may not be used as a TBB.

2.13. **Grounding Equalizer (GE)**: A bonding conductor that interconnects TGBs on the same floor, top floor, and every third floor of a multistory building (formerly TBBIBC).

2.13.1. The GE shall be sized according to the conductor table under TBB.

2.13.2. Metallic cable shields may not be used as a GE.

2.14. **Rack Bonding Conductor (RBC)**: A bonding conductor used to connect the rack/cabinet directly to the TMGB/TGB/Mesh.

2.14.1. Metallic enclosures, including telecommunications cabinets and racks, shall be bonded to the mesh-BN, TGB, or TMGB using a minimum sized conductor of No. 6 AWG.

2.14.2. Cabinets, racks, and other enclosures in computer rooms must not be bonded serially; each shall have their own dedicated bonding conductor to the mesh-BN, TGB, or TMGB

2.15. **Unit Bonding Conductor (UBC)**: A bonding conductor used to connect a rack/cabinet mounted equipment unit to the grounding structure (i.e. conductor, busbar) utilized in that rack/cabinet.

2.16. **Electrical Distribution Panel (EDP)**: In existing room installations only; new construction must not have EDPs located in the same room as telecommunications equipment.

2.16.1. When located in the same room as the TMGB/TGB the EDP's equipment grounding bus or the panel board enclosure shall be bonded to the TMGB/TGB.

2.16.2. Using a bonding conductor for telecommunications (BCT) minimum 6 AWG to a maximum of 3/0 AWG depending on the length of cable required.

2.16.2.1. BCT should be installed in metal conduit for protection and ease of replacement everywhere inside the building, except as follows:

2.16.2.1.1. inside MDF/IDF rooms.

2.16.2.1.2. between stacked MDF/IDF rooms where the sleeve through the floor is less than three (3) feet.

2.16.2.2. BCT in metal conduit must utilize grounding bushings at both conduit ends.

- 2.16.3. Use same AWG as TBB.
- 2.16.4. A qualified electrician shall make all connections within an ac electrical panel.
- 2.16.5. Outside of the scope of ANSI/TIA-607B.

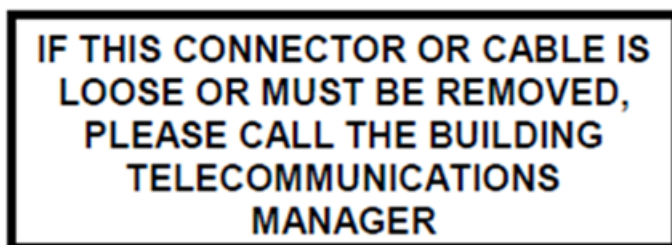
- 2.17. **Conductive Cables** contain metallic components that are capable of transmitting current.
 - 2.17.1. Conductive cables should be bonded and grounded as specified in NEC Article 770.100.
 - 2.17.2. Fiber optic cables may be conductive or non-conductive.
 - 2.17.3. Telecommunications cables with metallic sheath members shall be bonded together at splices with a #6 solid or stranded copper ground wire and bonded to the TMGB or TGB.
 - 2.17.4. Cable shields (of cables not installed in ferrous metal conduit elsewhere grounded) shall be grounded to a tested and proven earth ground within 50 feet of entering any building with an independent #6 solid or stranded copper ground wire or other electrically equivalent method as approved by the University.

2.18. **Ladder Rack and/or Cable Tray Potential Equalization** is achieved when all cable runway sections are bonded together and bonded back to the TMGB or TGB in a Telecommunications Room.

- 2.18. Maintain an 8” Bend Radius on the TEBC
- 2.18. Keep a 2” separation from other cables, power and telecommunications
- 2.18. Remove any paint, oxidation, etc. from the runway surfaces that are being bonded
- 2.18. Drill two holes as required to accommodate the 2-hole compression lug
- 2.18. Apply a thin coat of antioxidant around the holes and on the surface where the lug will be in contact.
- 2.18. Attach straps to the runway using stainless steel hardware sized for the lug holes.
- 2.18. Tighten the hardware
- 2.18. Wipe off any excess antioxidant after installation of the lug.

3. Labeling of Telecommunication Grounding System

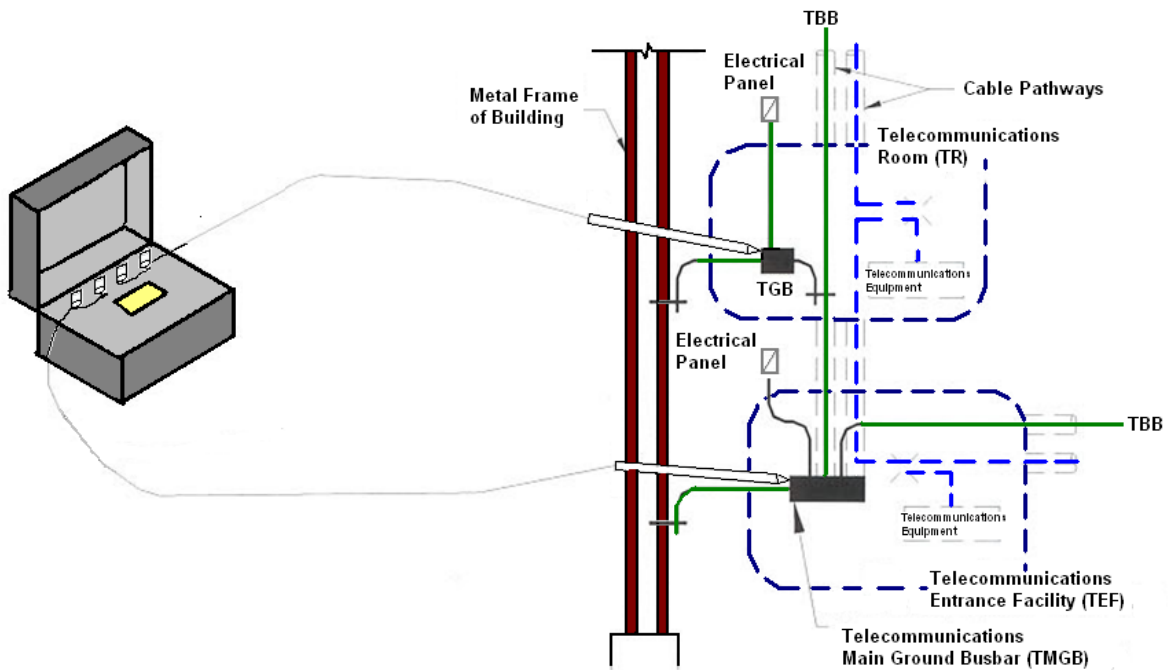
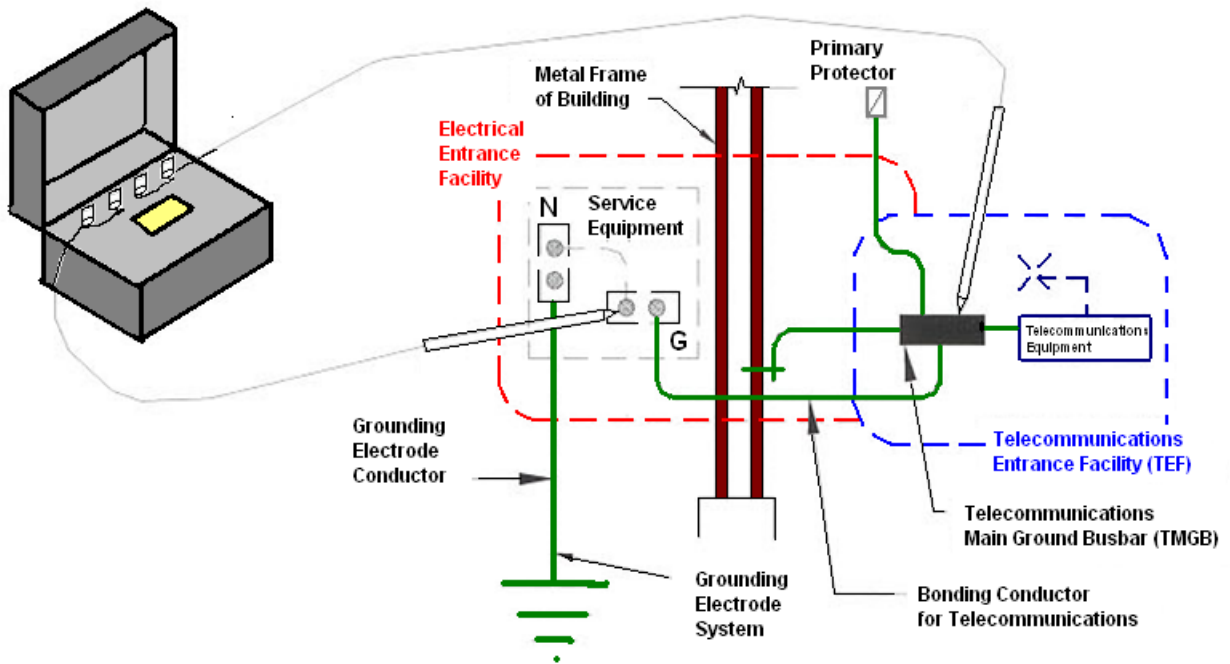
- 3.1. The format for the telecommunications main grounding busbar shall be FS-TMGB, while the format for the TGBs shall be FS-TGB.
 - 3.1.1. FS is the TS identifier for the space containing the busbar; Floor & space
 - 3.1.2. TMGB is the portion of an identifier designating a telecommunications main grounding busbar;
 - 3.1.3. TGB is the portion of the identifier designating a telecommunications grounding busbar.
- 3.2. Each telecommunications space or room shall be assigned an identifier unique within the building.
 - 3.2.1. The TS shall be labeled with the TS identifier inside the room so as to be visible to someone working in that room.
 - 3.2.2. The TS identifier shall have a format of FS.
- 3.3. All busbars and cables will have the following label attached in a visible location and in a readable format:



4. Testing of Telecommunication Grounding System

- 4.1. Testing shall be performed with an earth ground resistance tester, and not a standard Volt-Ohm-multimeter.
 - 4.1.1. Perform two-point ground continuity testing.
 - 4.1.2. Maximum value 100 milliohms.
 - 4.1.3. Follow manufacture instructions on setup and how to perform the test.

- 4.1.4. Care should be taken and safety precautions in place.
- 4.1.5. Record and submit ground test results.



27.05.28 PATHWAYS

1. Cable paths must be designed and installed in a manner which allows reasonable access to add or remove cables for future demand and maintenance purposes, including capacity for future growth.

1.1. It is the financial responsibility of the contractor to install sufficient pathway capacities to meet the requirements stated in the following sections 27.05.33, 27.05.36, 27.05.39 and 27.05.43.

1.2. It is the responsibility of the contractor to install pathways which upon project completion will remain readily accessible by telecommunication cable installers.

2. Separation from EMI sources:

2.1. Open cables and cables in nonmetallic raceways and unshielded power:

2.1.1. Electrical less than 2 kVa 5 inch minimum

2.1.2. Electrical 2 to 5 kVa 12 inch minimum

2.1.3. Electrical greater than 5 kVa 24 inch minimum

2.2. Cables in grounded metallic raceways and unshielded power:

2.2.1. Electrical less than 2 kVa 2-1/2 inch minimum

2.2.2. Electrical 2 to 5 kVa 6 inch minimum

2.2.3. Electrical greater than 5 kVa 12 inch minimum

2.3. Cables in grounded metallic raceways and shielded power:

2.3.1. Electrical less than 2 kVa 1 inch minimum

2.3.2. Electrical 2 to 5 kVa 3 inch minimum

2.3.3. Electrical greater than 5 kVa 6 inch minimum

2.4. Cables and electrical motors and transformers 5 kVa or larger 48 inches

2.5. Cables and fluorescent fixtures 5 inches

27.05.29 HANGERS and SUPPORTS

1. Hanger and supports must be NRTL (Nationally Recognized Testing Laboratories) labeled for support of Category 6A cabling.

2. J-hooks shall be installed where no provisions for cabling runways.

3. J-hooks shall be installed per ANSI/TIA 569 Commercial Building Standards for Telecommunications Pathways and Spaces, including a maximum distance between j-hooks of five (5) feet, but with varied spacing to avoid the production of electrical harmonics in the high-speed data cabling.

27.05.33 CONDUITS and BACKBOXES

1. Horizontal distribution conduit shall be installed from junction box joining each station conduit box to the floor telecommunications equipment room, assuming worst allowable case of 180° of conduit bend from pull point to pull point, to be sized per the following table:

EMT Conduit Trade Size	Category 6A Station Cables
1"	2
1-1/4 "	4
1-1/2 "	6
2"	12
2-1/2 "	18
3"	26
3-1/2 "	38
4"	48

The conduit fill table is based on BICSI's recommended 40% derated fill recommendation as calculated in the following table for horizontal station cables.

NEW CONSTRUCTION													
----- (inches) -----					NEW CONSTRUCTION			90 Degrees of Bend			180 Degrees of Bend		
EMT Conduit Trade Size	Cat 6A Cable Diameter	Conduit Area	Cable Area	100% Fill	Bends (NONE)	40% Fill	Cables	Bends	40% Fill Derated	Cables	Bends	40% Fill Derated	Cables
1.00	0.275	0.7850	0.0594	13.223	0	5.289	4	1	4.496	4	2	3.702	2
1.25	0.275	1.2266	0.0594	20.661	0	8.265	8	1	7.025	6	2	5.785	4
1.50	0.275	1.7663	0.0594	29.752	0	11.901	10	1	10.116	10	2	8.331	8
2.00	0.275	3.1400	0.0594	52.893	0	21.157	20	1	17.983	16	2	14.810	14
2.50	0.275	4.9063	0.0594	82.645	0	33.058	32	1	28.099	28	2	23.140	22
3.00	0.275	7.0650	0.0594	119.008	0	47.603	46	1	40.463	40	2	33.322	32
3.50	0.275	9.6163	0.0594	161.983	0	64.793	64	1	55.074	54	2	45.355	44
4.00	0.275	12.5600	0.0594	211.570	0	84.628	84	1	71.934	70	2	59.240	58

NEW CONSTRUCTION													
----- (inches) -----					NEW CONSTRUCTION			90 Degrees of Bend			180 Degrees of Bend		
EMT Conduit Trade Size	Cat 6A Cable Diameter	Conduit Area	Cable Area	100% Fill	Bends (NONE)	40% Fill	Cables	Bends	40% Fill Derated	Cables	Bends	40% Fill Derated	Cables
1.00	0.300	0.7850	0.0707	11.111	0	4.445	4	1	3.778	2	2	3.111	2
1.25	0.300	1.2266	0.0707	17.361	0	6.945	6	1	5.903	4	2	4.861	4
1.50	0.300	1.7663	0.0707	25.000	0	10.000	10	1	8.500	8	2	7.000	6
2.00	0.300	3.1400	0.0707	44.444	0	17.778	16	1	15.111	14	2	12.444	12
2.50	0.300	4.9063	0.0707	69.444	0	27.778	26	1	23.611	22	2	19.444	18
3.00	0.300	7.0650	0.0707	100.000	0	40.000	40	1	34.000	32	2	28.000	26
3.50	0.300	9.6163	0.0707	136.111	0	54.445	54	1	46.278	46	2	38.111	38
4.00	0.300	12.5600	0.0707	177.778	0	71.111	70	1	60.444	60	2	49.778	48

2. Junction boxes shall be sized according to NEC 314.28, NEC 314.54, Article 770, and to accommodate bending radiuses as discussed in NEC 300.34 and related TIA documents.

2.1. In any case, all methods employed for the installation of interior communication cables should not subject the cables to a bend radius less than the following minimums:

2.1.1. Copper riser communication cables, bending radius not smaller than 8 times the cable diameter.

2.1.2. Copper station communication cables:

2.1.2.1. In conduit, bending radius not smaller than three (3) inches, or 8 times the cable diameter, whichever is greater.

2.1.2.2. In furniture, where the cable is not subject to high pulling tensions, bending radius not smaller than 4

times the cable diameter.

2.1.3. Fiber optic cables, during pulling operations, should not exceed a bending radius smaller than 20 times the cable diameter, or as recommended by the cable manufacturer; after pull is complete, the final cable bend radius should not exceed 10 times the cable diameter.

3. Conduits for copper and fiber riser cables shall be sized to no greater than 40% derated fill.

4. Conduits for interior grade telecommunication cables, such as riser rated and horizontal station cables, may be placed in a slab-on-grade or in a slab above crawl space, but must never be placed below the slab for any reason. Likewise, horizontal station cables must not be placed in conduit which is exposed to outside weather conditions. Inside building rated cables are not designed to withstand the moisture and condensation which can occur in underground and exterior conduits, which will render the cable(s) unusable in a short period of time. Although such conduits may be placed in the slab as a last result, whenever possible conduits should be placed above slab, but never below.

27.05.36 CABLE TRAYS

1. **Horizontal distribution:** Cable trays are to be installed as low as possible above the finished ceiling.

1.1. A clearance of 12" shall be maintained above the trays.

1.2. 90° turns shall be made by two (2) 45° turns.

1.3. Cable trays shall not be installed using center point mounts.

1.4. Cable tray outside the IDFs shall be large enough that all of the telecommunication cabling installed as part of a project will not produce a fill ratio greater than 70% of the manufacturer's stated capacity.

2. **Telecommunication Rooms (IDFs):** In IDFs, ladder type cable tray shall be sized as indicated in the following table, based on the Chatsworth Cable Fill Capacities chart for their 10250-Xnn products:

CABLE TRAY CAPACITIES & ROOM SIZES			
Racks	Category 6A Cables	Tray Width	Minimum Room Size
One	1-250	12-inch	10'x11'
Two	251-382	18-inch	10'x11'
Two	383-500	24-inch	10'x11'
Three	501-637	30-inch	14'x14'
Three	638-792	36-inch	14'x14'

2.1. Install ladder tray one size larger above the equipment rack(s), secured and braced as necessary to stabilize the end of the rack(s). (See diagrams)

2.1. Mount ladder tray at a minimum 7' height.

2.2. Install cable tray systems such that cables will transition to the ladder rack runway without damage to or strain on the cables.

2.4. Use additional ladder rack where necessary to stabilize equipment racks in the room or as needed to provide reasonable and shortest distance routing of cables.

3. Refer to Division 26.

27.05.39 SURFACE RACEWAYS

1. Cables must not be subjected to sharp or binding edges.

2. Surface raceways must be large enough to accommodate all intended telecommunications cables as well as allow for 30% growth.
3. Such raceways and pathways shall installed to support horizontal cabling in accordance with the requirements of ANSI/TIA-569-C.
4. Refer to Division 26.

27.05.43 UNDERGROUND DUCT SYSTEMS and RACEWAYS

1. Maintenance holes

1.1. Manholes

- 1.1.1. Manholes shall be precast concrete 12x6x7 A-hole or J-hole type with sump hole.
- 1.1.2. Manholes shall have 32" diameter heavy-duty cast iron lids with penta-head bolts.
- 1.1.3. Lids shall be labeled "Communications".
- 1.1.4. Manholes shall have manufacturer's pulling irons installed.
- 1.1.5. Beginning from center of the side walls, manufacturer's manhole racking shall be installed 24" OC.
- 1.1.6. Manholes shall be fitted with a manufacturer's recommended iron ladder.

1.2. Handholes

- 1.2.1. Where not otherwise specified, handholes shall be 4x4x4 precast concrete with sump hole.
- 1.2.2. Precast handholes shall have 32" diameter heavy-duty cast iron lids with penta-head bolts.
- 1.2.3. Lids on all types of handholes shall be labeled "Communications".

2. Duct type

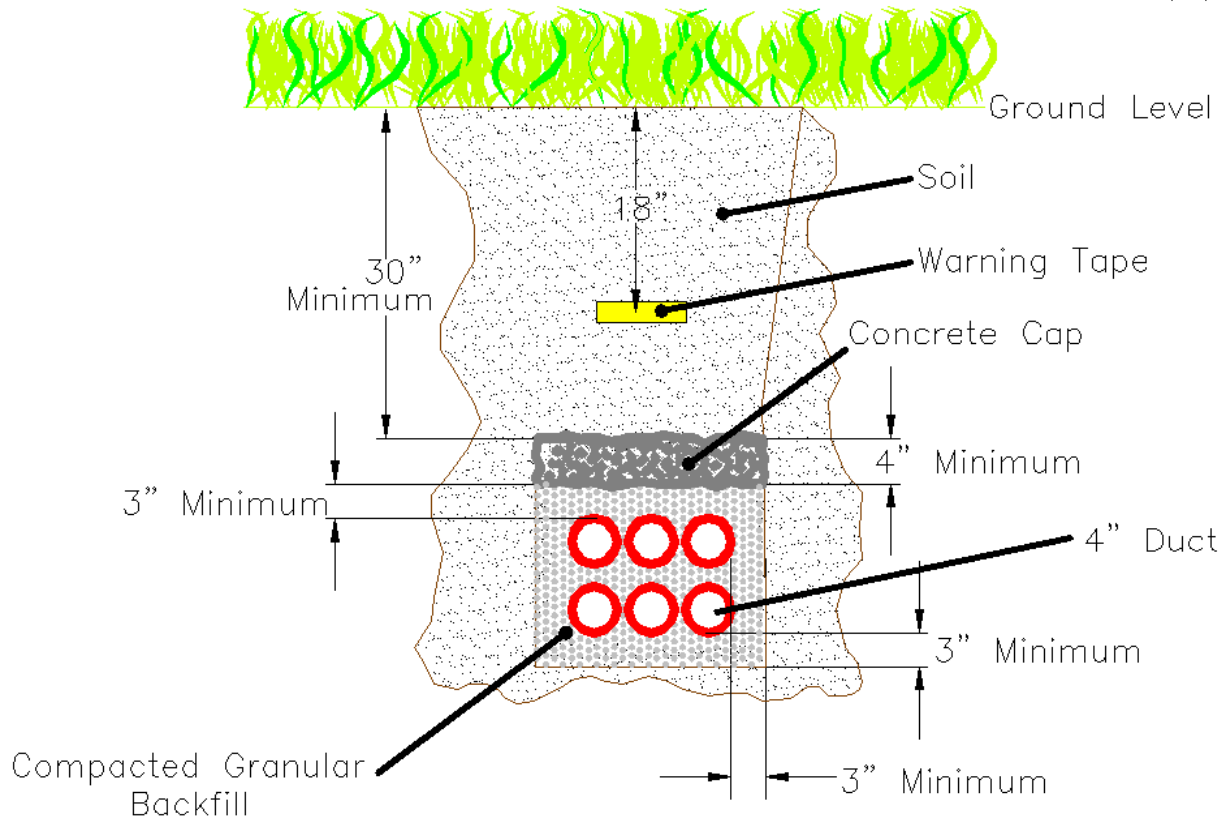
- 2.1. Trenched ducts shall be Schedule 40 PVC.
- 2.2. Directionally bored ducts shall be HDPE SDR 11, orange in color.
- 2.3. Both shall be 4" ID nominal trade size, unless specified otherwise.
- 2.4. NOTE: Innerduct is **no longer used** in outside plant communications ducts on Indiana University campuses.

3. Duct Installation

3.1. Trenched Ducts

- 3.1.1. Trenched ducts shall be installed with a minimum of 36" of cover (see following illustration), and according to manufacturer's instructions.
- 3.1.2. Ducts shall be separated and held in place with duct spacers at intervals of no more than 8 feet.
- 3.1.3. Corners and bends of duct runs shall be installed with minimum 48-inch radius sweeps, encased in concrete.
 - 3.1.3.1. Ducts must NOT be bent by heating with an open flame. Use factory sweeps, or bend conduit using devices such as Bendit which are designed to allow bending of PVC conduit without compromising the diameter and conduit material. Use bending devices in accordance with manufacturer's instructions.
- 3.1.4. Ducts shall be installed with a minimum of 4" of fall per 100' toward maintenance holes and away from buildings.
- 3.1.5. Ducts shall be surrounded by a minimum of 3" on all sides with flowable backfill
- 3.1.6. Ducts shall then be capped with a minimum 3" (4" preferred) concrete no less than the width of the backfilled trench.
- 3.1.7. Color top of concrete cap by using Orange chalk dust while still wet.
- 3.1.8. An orange magnetically detectable warning tape shall be installed above the top of the ductbank, 18" below ground level (see following illustration).
- 3.1.9. Ducts shall be sealed around their outer edges with hydraulic cement to prevent leakage into manholes.

- 3.1.10. Unused ducts shall be plugged at both ends using compression type fittings.
- 3.1.11. Seal maintenance hole penetrations using hydraulic cement.
- 3.1.12. See also 3.3.



3.2. Directionally bored ducts

- 3.2.1. Directionally bored ducts shall be installed with a minimum of 30" of cover, and according to manufacturer's instructions.
- 3.2.2. Corners and bends of duct runs shall be installed with minimum 48-inch radius sweeps.
- 3.2.3. Ducts shall be installed with a minimum of 4" of fall per 100' away from buildings.
- 3.2.4. HDPE ducts shall be installed in continuous runs from maintenance hole to maintenance hole, unless otherwise specified and approved by the appropriate UITs representative.
 - 3.2.4.1. If couplings are approved, couplings shall be of a type which provides air and water-tight integrity for internal pressures over 200 psi.
- 3.2.5. See also 3.3.

3.3. Both

- 3.3.1. Ducts shall be installed a minimum of 12" from electrical conduits for circuits of 5 kVa or less, a minimum of 24" for circuits greater than 5 kVa, and a minimum of 48" from transformers.
- 3.3.2. Duct shall be installed with as much separation from steam lines as is practical.
- 3.3.3. Where possible, ducts shall be terminated into precast cutout locations.
- 3.3.4. Duct shall NOT penetrate manholes in the collars, in the middle of side walls, at locations blocked by existing cables in the case of existing manholes, or in a location which blocks unused ducts.
- 3.3.5. Terminated duct penetrations into manholes, precast handholes, and building entrance wall penetrations

which do not land in a pull box must be terminated flush to the wall(s) using the type of bell end illustrated below.



3.3.6. Duct penetration locations should allow for easy racking of cables around manhole walls.

4. Building penetrations

4.1. Building entrance ducts which penetrate the floor must extend high enough up for installation of a bushing to protect the cable sheath from the edges of the conduits

4.1.1. Bushing finished top shall be no higher than 8 inches from the floor.

5. Installed Duct Preparation

5.1. Pull round wood or steel test mandrel of recommended size through each duct from both directions to remove obstructions and prove the duct is usable.

5.1.1. Sections of duct which are proven unusable must be replaced and new duct tested again.

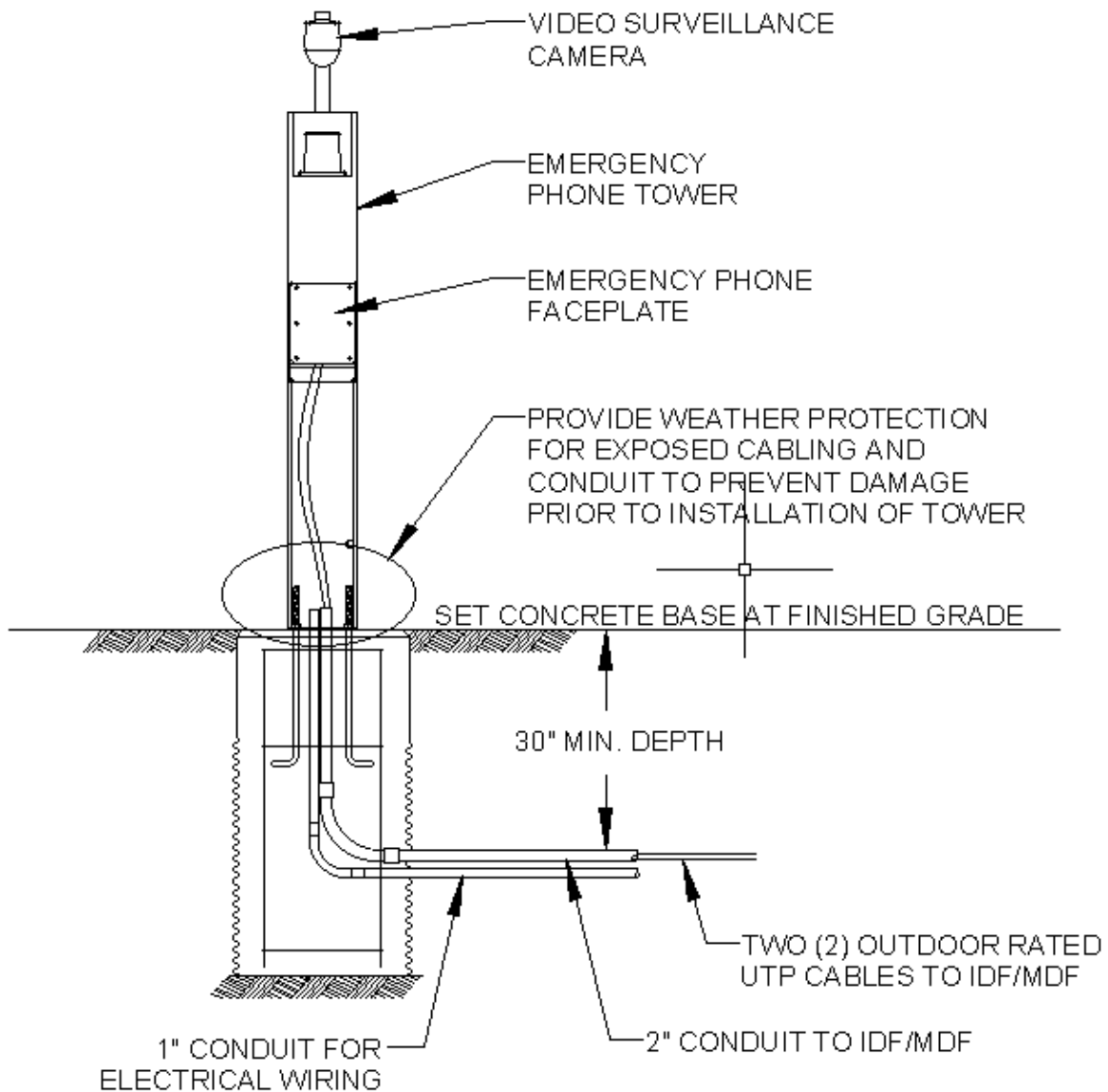
5.2. Pass a wire brush mandrel and/or a rubber duct swab of appropriate size through each duct until all foreign materials and water are removed.

5.3. Ducts shall be provided with Greenlee, Muletape, or equal continuous measuring tape in each duct.

5.4. Install a locate wire in one duct of each conduit run and terminate on collar of manholes for easy access.

5.5. Unused ducts shall be plugged using compression type fittings

6. Outdoor Emergency Phone Detail



NOTE: Current as of 10/2/2018. Log in to <https://app.e-builder.net> to retrieve latest version, under “zIUResources – BL”, “Standard Front End Docs”, “IU Standards”, “Electrical Standards”, “20XX – IU Electrical Design Standards.pdf”

Additional cable and/or electronic treatments may be necessary, depending on cable distance (copper data cables not to exceed 295 feet) or other situational requirements.

27.05.53 IDENTIFICATION

1. Comply with Section 27.15.43
2. Otherwise, identify system components according to TIA 606-B.

27.06.00 SCHEDULES for COMMUNICATIONS

See 27.04.50 GENERAL INSTALLATION

Firestop (non-hardening compounds only)

FIRE-STOP	3M MP+1.4"x11"
FIRE-GRMT2PC	Specified Technologies RFG2
FIRE-PILL941	Specified Technologies SSB14
FIRE-PILL942	Specified Technologies SSB24
FIRE-PILL962	Specified Technologies SSB26
FIRE-PILL963	Specified Technologies SSB36
Firestop, 36 ci tube	Specified Technologies SSP100

See 27.05.26 GROUNDING

Grounding Busbars Comply with J-STD-607-B

TMGB

4" X 16" Copper	Hubbell HBBB14416H	or equivalent
4" X 16" Tin Plated Copper	Hubbell HBBB14416HTP	or equivalent
4" X 20" Copper	Hubbell HBBB14420J	or equivalent
4" X 20" Tin Plated Copper	Hubbell HBBB14420JTP	or equivalent

TGB

2" X 10" Copper	Hubbell HBBB14210A	or equivalent
2" X 10" Tin Plated Copper	Hubbell HBBB14210ATP	or equivalent
2" X 24" Copper	Hubbell HBBB14224B	or equivalent
2" X 24" Tin Plated Copper	Hubbell HBBB14224BTP	or equivalent

Horizontal Cabinet or Equipment Rack Busbar – 19"

Grounding busbar kit, 19"	Panduit RGRB19_ (shown in drawings)
0.75"x19" x 0.25" Copper	Hubbell HBBBHR19KT or equivalent
0.75"x19" x 0.25" Tin Plated Copper	Hubbell HBBBHR19KTTP or equivalent

Vertical Cabinet or Equipment Rack Busbar – 36" to 72"

0.75" x 36"x0.25" Copper	Hubbell HBBBVR36KT or equivalent
0.75"x36"x0.25" Tin Plated Copper	Hubbell HBBBVR36KTTP or equivalent

Compression Lugs

0.250" holes X 0.625" spacing		
0 degrees	Hubbell HGBLXXD	or equivalent
45 degrees	Hubbell HGBLXXD45	or equivalent
90 degrees	Hubbell HGBLXXD90	or equivalent
0.250" holes x 0.750" spacing		
0 degrees	Hubbell HGBLXXDA	or equivalent
0.375" holes x 1.000" spacing		
0 degrees	Hubbell HGBLXXDB	or equivalent
90 degrees	Hubbell HGBLXXDB90	or equivalent

C Tap

Main Run 6-4 AWG - Tap 6 AWG	Hubbell HYC4C6	or equivalent
Main Run 6-4 AWG – Tap 4 AWG	Hubbell HYC4C4	or equivalent
Main Run 2 AWG – Tap 8-4 AWG	Hubbell HYC2C4	or equivalent
Main Run 2 AWG – Tap 2 AWG	Hubbell HYC2C2	or equivalent
Main Run 1/0-2/0 AWG–Tap 8-2 AWG	Hubbell HYC26C2	or equivalent
Main Run 1/0-2/0 AWG–Tap 1/0-2/0 AWG	Hubbell HYC26C26	or equivalent

H Tap

Main Run 4/0-2 AWG - Tap 2-8 AWG	Hubbell HYH292C	or equivalent
Main Run 2-8 AWG – Tap 2-8 AWG	Hubbell HYH2C2C	or equivalent
Main Run 6-10 AWG – Tap 6 AWG	Hubbell HYH6C6C	or equivalent

I-Beam Tap

I-Beam steel with a Standard Flange	Hubbell HYGIBS####	or equivalent
I-Beam steel with a Wide Flange	Hubbell HYGIBW####	or equivalent

Busbar Tap

Busbar thickness 0.25", Main Run 2 AWG - Tap 6 AWG		
	Hubbell HYG14B2TC2C6C	or equivalent
Busbar thickness 0.25", Main Run 2 AWG – Tap 2 AWG		
	Hubbell HYG14B2TC2C2C	or equivalent
Busbar thickness 0.25", Main Run 4/0 – 1/0 AWG		
	Hubbell HYGBT28	or equivalent

Ladder Rack Bonding Conductors

Stranded THHN, green	Hubbell HGRKTD12D	or equivalent
Stranded THHN, green	Hubbell HGRKTKA9KA5	or equivalent
Stranded THHN, green	Hubbell HGRKTKLU9KLU5	or equivalent
Braided Jumper	Hubbell HGBBD12	or equivalent

Basket Tray Conductors

Hubbell HGBKS17	or equivalent
Hubbell HGRKTWC45	or equivalent
Hubbell HGRKTWB5	or equivalent

Wrist Strap ESD Port

Hubbell HGBESDKT10	or equivalent
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Raised Floor Grounding Clamp

Grid or Parallel	Hubbell HGBGXP1828RF	or equivalent
Parallel	Hubbell HGBGP1526G1	or equivalent
Parallel	Hubbell HGBGRF4C3	or equivalent
Stringer 0.75"-1.5" Round or Square	Hubbell HGBGXP1828RF	or equivalent
Stringer 1.0"-1.25" Round	Hubbell HGBGP1526G1	or equivalent
Stringer 0.75"-1.0" Round or Square	Hubbell HGBGRF4C3	or equivalent
Wire Range 6 – 4/0 AWG	Hubbell HGBGXP1828RF	or equivalent
Wire Range 4 – 2/0 AWG	Hubbell HGBGP1526G1	or equivalent
Wire Range 8 – 2 AWG	Hubbell HGBGRF4C3	or equivalent

See 27.05.29 HANGERS

Horizontal Cable Hangers	Panduit J-Pro Series (preferred)
Horizontal Cable Hangers	Panduit J-Mod series
Horizontal Cable Hangers	Erico Caddy CAT J-Hook: Cat32
Horizontal Cable Hangers	Erico Caddy CableCat Wide Base Cable Support Clips

See 27.05.33 CONDUITS and BACKBOXES

Refer to following section on Information Outlets, referencing “*See 27.15.43*”

See 27.05.36 CABLE TRAY

Cable Tray through building (Not in IDF)	Comply with NEMA VE 2 and TIA-569 cable tray or cable basket 12” or larger as required by manufacturer’s specifications
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See 27.05.43 UNDERGROUND DUCTS and RACEWAYS

Manholes	12x6x7 A-hole or J-hole type with sump hole with manufacturer’s racking hardware, pulling irons, and manufacturer’s iron ladder
Manhole Ducts	4” nominal trade size Schedule 40 PVC.
Handholes	4x4x4 precast concrete with sump hole
Handhole ducts	Schedule 40 PVC, or ducts suitable for directional boring
Duct fittings (either)	Bell type fittings
Duct plugs (either)	Compression type fittings

See 27.11.13 ENTRANCE PROTECTION

Solid-state 4-pair protector unit for Outdoor Devices:

For POE circuits (power over Ethernet) minimum 48V (*cameras, WAPs, for instance*)
For Analog circuits minimum 96V (*dial tone circuits*)

For both OSP Entrance Cables and Outdoor Devices:

Circa Building Entrance Terminal 110 Connector Series, by pair count
Circa Gas Tube Module Circa 3B1E

See 27.11.16 EQUIPMENT RACKS

7'x19" Equipment Rack Panduit CMR19x84
Wire Management Horizontal Panduit WMPH2E
Wire Management Intermediate 12" Panduit Patchrunner PR2VD12
Wire Management End Panel Panduit PREPB1
Tie bracket

Equipment Cabinet (for small buildings) Cooper B-Line VLWM2425PB
(use must be pre-approved) Plexiglas door, Black

See 27.11.19 TERMINATIONS

Copper backbone Termination Block Panduit Pan-Punch 110 Category 5e system
Horizontal Copper Cabling Patch Panel
MDF/IDF Panduit CPPLA24WBLY
Equipment Cabinet (small bldgs.) Panduit CPPL24M6BLY
Voice Patch Panel Panduit VP24382TV25Y with RJ21 connector

Patch Panel Jack Modules:

For 6A station wire Panduit CJ6X88TGVL TX6 PLUS, Violet, Cat 6A

Corning Fiber Terminations for Outside Plant Terminations Only

Corning Connector Housing: 2 Rack Unit Housing - CCH-02U
4 Rack Unit Housing - CCH-04U

Corning Coupler Panels: 12 port LC APC Panel - CCH-CP12-B3
24 port LC APC Panel - CCH-CP24-B3

Corning CCH Splice Cassettes: 12 strand LC APC Cassette – CCH-CS12-B3-P00RE
 24 strand LC APC Cassette – CCH-CS24-B3-P00RE

Sumitomo Fiber Terminations (for Sumitomo cables only):

1U Termination Unit (requires prior UITS approval)	Sumitomo FT01RU3P Rack Mount Panel
2U Termination Unit (requires prior UITS approval)	Sumitomo FT02RU4P Rack Mount Panel
4U Termination Unit (standard / preferred)	Sumitomo FT04RU12P Rack Mount Panel
PrecisionFlex OM4 LC 12F cassette universal	FTLC-MP12COM4-L-U
PrecisionFlex SM LC/APC 12F cassette universal	LGX FTLC-MP12COS2-LA-U
Splice Tray, 12 Mass/24 Single	ST-01

See 27.11.23 CABLE MANAGEMENT and LADDER RACK

Ladder Rack (in IDF)	Chatsworth 10250-712* (12” or wider, as required) for up to 180 Cat 6A cables** Chatsworth 10250-718* (18” or wider, as required) for up to 270 Cat 6A cables** * associated parts, as required ** based on the Chatsworth “Estimated Cable Fill Capacities” chart, under “Recommended Fill” for Cat 6A wiring since IU does not use the “cable retaining posts” on new installs. Refer to chart for other sizes of Chatsworth “Universal Cable Runway”.
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See 27.13.13 BACKBONE COPPER (Riser)

Category 3 Copper Backbone Cable	OFS Type CMP, #24 AWG, twisted pair, solid copper Category 3, suitable for placement in a plenum
Category 3 Copper Backbone Cable	Belden Corporation equivalent
Category 3 Copper Backbone Cable	General Cable, Guardian Products, equivalent
Category 3 Copper Backbone Cable	Mohawk Wire and Cable Corporation equivalent
Category 3 Copper Backbone Cable	Commscope, General Instrument, equivalent
Riser Cable to Patch Panel Tie Cable	Type CMP 25-pair amphenol style cable, #24 AWG twisted pair, solid copper Category 3

See 27.13.23 BACKBONE FIBER

Sumitomo 12 fiber 50 micron Multimode OM4 Plenum Riser Cables, MPO/MPO

CB-4012IUUXYY020M-P1R	Cable, pulling eye one end only, 20 <u>meters</u>
CB-4012IUUXYY030M-P1R	Cable, pulling eye one end only, 30 <u>meters</u>
CB-4012IUUXYY040M-P1R	Cable, pulling eye one end only, 40 <u>meters</u>
CB-4012IUUXYY050M-P1R	Cable, pulling eye one end only, 50 <u>meters</u>
CB-4012IUUXYY060M-P1R	Cable, pulling eye one end only, 60 <u>meters</u>
CB-4012IUUXYY070M-P1R	Cable, pulling eye one end only, 70 <u>meters</u>
CB-4012IUUXYY080M-P1R	Cable, pulling eye one end only, 80 <u>meters</u>
CB-4012IUUXYY090M-P1R	Cable, pulling eye one end only, 90 <u>meters</u>
CB-4012IUUXYY100M-P1R	Cable, pulling eye one end only, 100 <u>meters</u>
CB-4012IUUXYY110M-P1R	Cable, pulling eye one end only, 110 <u>meters</u>
CB-4012IUUXYY120M-P1R	Cable, pulling eye one end only, 120 <u>meters</u>
CB-4012IUUXYY150M-P1R	Cable, pulling eye one end only, 150 <u>meters</u>
CB-4012IUUXYY160M-P1R	Cable, pulling eye one end only, 160 <u>meters</u>
CB-4012IUUXYY275M-XXA	Cable, pulling eye one end only, 275 <u>meters</u>

Sumitomo 12 fiber Singlemode Plenum Riser Cables, MPO/MPO

CB-9012IUUXYY020M-P1R	Cable, pulling eye one end only, 20 <u>meters</u>
CB-9012IUUXYY030M-P1R	Cable, pulling eye one end only, 30 <u>meters</u>
CB-9012IUUXYY040M-P1R	Cable, pulling eye one end only, 40 <u>meters</u>
CB-9012IUUXYY050M-P1R	Cable, pulling eye one end only, 50 <u>meters</u>
CB-9012IUUXYY060M-P1R	Cable, pulling eye one end only, 60 <u>meters</u>
CB-9012IUUXYY070M-P1R	Cable, pulling eye one end only, 70 <u>meters</u>
CB-9012IUUXYY080M-P1R	Cable, pulling eye one end only, 80 <u>meters</u>
CB-9012IUUXYY090M-P1R	Cable, pulling eye one end only, 90 <u>meters</u>
CB-9012IUUXYY100M-P1R	Cable, pulling eye one end only, 100 <u>meters</u>
CB-9012IUUXYY110M-P1R	Cable, pulling eye one end only, 110 <u>meters</u>
CB-9012IUUXYY120M-P1R	Cable, pulling eye one end only, 120 <u>meters</u>
CB-9012IUUXYY150M-P1R	Cable, pulling eye one end only, 150 <u>meters</u>
CB-9012IUUXYY160M-P1R	Cable, pulling eye one end only, 160 <u>meters</u>
CB-9012IUUXYY275M-XXA	Cable, pulling eye one end only, 275 <u>meters</u>

See 27.13.33 BACKBONE COAX

CATV Coaxial Backbone Cable	CommScope Video Series CATVP RG11, Plenum Rated or Belden or General Cable equivalent
CATV Coaxial Backbone Cable	CommScope 2287K, RG11, Plenum Rated or Belden or General Cable equivalent
CATV Amplifier	ACI Communications, Inc. MFTJ1/42PC419-1 with North American cord set
CATV Coupler	Tru-Spec

CATV Coupler	TVC
CATV Coupler	Scientific Atlanta
Directional Tap, 4 port	Blonder Tongue SRT-4A, 5-1000 Mhz
Directional Tap, 8 port	Blonder Tongue SRT-8A, 5-1000 Mhz
3-way Splitter	Blonder Tongue SXRS-3, 5-1000 Mhz

See 27.15.13 HORIZONTAL COPPER CABLING

Horizontal Station Cable, 6A Plenum	Superior Essex 10 Gain XP 6A Plenum P/N 6H-272-7B Purple, .275 inches, bend radius 1.20 inches
Horizontal Station Cable, 6A Plenum	General Genspeed 10UTP6A Plenum P/N 7141825, Purple, .250 inches, bend radius 1.00 inches
Horizontal Station Cable, 6A Plenum	Bertek LANmark-XTP 6A Plenum P/N 11085661 Violet, .275 inches, bend radius 1.12 inches
Horizontal Station Cable, 6A Plenum	Belden 10GXS13 6A Plenum P/N 0071000 Violet, .265 inches, bend radius 1.10 inches
Horizontal Station Cable, 6A Plenum	Panduit PUP6AM04VL-UG 6A Plenum Violet, .275 inches, bend radius 1.10 inches

For Outside Emergency Phones, and Conduits in Slab-On-Grade:

Horizontal Station Cable, 6A filled	Superior Essex 04-001-A5 OSP BBDG
Horizontal Station Cable, 6A filled	Superior Essex 04-001-A4 OSP BBDN

See 27.15.33 HORIZONTAL COAXIAL CABLING

RG-6 Coaxial Cable, Plenum	RG-6 Quad-shield Plenum, or Belden or General Instrument equivalent
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See 27.15.43 INFORMATION OUTLET

Standard Information Outlet, Single Gang face

Double Gang Electrical Box	4"x4" minimum x 2-1/8" deep double gang box
Mud Ring	4" square Double Gang to Single Gang mud ring
Faceplate	Panduit CFPE4IWY Executive Series, 4-port, off-white faceplate
Jack module: Cat <u>6A</u>	Panduit CJ6X88TGVL TX6 PLUS, Violet
Blank module	Panduit CMBIW-X Mini-Com blank module insert, off-white

Standard Information Outlet, Double Gang face

Double Gang Electrical Box	4"x4" minimum x 2-1/8" deep double gang box
Mud Ring	4" square Double Gang mud ring

Faceplate	Panduit CFPE10IW-2GY Executive Series, 4-port, off-white
Jack module: Cat 6A	Panduit CJ6X88TGVL TX6 PLUS, Violet
Blank module	Panduit CMBIW-X Mini-Com blank module insert, off-white

Wall Phone Outlet

Single Gang Electrical Box	4"x4" minimum x 2-1/8" deep double gang box
Mud Ring	4" square Double Gang to Single Gang mud ring
Wall Plate	Panduit KWP6PY stainless steel plate with Category 6 Keystone module (see also below for Security Phone Wall Plate)

Wireless Access Point Outlet (WAP) – Ceiling Mount

Tile Ceiling Mount	Oberon Model 1068-00
Aruba 315 Hard Ceiling Mount.....	Aruba AP-310-MNT-W3
Aruba 335/345 Hard Ceiling Mount...	Aruba AP-220-MNT-W3
Jack module: Cat 6A	Panduit CJ6X88TGVL TX6 PLUS, Violet

Wireless Access Point Outlet (WAP) – Wall Mount

Double Gang Electrical Box	4"x4" minimum x 2-1/8" deep double gang box
Mud Ring	4" square Double Gang mud ring
Faceplate	Panduit CFPL2IW-LY Executive Series, 2-port,
Jack module: Cat 6A	Panduit CJ6X88TGVL TX6 PLUS, Violet

Biscuit Jack

Interior Wall Security Phone

Wall Phone Plate	Hubbell P630S
Wall Phone Set	Cortelco Trendline 815047-VOE-21F
Top of mounted set must be below 48" aff; therefore the installed top of the Wall Phone Plate should not be higher than 45" aff.	

27.08.00 COMMISSIONING

Intentionally blank

27.10.00 STRUCTURED CABLING

27.11.00 EQUIPMENT ROOM FITTINGS

27.11.03 WALLS

1. All walls shall be covered with 4' x 8' x 3/4" plywood, mounted 0'-6" above the finished floor with the 8'-0" dimension vertical.

1.1. Backboards shall either be painted with two (2) coats of fire retardant paint on all sides, or fire-retardant treated and painted.

1.2. Backboard paint color shall be a light gray / off-white.

27.11.13 ENTRANCE PROTECTION

1. Entrance cable protection shall be provided by the installer of outside plant cables in accordance with all applicable codes and standards.

1.1 On the IUB and IUPUI campuses, UITS provides outside plant cables and terminations to the building IDF-1 (MDF).

1.1.1. Any station cable which leaves the envelope of the building must be OutSide Plant rated and be electrically protected.

1.2 On the regional campuses, outside plant facilities must be included in the project; the work must be performed by a qualified telecommunications contractor.

27.11.16 CABINETS, RACKS, FRAMES and ENCLOSURES

1. Equipment Racks

1.1. The equipment rack shall be installed in the Telecommunication Equipment Rooms (IDFs) according to layout and communication media requirements

1.2. Telecommunication Equipment Room (IDF) layouts shall be coordinated with the appropriate University Information Technology Services representative

1.3 The rack shall be anchored to the floor and braced overhead with ladder racking and grounded to the ground busbar location in the IDF with a #6 solid or stranded ground wire.



2. Wire management

- 2.1. **Vertical:** Open ends of racks shall have 12” vertical wire management with hinged doors on the front.
- 2.2. Between each of multiple racks use 12” a vertical wire manager with a hinged door on the front.
- 2.3. **Horizontal:** On the top and bottom of each rack, install one horizontal wire manager with covers.

27.11.19 TERMINATION BLOCKS and PATCH PANELS

1. Copper Equipment

1.1. Unshielded Twisted Pair Riser

- 1.1.1 Amphenol style cables shall be terminated on 110 type blocks with 110A wiring blocks.
- 1.1.2. Terminal blocks shall be located so as to be easily cross-connected to feeder pair and the voice cable stations and plugged into the analog voice patch panel.

1.2. Horizontal Cabling Patch Panels

- 1.2.1. Use Panduit modular 6 port face plate angled patch panels filled with yellow TX-6+ modules
- 1.2.2. Use a Panduit voice patch panel installed in the rack for analog voice with a 50 pin, 25 pair female amphenol connector
- 1.2.3. All patch panels, termination panels, and cable managers should be installed so that their fronts, and the front of the networking equipment later provided by owner, shall be visible from the telecommunications

room open doorway.

2. Fiber Equipment

2.1. Use cable clamps, breakout kits, mounting bracket(s) and other miscellaneous hardware as necessary to complete a proper installation.

2.2. Breakout kits will be required to terminate all loose tube 250 micron fibers (outdoor rated cables).

2.2.1. NOT needed for 900 micron fiber.

3. Coaxial Equipment

3.1. Amplifiers, couplers, directional taps, splitters, and associated parts shall not be mounted in telecommunication rooms. Coaxial equipment shall be mounted on wall mounted plywood as noted on the prints and in following illustration.

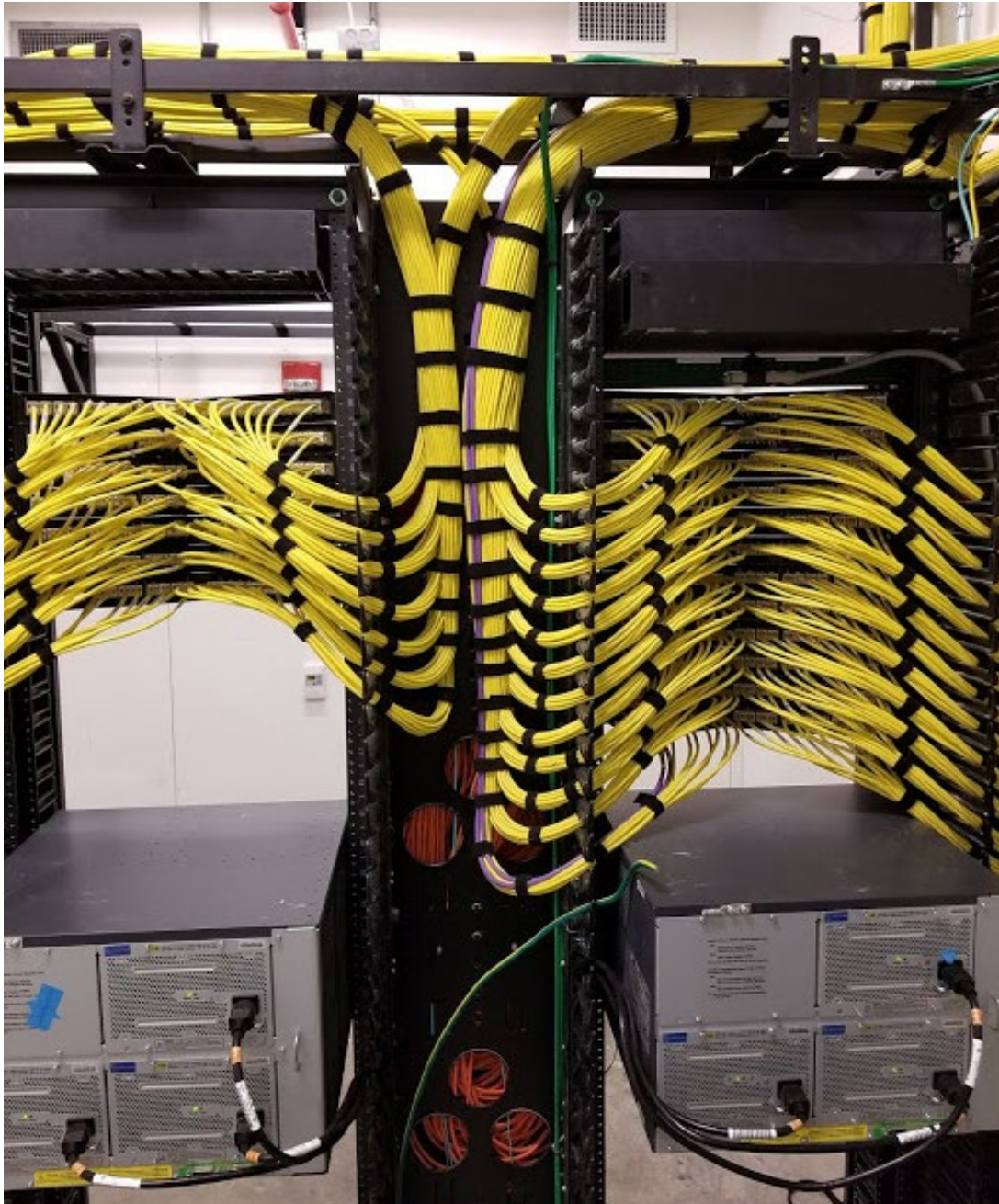


27.11.23 CABLE MANAGEMENT and LADDER RACK

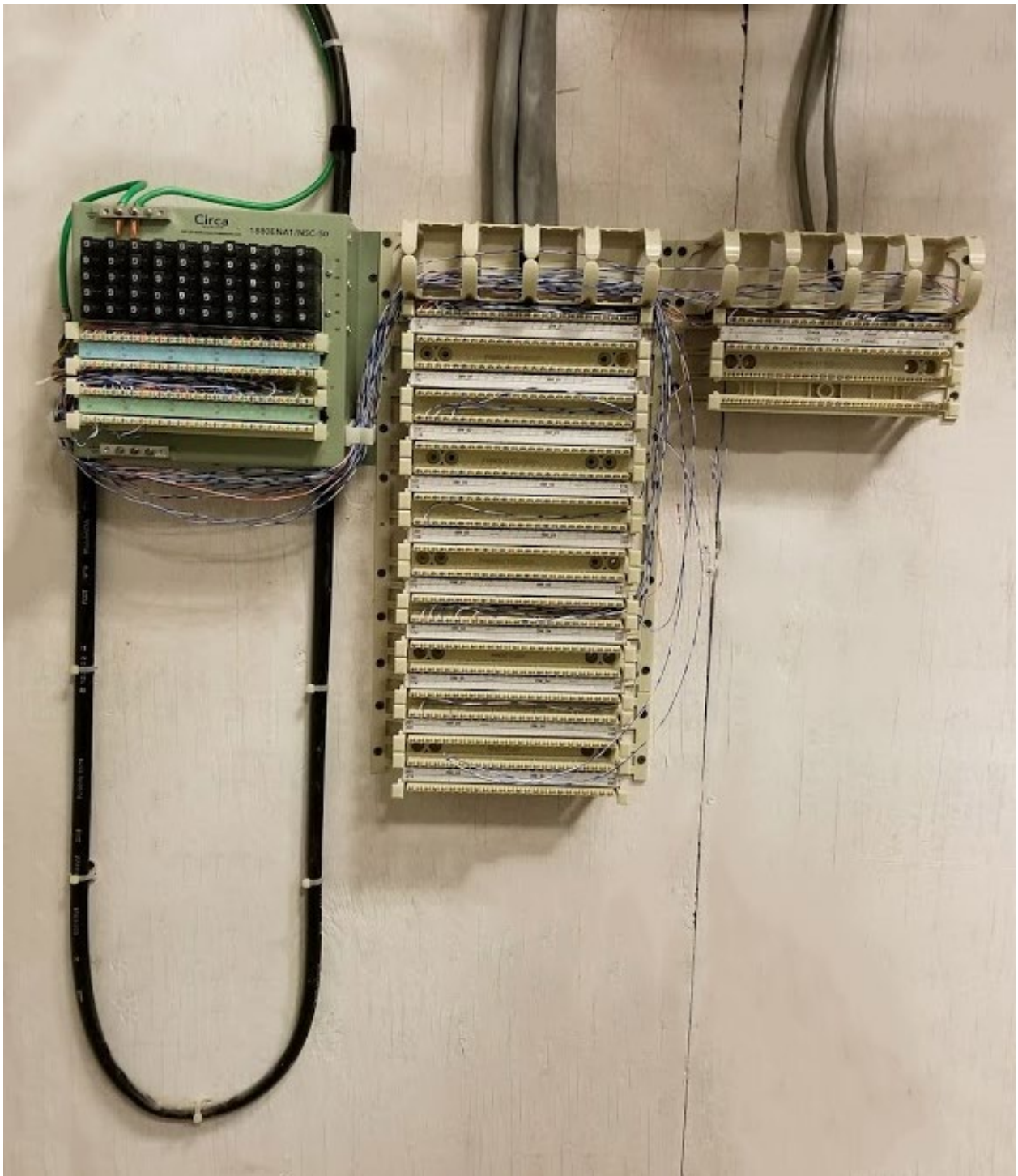
1. A minimum 18" ladder rack shall be installed from the top of and perpendicular to the equipment rack(s) to 4' x 8' wall mounted plywood board, as needed to stabilize equipment racks, and according to room layout and field conditions. See also illustrations.
2. Bond all ladder rack segments and connect to telecom grounding bar with minimum #6 ground wire.
3. Transition station cables and bundles from room entrances to ladder rack with large radius bends (following illustration).
4. Preserve bundles as defined by conduit and cable tray entrances into the IDF room; do **not** combine station cable bundles as defined by entrances into IDF room into larger bundles. If exceptionally large bundles enter the IDF room by cable tray, divide into manageably sized bundles.
5. Use vertical ladder rack for distances greater than three (3) feet from conduit or cable tray to IDF ladder rack.
6. Neatly bundle station cables and secure bundles with Velcro tie wraps (following illustration).



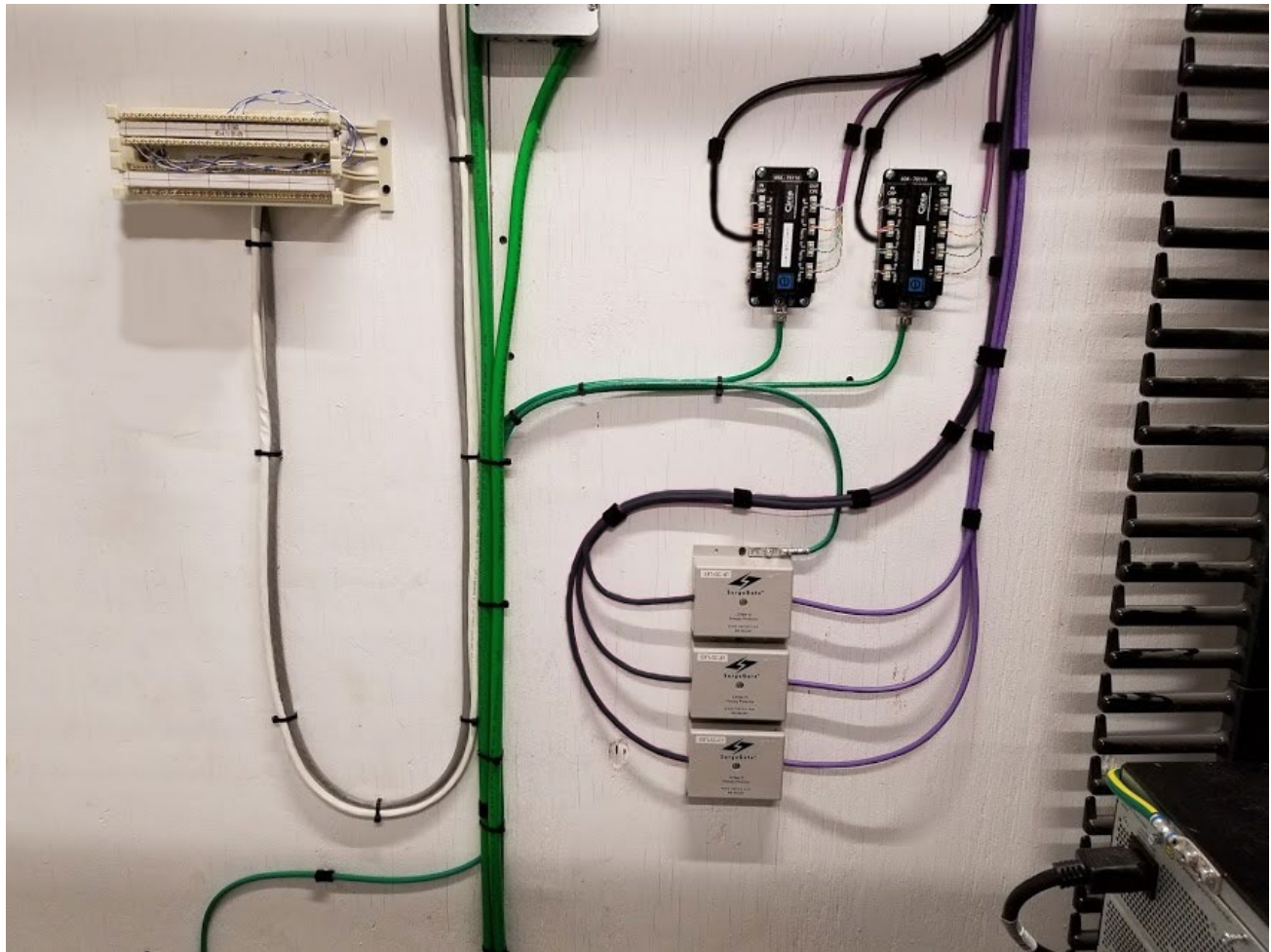
7. Transition station cables and bundles from ladder rack to wire managers with large radius bends (following illustration).
8. Keep station cables and bundles to the side from which they transition. (following illustration) Eg, do not block wire manager by arcing cables from one side to the other. Maintain proper bend radius.
9. Preserve cable bundles; do **not** combine bundles.
10. Neatly bundle station cables and secure bundles with Velcro tie wraps (following illustration).

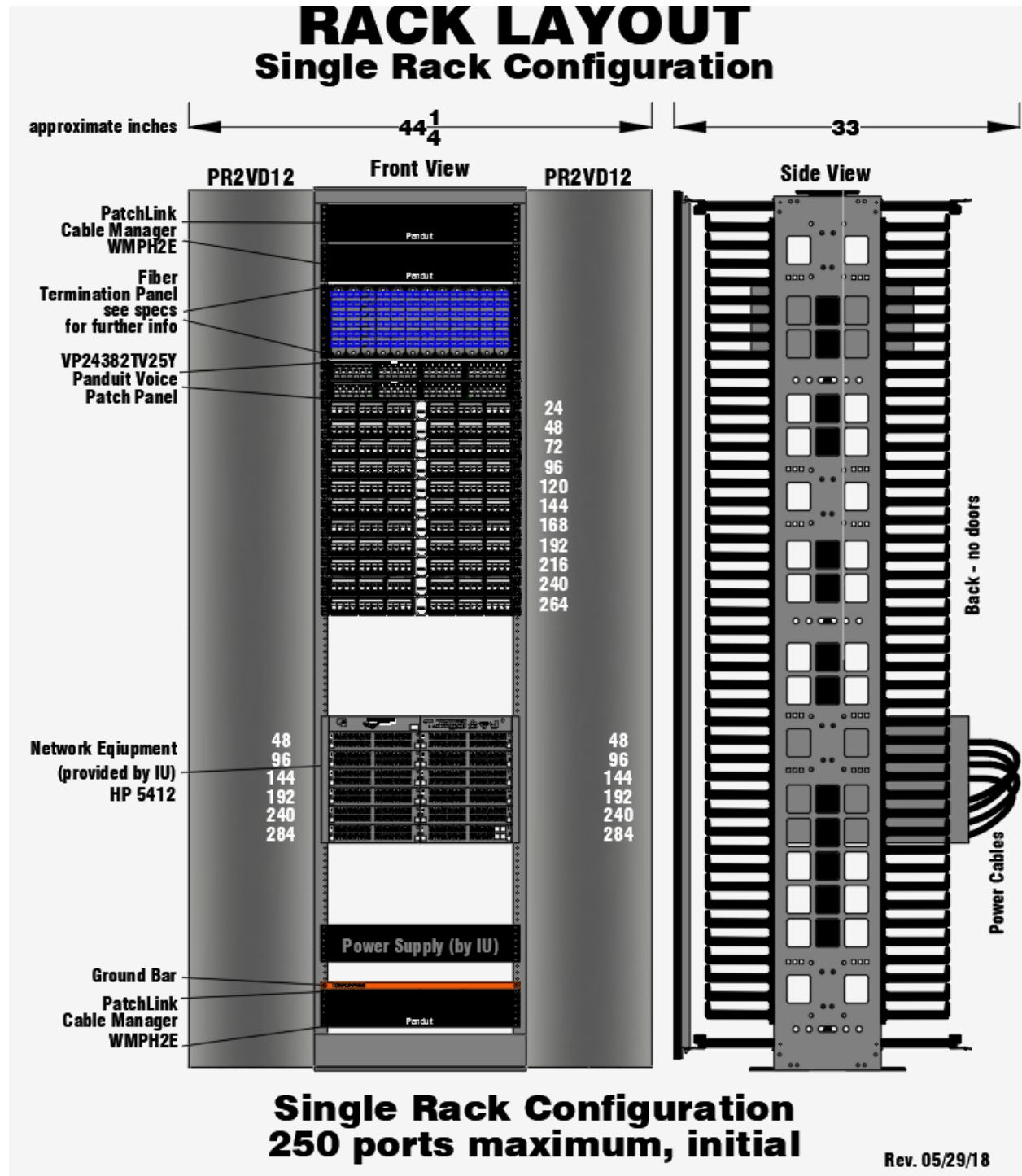


11. Mount top of protector block(s) and riser block jumper rings at 5 feet (60 inches). (following illustration)
12. Riser blocks and protector block must be mounted adjacent to one another.



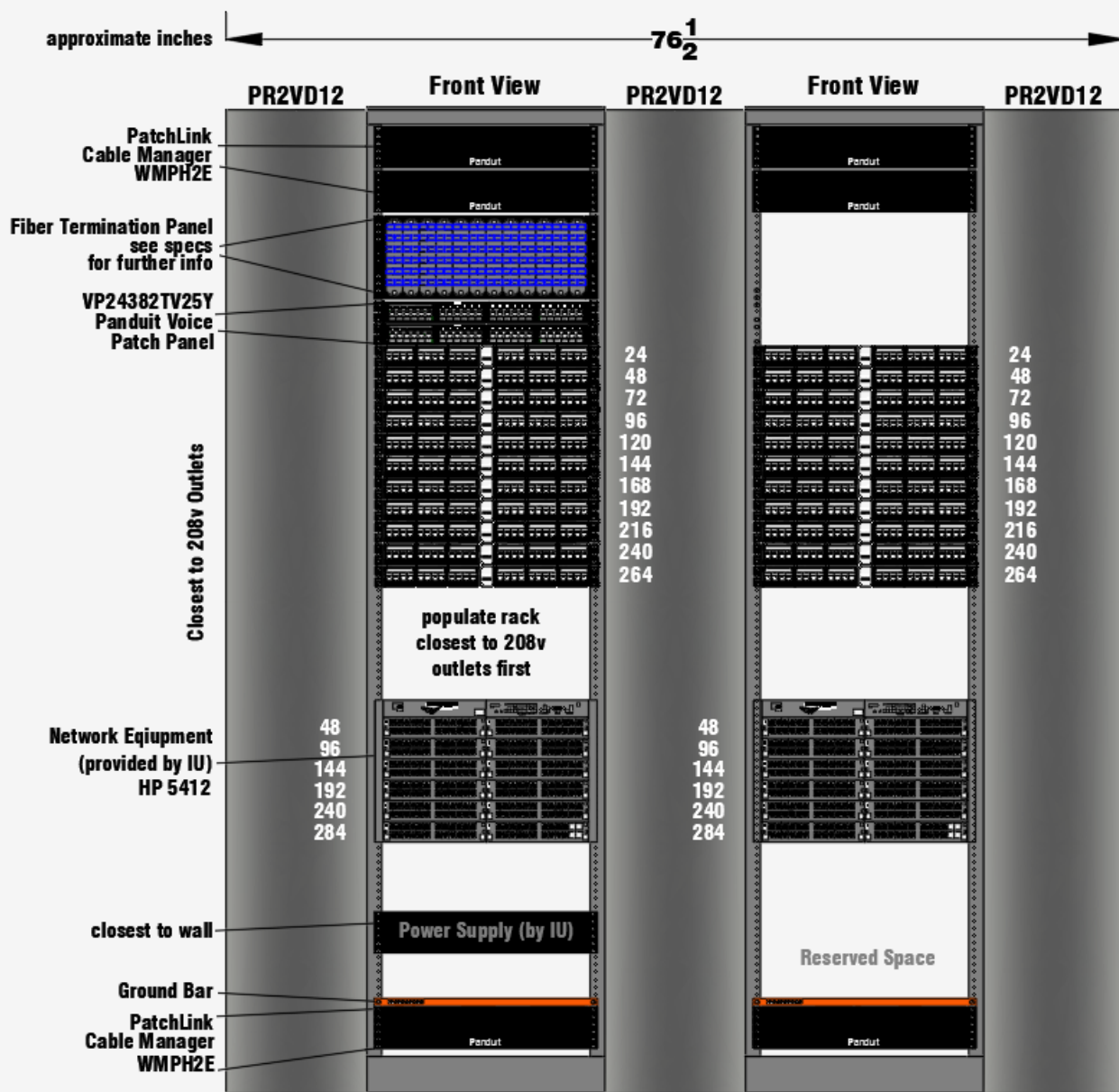
13. Mount 110 block for connections between riser cable and voice patch panel. (Left side of following illustration.) In MDF, this block should be physically separated from riser cable blocks next to outside plant protector block(s).
14. Mount 4-pair protector units for individual outdoor station cables in a configuration similar to below. Provide proper grounding from telecom grounding bus bar to each protector unit according to manufacturer's instructions.
15. Use only shielded station cable from outside mounted security phones and security cameras to the individual 4-pair protector unit(s) in accordance with NEC grounding practices for outside telecom cables entering a building envelope. Connect shields to the 4-pair protector unit grounding device according to manufacturer's instructions.
16. In all cases, housekeeping counts. Use tie wraps and Velcro straps as necessary to provide neat, traceable and maintainable wire and cable paths.





RACK LAYOUT

Dual Rack Configuration

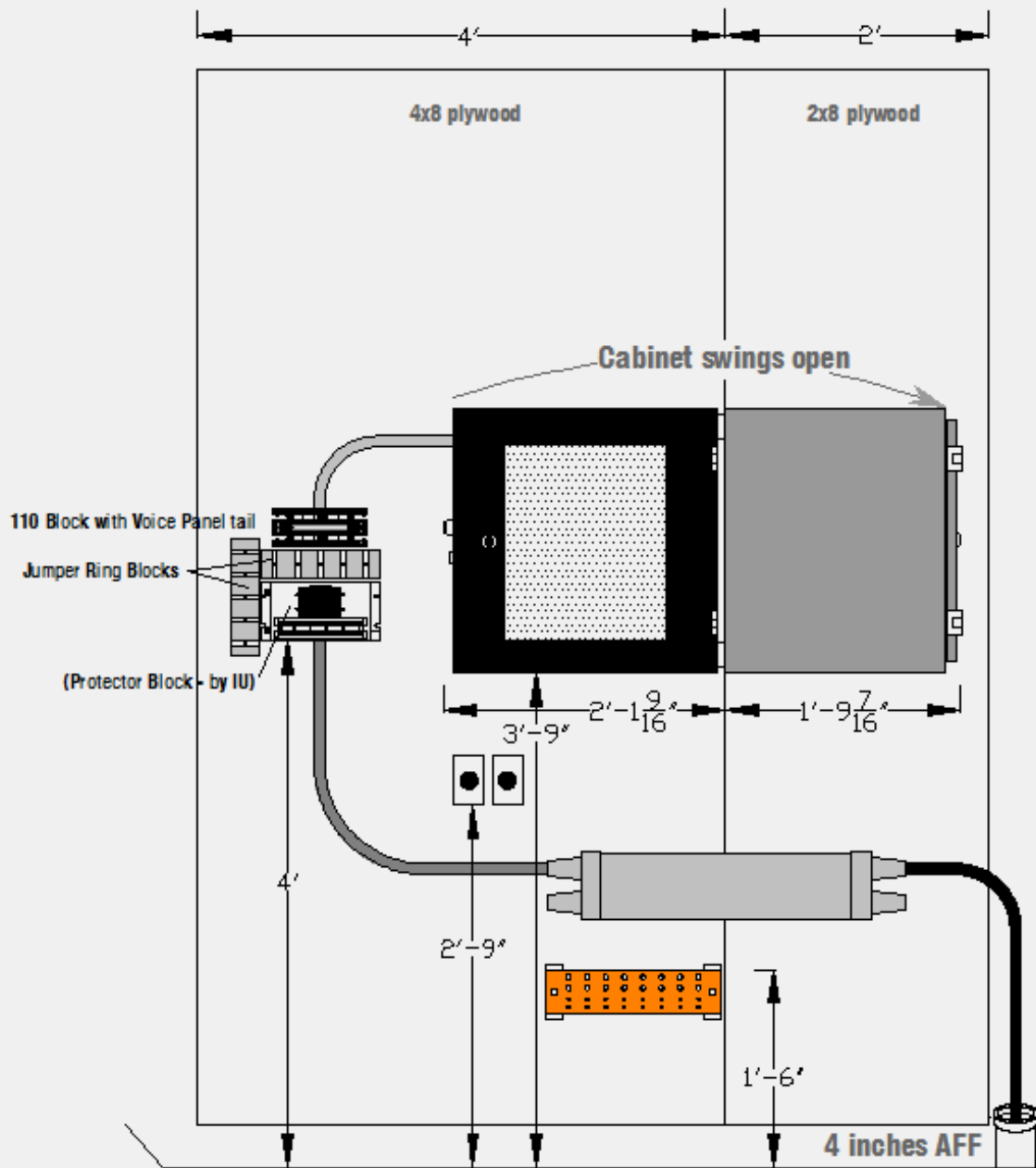


Dual Rack Configuration

500 ports maximum, initial

Rev. 05/29/18

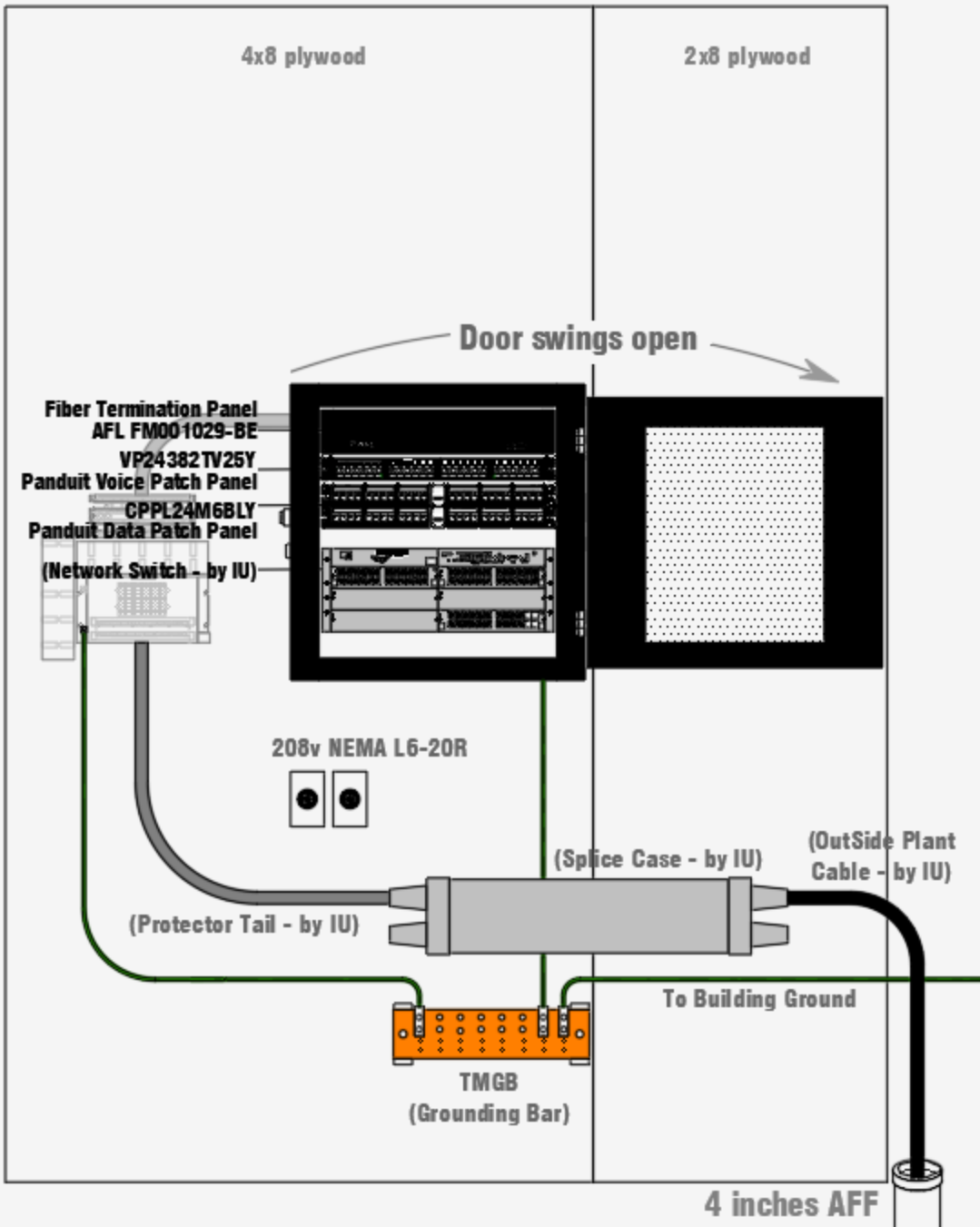
CABINET LAYOUT for small buildings



48 ports maximum, initial

11/20/2015

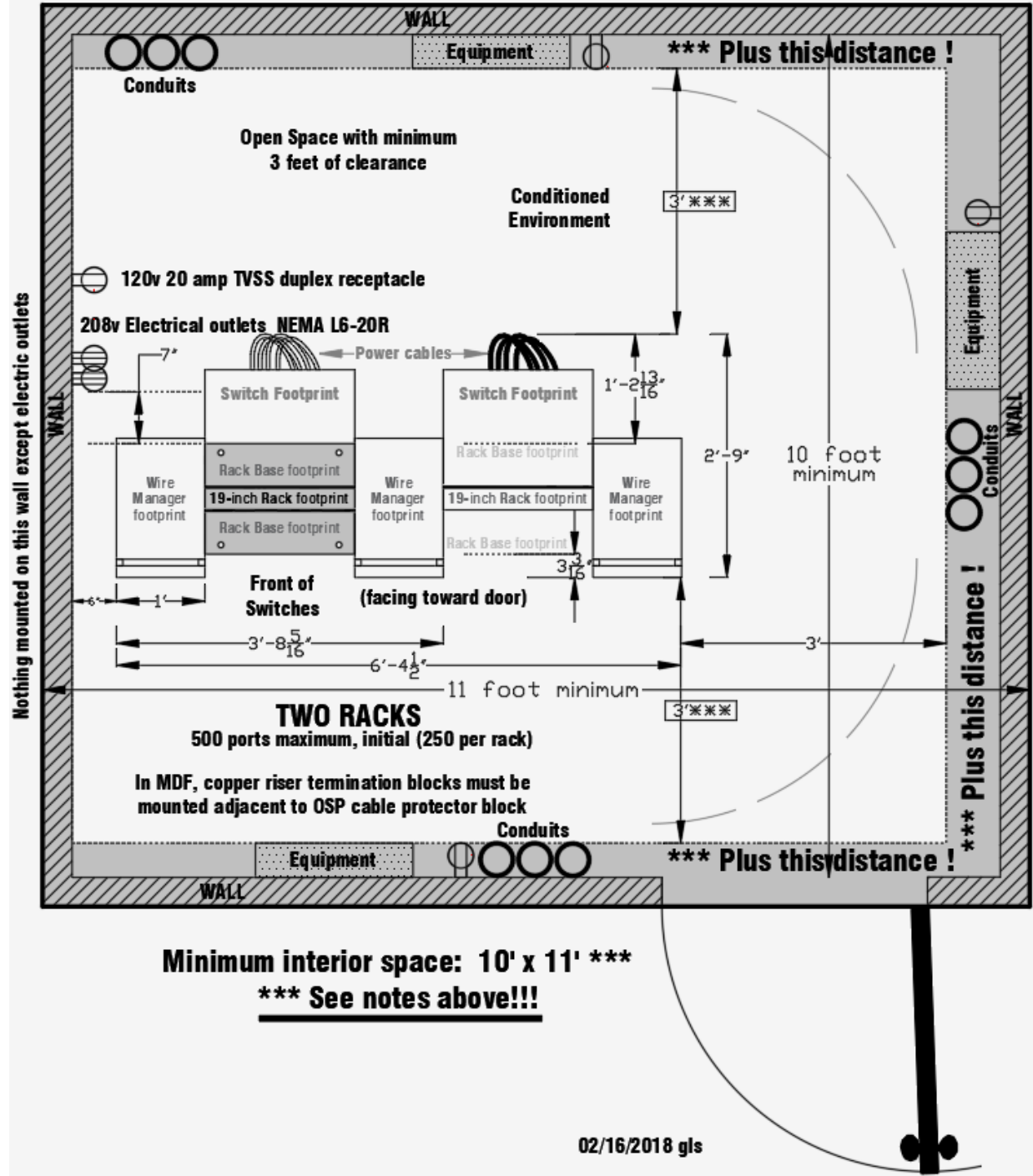
CABINET LAYOUT for small buildings



48 ports maximum, initial

02/04/2019

IDF ROOM - ELECTRICAL LAYOUT typical

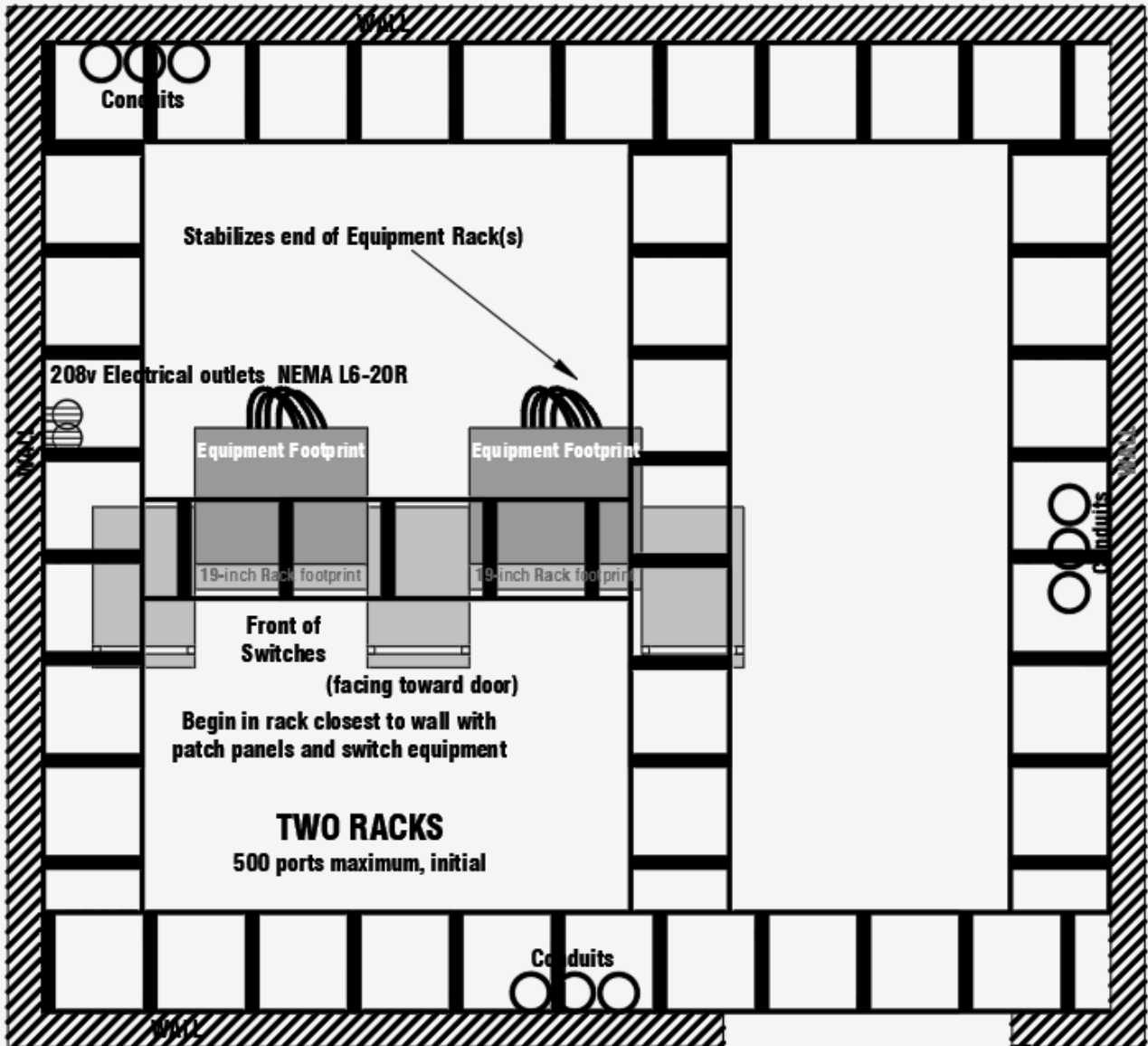


IDF ROOM - LADDER RACK LAYOUT

Chatsworth Universal Cable Runway

Chatsworth 10250-7xx **

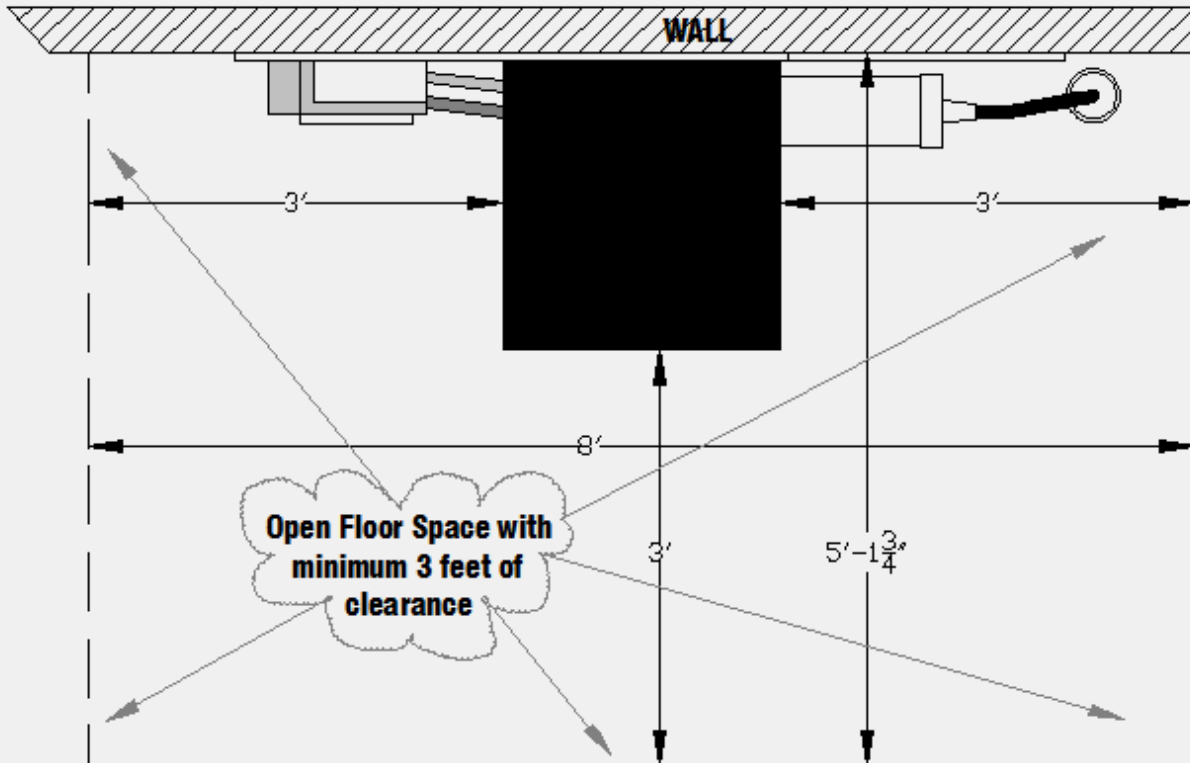
** where xx = 12, 15, 18, 24, etc.



DESIGN NOTE: Section of ladder rack must be sized according to maximum cables. For example, if each 12" wide section above will be full, then trays from outside the room coming in will need to be a minimum total 36" of tray width.

02/16/2018 gls

CABINET LAYOUT for small buildings



48 ports maximum, initial

11/20/2015

27.12.00 TRANSMISSION MEDIA

1. General: Provide telecommunication transmission media of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for applications indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20°C (68°F).
2. Cable Labeling: The National Electrical Code (NEC) requirements dictate that telecommunication cables used within a building are classified as to their use and smoke and flame requirements. Underwriters Laboratories (UL) provides certification that a cable meets the NEC requirements.
3. All cables shall be clearly marked with the proper NEC classification as follows:

RISER CABLES	
<u>CABLE TYPE</u>	<u>NEC CLASSIFICATION CODES</u>
Fiber Optic	OFNP, OFNR
Copper UTP	CMR & CMP, Category 3
Coaxial	CL2R & CL2P, CATVR & CATVP

HORIZONTAL CABLES	
<u>CABLE TYPE</u>	<u>NEC CLASSIFICATION CODES</u>
Fiber Optic	OFN, OFNR & OFNP
Copper UTP	CMG, CMR & CMP, Category 6A
Coaxial	CL2, CL2R & CL2P

27.13.00 BACKBONE CABLING

27.13.13 COPPER BACKBONE CABLING

1. Terminating blocks mounted to the wall.
2. Copper backbone cables shall be extended to the equipment rack with 25 pair male amphenol style cables, terminated at the wall on 110 blocks on one end, with the amphenol end plugged into the analog voice patch panels.
3. Cable pairs and 25-pair binder groups shall be cut down in standard color code order.
4. UTP riser cable will have cable ID and pair count clearly marked on building equipment room and punch down blocks.
 - 4.1. Copper backbone cabling will be labeled in both the building telecommunications equipment room and the floor telecommunications equipment rooms.
 - 4.2. Cable ID's will be building number + an underscore + an incremental two digit cable number.
 - 4.2.1. For example, the cable to IDF-2 would be 023_01, while the cable to IDF-3 would be 023_02.
 - 4.3. Counts shall start from the lowest IDF number and increment with IDF numbers.
 - 4.3.1. For example, the cable to IDF-2 would count 023_01, 1-50, while the cable to IDF-3 would count 023_02, 51-100.
 - 4.4. All labeling must be approved by the appropriate IU UITS personnel.

27.13.13.23 Testing of Copper Backbone Cabling

1. Perform visual inspection to ensure that all cables are terminated on the punch down block in proper color

code order.

2. Test all pairs for continuity and tip and ring polarity.
3. Test results shall meet or exceed the appropriate tests requirements as specified in the ANSI/TIA-568 specifications.
4. Bad pairs shall be limited to a maximum of 1% of the total number of pairs, and with a maximum of two (2) bad pairs per binder group.
5. Test results shall be posted to the University project management website, emailed to the appropriate UITS representative (depending on whether it is AV or telecom test results) in a timely fashion, and stored on a CD and delivered to the University Information Technology Services representative upon request.
6. Test results shall be verified by the designated University personnel as part of the *inspection* and acceptance procedure.

27.13.23 OPTICAL FIBER BACKBONE CABLING

1. Qualifications

- 1.1. Bidders will supply documentation of verified experience splicing the proposed type(s) and size(s) of cable, splice cases, and where applicable cutting over live fiber circuits with minimal down time.

2. Cable Installation

- 2.1. Install FO cables and devices in accordance with industry standards and manufactures written instructions.
 - 2.1.1 Fiber riser cables must be separated from horizontal station wires and station wire bundles.
 - 2.1.2. Fiber riser cables must be kept to the side of cable trays and not be placed under station wires.
- 2.2. Install fiber optic cable without damage to fibers, cladding, or jacket.
 - 2.2.1. Ensure that media manufactures recommended pulling tensions are not exceeded.
- 2.3. Do not bend cables to smaller radii than minimums recommended by manufacturer.
- 2.4. Use a pulling means, including fish tape, rope, and basket-weave grips, that will not damage media or raceway.
 - 2.4.1. Install FO cable simultaneously where more than one cable is being installed in the same raceway.
- 2.5. Use pulling lubricant where necessary; compound used must not deteriorate cable materials. Do not use soap.
- 2.6. NO splices are allowed. Cable runs to be continuous.
- 2.7. Install a spare fiber loop of between 50 and 100 feet in each IDF for each fiber cable.
 - 2.7.1. Secure fiber loop(s) in a location which will not interfere with the installation of other cables, conduits and devices in the IDF room.
 - 2.7.2. For outside plant fibers, install spare fiber loops in every third manhole.
- 2.8. Provide grounding connections for FO cable and other system components as required by specifications and applicable codes and regulations, according to manufacturer's written instructions.
- 2.9. Fiber optic cable will have cable ID and strand count clearly marked on the fiber cabinet in the IDF, on

the cable in the fiber cabinet, and on at least one visible point along its racking route within the IDF.

2.9.1. Outside plant fiber optic cable shall be labeled likewise in every manhole with stamped stainless steel tags.

27.13.23.13 Splicing and Terminations

1. Execution

1.1. The Contractor is responsible for performing work in compliance with OSHA 1910.146 (Permit Required Confined Spaces) and OSHA 1910.268 (Telecommunication Installation Practices).

1.2. All fiber splicing will be done in a well-lighted secured controlled environment (climate controlled splicing trailer or vehicle built specifically for fiber cable splicing, IDF closet or approved room, or equivalent wherein dust or and other contaminants are minimized), with splice case and cables properly secured.

1.2.1. Splicing on outside plant fiber cables should not occur in manholes unless no other approved option is possible, and then requires specific approval and monitoring by appropriate UITS personnel.

1.2.2. In any case, splicing location must be away from electrical or other utility dangers and clear of vehicular and pedestrian traffic.

1.3. Perform all work according to University plans and specifications, manufacturers' specifications and recommended practices where given, and best industry practices otherwise, including workspace and fiber hygiene.

1.4. Provide termination of cables.

1.4.1. Use AFL fiber optic connectors on singlemode cables.

1.4.2. Use preterminated MTP/MPO connectors on 50 micron multimode cables with pre-connectorized modules with and AFL cabinets.

27.13.23.23 Testing of Fiber Cables

1. General

1.1. Maintenance of working circuits is critical. Cutover of live circuits require prior approval of UITS Change management as described in "27.04.40 SEQUENCING and SCHEDULING".

1.2. It will be the contractor's responsibility to provide the test equipment necessary and document the campus telecommunication coordinator the test equipment available for testing and the last date of certification.

1.3. Cables will have connectors installed on fiber cables prior to testing.

1.4. Tests shall be performed on inter-building and riser fiber cables.

1.4. Testing equipment:

1.4.1. Continuity tester

1.4.2. Visible fault detector

1.4.3. Power meter and light source

1.4.4. OTDR (Optical Time Domain Reflectometer)

1.4.5. Appropriate types of fiber jumpers

1.4.6. Equipment for two testers to communicate

1.4.7. Fluke DSP 4000 or equivalent.

1.4.8. Other equipment as approved by designated University personnel and as required to complete the testing to the satisfaction of the University

1.5. Prior to usage, test equipment and components in accordance with manufactures published test procedures.

1.6. All fibers will be tested bi-directionally per TIA-526-7 (singlemode) and TIA-526-14 method A-2 (multimode).

1.7. Bi-directional attenuation figures in decibel (dB) will be documented.

1.7.1. Before testing, verify with the University Information Technologies representative if raw or referenced readings are preferred.

1.8. All strands shall test good and meet current ANSI/TIA-568 specifications. Dark fibers and excessive attenuation due to breaks, bends, bad splices, defective connectors and bad installation practices will not be accepted and must be corrected.

1.9. Replacement fiber cables shall be subject to tests and criteria as described in this document.

1.10. All fiber cables shall have NO bad fibers. Fiber cables tested to have bad fibers, and determined to be non-repairable by practices acceptable to the University, shall be replaced at no additional cost to the University.

1.11. Any and all measures taken to correct unacceptable test results will be recorded, along with loss measurements taken before and after corrective measures.

1.12. Documentation will include cable ID, from and to points, strand ID, bi-directional attenuation figures in dB, per TIA Method A-2.

1.13. Use of an OTDR may require that a "launch reel" be used to overcome the OTDR's dead zone, if needed for fault location if the bi-directional tests fail.

1.14. Fiber jumpers used with the OTDR, light source and power meter must be of the same size and type of the fiber being tested.

1.15. Clean all connections according industry recommended practices each time when installing connectors for testing and circuit connections.

1.16. Fiber jumpers used with the light source and power meters shall be zeroed out by attaching the jumper from the light source via a coupler to the jumper from the power meter.

1.16.1. This reading noted, will become the reference level to obtain a true attenuation reading (some power meters can be zeroed to allow reading the attenuation level direct).

1.16.2. TIA-526-7 and TIA-526-14 Method A-2 should be used to zero OLTS.

2. Loss Budgets

2.1. Average splice loss shall not exceed 0.35 dB attenuation for multi-mode, 0.25 dB attenuation for single mode, measured from both directions.

2.2. No individual splice, multimode or single mode, shall exceed 0.50 dB attenuation, measured from both directions.

2.3. No termination shall exceed 0.40 dB attenuation for multimode, 0.30 dB attenuation for single mode.

d. No single mode OSP fiber shall exceed 0.000091436 dB attenuation per foot at 1550 nm. (0.25 dB

attenuation per kilometer at 1550 nm).

2.4. Acceptable maximum allowable attenuation per spliced and terminated fiber will be determined by the following formula:

$$\text{MAX} = (\text{S} * \text{MS}) + (\text{E} * \text{ME}) + (\text{F} * \text{MF})$$

Where S = number of splices in fiber between end termination points

MS = dB maximum average allowable attenuation per splice

E = number of endpoint terminations (namely, 2)

ME = dB maximum allowable attenuation per endpoint termination

F = number of feet of fiber from endpoint termination to endpoint termination

MF = maximum allowable fiber attenuation per foot of fiber

Manufacturer's specifications (converted from dB/km by formula (dB per km / 3280.8))

3. Riser Fiber Cable Testing

3.1. Test multimode riser fiber at 850 nm and 1300 nm in both directions.

3.2. Test singlemode riser fiber at 1310 nm and 1550 nm in both directions is to be used.

3.3. No multimode riser fiber shall exceed 0.00021336 dB attenuation per foot at 1300 nm, 400 Mhz bandwidth. (0.70 dB attenuation per kilometer at 1300 nm, 400 Mhz bandwidth).

4. Entrance / Outside Plant Fiber Cable Testing

4.1. Test entrance fiber with an OLTS per TIA-526-7 method A-2, Option 1.

4.1.1. Test with an optical time domain reflectometer (OTDR) if needed per Option 2.

4.1.2. ORL should be -30 dB or higher.

4.2. Test singlemode entrance fiber at 1310 nm and 1550.

4.3. Test cable segments for faulty connectors and terminations, and for the integrity of the cable and its component parts.

4.4. Replace malfunctioning of damaged items with new materials, then retest until satisfactory performance is achieved. Test cable in both directions using the wavelengths described above.

27.13.33 COAXIAL BACKBONE CABLING

1. Design Specifications for Campus Cable Distribution System

Cable specifications	Cable must be 100% shielded
Cable testing	Cable must be 100% sweep tested and certified
System frequency response	50 MHz - 1 GHz (Forward) 5 MHz - 42 MHz (Reverse)
System tilt	10 dbmv MAXIMUM
Maximum system level	+40 dbmv at visual carrier, aural carrier shall be - 10 to - 17 - 6 dbmv in respect to visual carrier
Signal leakage	Maximum signal leakage from the system shall not exceed -40 dbmv at CATV channel 'A' (121.25 MHz), and shall

Spurious output	not exceed -53 dbmv at CATV channel 'W' (295.25 MHz) Spurious output of modulators/processors shall not exceed -70 dbmv
System carrier to noise	Shall exceed -54 dbmv at last tap
System operating range	System shall perform as specified at temperatures 120°F between 32°F
Hum to Noise	System hum and noise shall exceed -50 dbmv at all points
Field rate sync division	5% maximum (FCC requirement)
Cross modulation	-70 dbmv on fully loaded system
K-factor	2% or better
Adjacent carriers	Adjacent channel carriers shall be within 2 dbmv
Receive outlet level	+6 dbmv, +4 dbmv -3 dbmv
Return outlet level	+10 dbmv, +15 dbmv -0 dbmv at the "head-end" equipment with signal injected by modulator (+60 dbmv, +0 dbmv -45 dbmv adjustable) located in technology equipment.

2. **Labeling** of all coaxial cables will have the building equipment room and floor equipment room ends clearly marked with the cable ID number.

3. **Testing of coaxial cables**

- 3.1. Cables will have connectors installed on ends prior to testing.
- 3.2. Cable must be 100% sweep tested and CERTIFIED to meet with CATV standards.
- 3.3. Frequency response from 50 MHz to 1 GHz will be measured and shall indicate no greater than 7 dbmv system tilt.
- 3.4. Attenuation will be measured end to end using 150 MHz as a test signal and attenuation will be documented in dbmv.
- 3.5. Documentation will include cable ID, from and to points, frequency response, attenuation figures and as built information.

27.15.00 HORIZONTAL CABLING

27.15.00.23 COMMUNICATIONS AUDIO-VISUAL HORIZONTAL CABLING

See following addenda

27.15.16 VOICE COMMUNICATIONS HORIZONTAL CABLING

1. All telecommunications horizontal copper cabling materials and installation shall be data grade as described in 27.15.19 and elsewhere, and shall NOT be referenced as “Voice” cable or wire.

27.15.19 DATA COMMUNICATIONS COPPER HORIZONTAL CABLING

1. Before the installation of Horizontal Cabling will be allowed to begin, the telecommunications subcontractor must provide a mock-up of the labeling and wiring to a sample face-plate and patch panel.

1.1. The mock-ups must be reviewed by an appropriate representative of UITS and approved prior to performing any final wiring required by the project documents.

2. Installation of Horizontal Copper Cabling

2.1. 4-pair UTP cables should withstand 25 foot-pounds of pulling pressure. This number shall be verified by the wire manufacturer.

2.1.1. Maximum cable length is limited to 90 meters (295 feet) from the jack to the patch panels.

2.1.2. Comply with ANSI/TIA-569 standard regarding the requirements and recommendations for separation of copper telecommunication cabling from sources of electromagnetic interference.

2.1.3. The Contractor shall replace any damaged cable at no expense to the University. No repair will be allowed on damaged cables.

2.2. Cabling shall be terminated at the station jack and at the equipment room as indicated in ANSI/TIA-568, wiring configuration T568A.

2.2.1. The modular faceplate at the user end shall be equipped with inserts for communication services as indicated on plans.

2.2.2. Station cable in the IDF shall be terminated on Category 6A patch panels located in the equipment racks.

2.2.3. The minimum bend radius of Category 6A UTP cable shall not be smaller the manufacturer’s recommended minimum at any time during installation or after completion, and shall not cause the cable jacket to buckle.

2.2.4. Station cables supported by j-hooks shall have no more than 12 inches of sag between j-hooks.

2.2.5. Route cables from the back of the patch panel through its coupler openings and loosely attach them to the wire manager with Velcro cable ties, leaving enough slack for re-termination at a future date.

2.2.6. Remove only as much jacketing as needed to terminate properly to the connecting hardware, keeping the amount of jacketing removed to an absolute minimum.

2.2.7. Do not untwist pairs more than 0.5 inches.

2.2.8. Visually *inspect* cable pairs for bare wire and other defects before terminating wires.

2.2.9. Once all of the cables have been terminated, dress the cable slack behind the panel with Velcro tie wraps tightened to a snug but not compressing fit.

2.3. Telecommunication cabling for elevator emergency phones shall be provided as follows:

2.3.1. Cabling for the elevator telephone to the elevator control room is by the elevator installer.

2.3.2. Cabling from the elevator control room to the telecommunication equipment room is by the electrical contractor.

2.3.2.1. Jack must be mounted adjacent to, but outside of the elevator electrical panel.

- 2.3.3. The electrical contractor shall notify campus personnel of the elevator service date.
2.3.3.1. This notification for request of services shall be provided no fewer than **21** days prior to service.

3. Testing of Horizontal Copper Cabling

- 3.1. Perform visual inspection to ensure that all cables are terminated on the eight position station jacks on both ends in proper color code order.
- 3.2. All station cables attached between information outlets and floor equipment room patch panels will be link tested with a cable analyzer to ensure compliance with current ANSI/TIA-568.
- 3.3. All pairs shall test good and meet Category 6A parameters for the respective type of cable.
- 3.3.1. Open, split, miss-terminated pairs, deviations from the manufacturer's installation specifications, defective connections and bad installation practices will not be accepted and must be corrected.
- 3.4. Test 100% of station wire in both directions with a certified handheld tester appropriate testing Category 6A installations, such as the Fluke OmniScanner or the Fluke DSP 4000 and other test equipment as necessary to assure proper termination sequences, continuity, and Category 6A compliance. Station wire shall have **NO** bad pairs.
- 3.5. When all station wire is determined to be acceptable, University Information Technology Services will spot test the plant using a certified handheld tester, such as the Fluke OmniScanner or Fluke DSP 4000.
- 3.6. Test results shall meet or exceed the appropriate tests requirements as specified in the ANSI/TIA-568 specifications.
- 3.7. The approved handheld tester will have the capability to be programmed with current Category 6A requirements as specified in ANSI/TIA-568 standards.
- 3.8. Documentation will include cable ID (same as jack ID) to be marked on the punch down blocks and patch panels in the telecommunication closet, station jack ID to be marked on the station jack and results of the testing done with the cable analyzer.
- 3.9. Analyzer documentation test result must be provided in the **native format** such as *.flw (not PDF) of the testing equipment used.
- 3.9.1. Results must be labeled using the information outlet labeling scheme for the project.
- 3.10. Test results shall be stored on a CD and delivered to the University Information Technology Services representative, or transmitted electronically to both the appropriate UITs representative and to the appropriate University Architect's Office representative.
- 3.11. Test results shall be verified by the designated University personnel as part of the inspection and acceptance procedure.

4. Submission of test results

- 4.1. In order to facilitate quicker turn-around for ordering and activating new information outlets in the building, the Telecommunications Subcontractor shall submit partial jack lists that are tested and approved rather than submitting the lists and test results of the entire building.
- 4.1.1. The details of how the partial lists are created will be determined in the field through coordination between the Telecommunications Subcontractor and the UITs Technical Staff.
- 4.1.2. As an example, test results may be submitted by IDF as work in an IDF is completed.
- 4.1.3. Special care must be taken to assure that telecommunications outlets for Fire Alarm systems and Elevator, which will be required for state inspections, be installed, tested and verified with sufficient lead times to meet the project construction and occupancy schedule.

27.15.23 OPTICAL FIBER HORIZONTAL CABLING

Not Applicable

27.15.33 COAXIAL HORIZONTAL CABLING

1. All coaxial cables will have the building equipment room and floor equipment room ends clearly marked with the cable ID number.

2. Testing of coaxial horizontal cables

- 2.1. Cables will have connectors installed on ends prior to testing.
- 2.2. Cable must be 100% sweep tested and CERTIFIED to meet with CATV standards.
- 2.3. Frequency response from 50 MHz to 1 GHz will be measured and shall indicate no greater than 7 dbmv system tilt.
- 2.4. Attenuation will be measured end to end using 150 MHz as a test signal and attenuation will be documented in dbmv.
- 2.5. Documentation will include cable ID, from and to points, frequency response, attenuation figures and as built information.

27.15.43 FACEPLATES AND CONNECTORS

1. Termination equipment

1.1. All station cables in the IDF shall be terminated on rack mounted patch panels.

2. Information Outlet Rough-In

- 2.1. Standard Information Outlets (single gang or double gang) shall be located at the same height as 120 volt AC outlets (normally 18" above finished floor).
- 2.2. Wall mounted telephones require a double gang box with a single gang plaster ring, positioned 40" A.F.F. to the center of the outlet box.
- 2.3. Information Outlets above counter tops should be installed so that the center of the outlet box will be a minimum of 12" above the counter top.
 - 2.3.1. A counter top with a splash back may require different outlet box locations.
- 2.4. Wall mounted telephones require a special wall telephone jack that provides mounting lugs for the telephone and an eight position jack.
- 2.5. Information Outlets for wall mounted wireless Access Points must be located to accommodate mounting the Access Point equipment, which is 8.0"(W) x 8.0"(D) x 2.2"(H), centered on the box.
- 2.6. No Information Outlet will be installed such that workstations or devices served from it cannot be reasonably reached by a 16 ft cord.

3. Finishing of Information Outlets

- 3.1. Information Outlet faceplates and jack modules must not be modified in any manner, including being painted.
- 3.2. Jack labeling must remain visible.

4. Labeling of Horizontal Copper Cabling

4.1. The telecommunications contractor's onsite representative(s) shall schedule a meeting with the UITs representative through the IU Project Manager prior to the permanent labeling of Information Outlets and IDF patch panels.

4.2. Information Outlet receptacles, cables, and terminations shall be labeled with a standard identification tag at both the Information Outlet and on the jackfields in the IDF/Wire Closet.

4.1.1. Tags shall be preprinted or computer printed with indelible waterproof ink and mechanically secured in a permanent fashion; for example, such as using an appropriate label maker with 3/8" tape.

4.1.2. Handwritten labels are NOT acceptable.

4.1.3. Labels shall be mounted in a manner which permits easy access and viewing.

4.1.4. The station cable serving each receptacle must be labeled at the room receptacle and the IDF rack.

4.3. Information Outlet receptacles in rooms are to be labeled -A through -ZZ in each room beginning with the first receptacle to the left of the main entrance to the room and continuing clockwise around the room.

4.3.1. All labeling will be done in all capital letters.

4.3.2. For example, a jack labeled 246A-A would be because:

4.3.2.1. Room 246A is the room number

4.3.2.2. The Information Outlet designation is "A" (first receptacle in room from the left of the door)

4.3.2.3. Station cables from a given room shall be terminated in sequential order, i.e. - 246A-A, 246A-B, 246A-C, 246A-D, etc. If double letters are needed, the progression would be -AA, -AB, AC, ... -AZ, -BA, -BB, etc.

4.4. Information Outlets for special purposes shall have a unique identifier listed with the jack ID.

4.4.1. The identifier shall be inserted into the Outlet ID, between the room number and the Outlet designator as indicated in following drawings.

4.4.2. Identifiers are listed below:

- | | |
|---------------------------------------|--|
| 4.4.2.1. Building Automation | "100+BA-A1" and "100+BA-A2" |
| 4.4.2.2. Fire Panel | "100+FP-A1" and "100+FP-A2" |
| 4.4.2.3. Wireless Access Point (WAP) | "100+WD-A1" (and "100+WD-A2" if applicable) |
| 4.4.2.4. Elevator Phone | "100+EL-A1" and "100+EL-A2" |
| 4.4.2.5. Interior Emergency Phone | "100+EM-A1" and "100+EM-A2" |
| 4.4.2.6. Outdoor Emergency/Blue Light | "OUT _x +EM-A1" and "OUT _x +EM-A2" |
| | where "x" is "N", "E", "S", or "W" for direction from serving building
or in extreme cases, "NE", "NW", "SE", or "SW" |

4.5. ALL LABELING SHALL BE COORDINATED WITH AND APPROVED BY AN APPROPRIATE UITs REPRESENTATIVE.

4.5.1. Schedule a meeting with the UITs representative through the IU Project Manager prior to the permanent labeling of Information Outlets and IDF patch panels.

4.5.2. In cases where the telecommunications (sub)contractor installs Wireless Access Point equipment, the equipment installer must provide a cut sheet of installed access equipment IDs and its associated data jack ID. An example of this cut sheet follows:

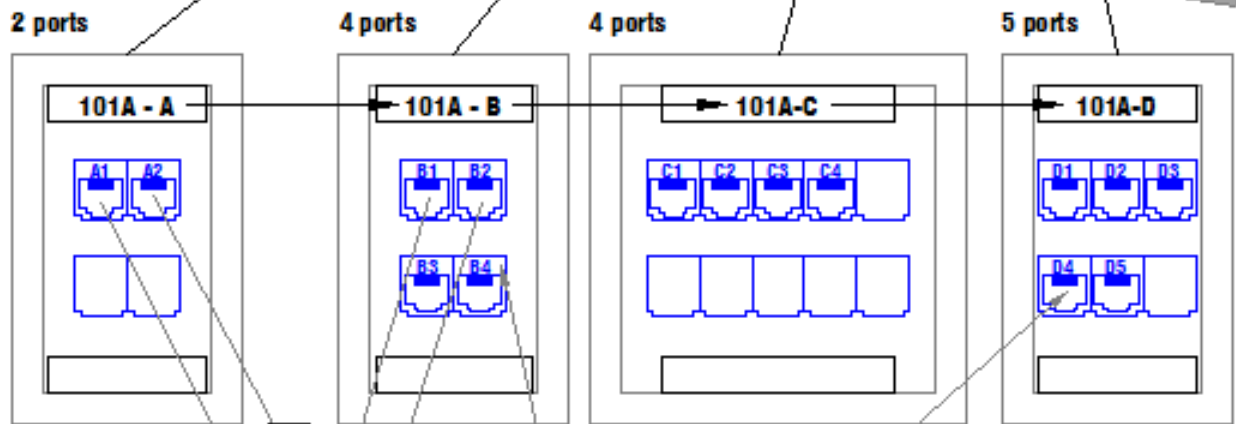
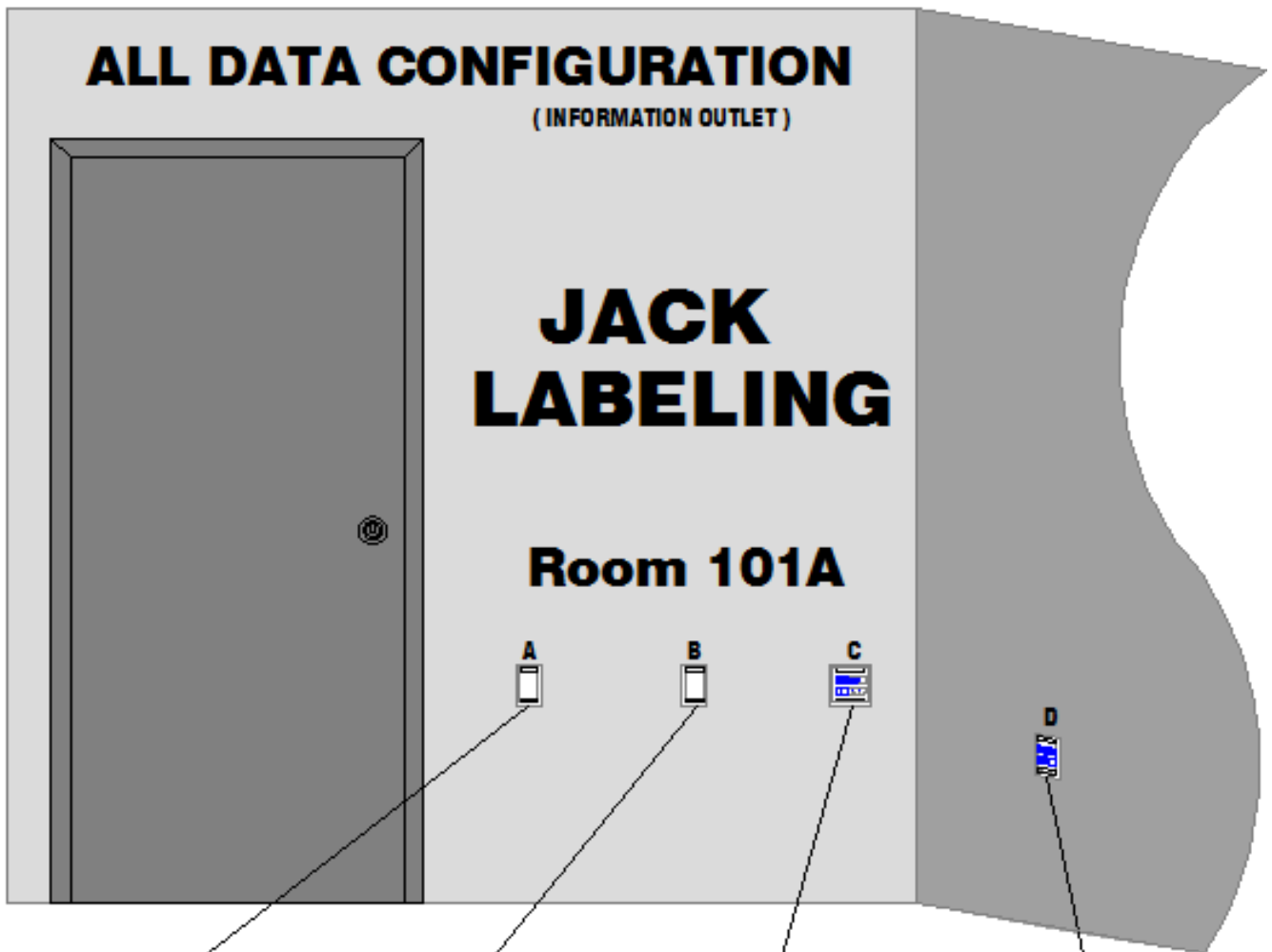
WIRELESS ACCESS POINT CUT SHEET example

- Place the AP sticker on a sheet
- Write the Jack ID next to the sticker

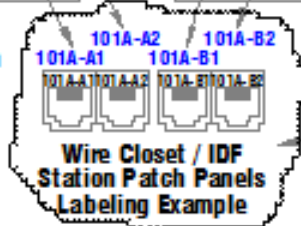
Marching 100	
<PLACE AP STICKER HERE>	<WRITE JACK ID HERE>

Once complete, deliver cut sheet to UITS Wireless engineering.

LABELING EXAMPLES



Standard Information Outlet (above)



Xn = Jackfield Port (not labeled on Room Outlet, is labeled on Jackfield)

Note: Pins on top

Revi 6/09/11 gls

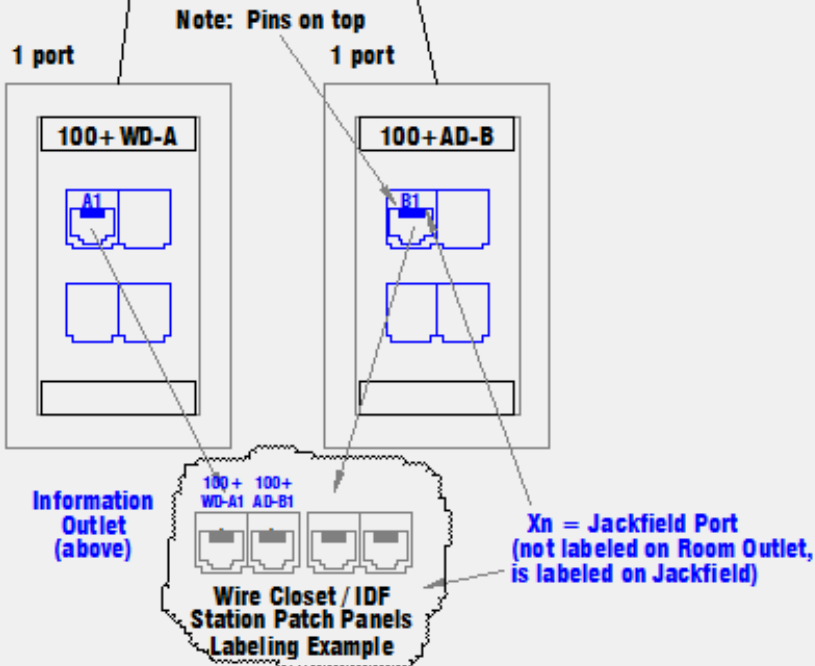
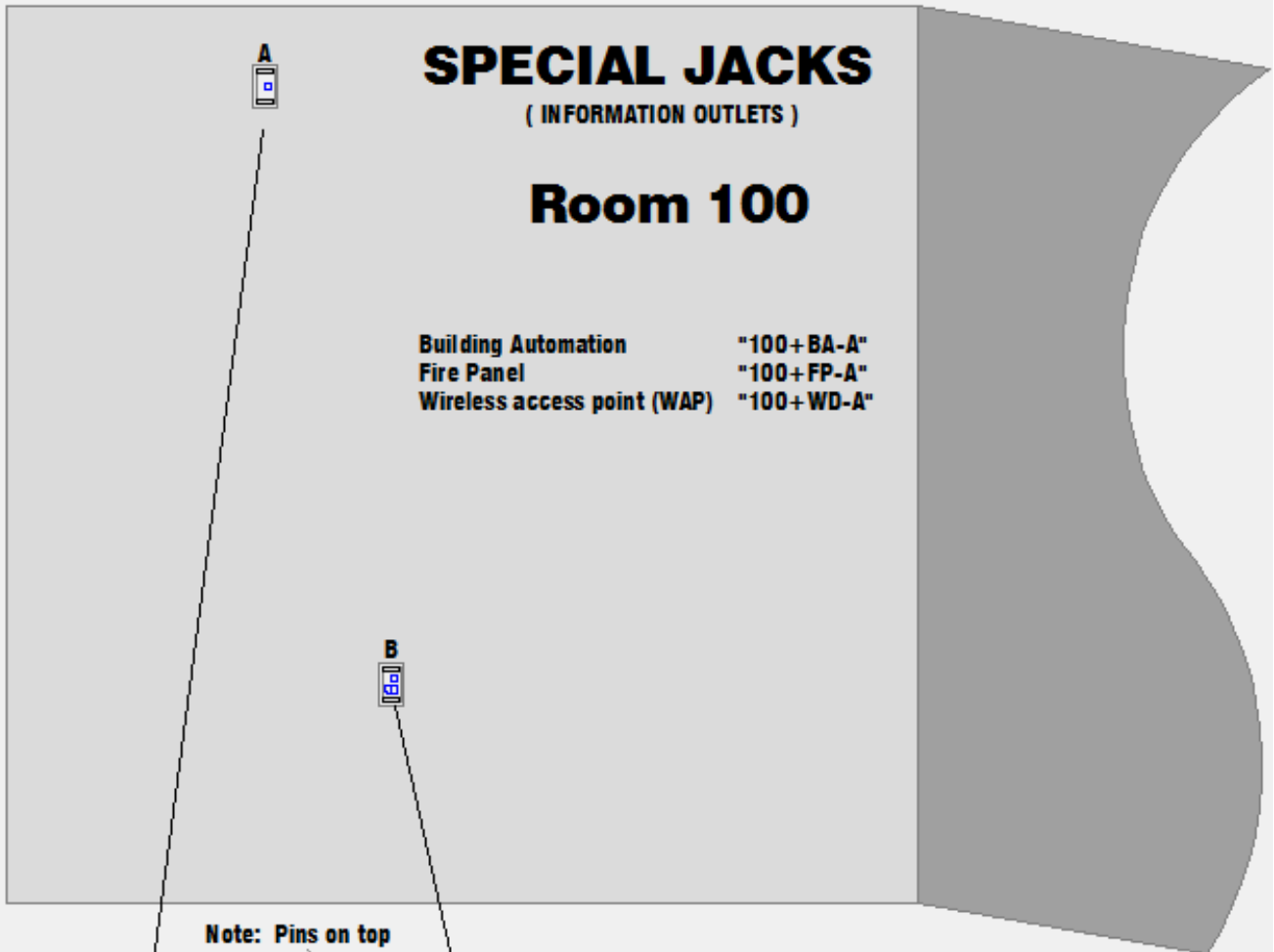
JACK LABELING

SPECIAL JACKS

(INFORMATION OUTLETS)

Room 100

Building Automation	"100+BA-A"
Fire Panel	"100+FP-A"
Wireless access point (WAP)	"100+WD-A"



Revi 03/21/14 gls

27.20.00 DATA COMMUNICATIONS

User End Equipment and IDF Network Equipment provided by IU

27.30.00 VOICE COMMUNICATIONS

User End Equipment provided by IU

27.40.00 AUDIO-VIDEO COMMUNICATIONS

27.41.16 INTEGRATED AUDIO-VISUAL SYSTEMS AND EQUIPMENT

See following addenda

(otherwise User End Equipment and A/V Closet Equipment provided by IU)

27.50.00 DISTRIBUTED COMMUNICATIONS and MONITORING SYSTEMS

TBD

27.60.00 WIRELESS TRANSCEIVERS

Equipment provided by IU

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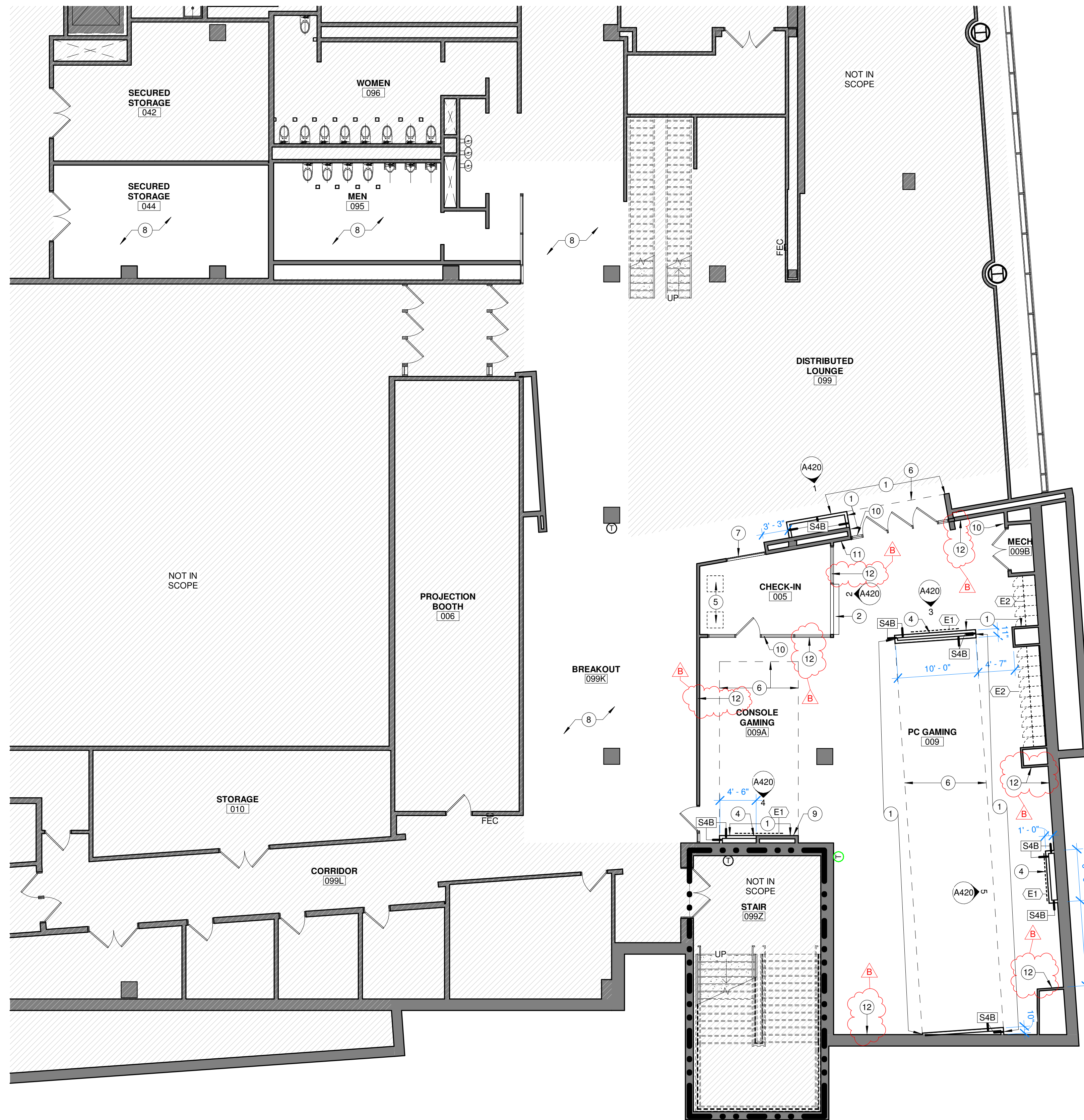
27.99.99 APPENDIX: Design Guide

----- INSERT IU Building Telecommunications Design Guidelines -----

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EQUIPMENT SCHEDULE

MARK	NAME	REMARKS	FURN / INSTL
E1	WALL MOUNTED TV	PROVIDE BLOCKING IN WALL AS REQUIRED. COORDINATE WITH MONITOR SIZE/MOUNT	C.F.C.I.
E2	LOCKERS	BRADFORD SYSTEMS DAY USE LOCKERS: 15"W X 18"D X 72" TOTAL HEIGHT; FINISH TO BE SELECTED FROM MANUFACTURER'S FULL RANGE	C.F.C.I.



1 LOWER LEVEL - ARCHITECTURAL PLAN
1/8" = 1'-0"

GENERAL ARCH. NOTES

- A. THESE GENERAL NOTES APPLY TO ARCHITECTURAL DRAWINGS.
- B. WORK SHOWN IN THE DRAWINGS SHALL BE BASE BID UNLESS SPECIFICALLY NOTED TO BE BY ALTERNATE BID.
- C. FIELD VERIFY EXISTING FINISH FLOOR ELEVATIONS PRIOR TO STARTING CONSTRUCTION. MATCH NEW FLOOR ELEVATIONS WITH EXISTING UNLESS NOTED OTHERWISE.
- D. COORDINATE EQUIPMENT WORK WITH MANUFACTURERS AND SUPPLIERS TO INSURE PROPER ROUGH-IN CLEARANCES FOR INSTALLATION. USE AND MAINTENANCE. NOTIFY ARCHITECT IF CLEARANCES FOR SELECTED EQUIPMENT DO NOT HAVE THE MINIMUM REQUIRED CLEARANCES.
- E. PROTECT EXISTING SURFACES TO REMAIN THAT ARE NOT INCLUDED IN SCOPE OF WORK BUT THAT ARE WITHIN AREAS OF CONSTRUCTION ACTIVITY.
- F. PATCH, REPAIR AND RESTORE EXISTING FINISHES AND SURFACES TO "AS NEW CONDITION" AS REQUIRED TO MATCH SURROUNDING MATERIALS OR TO PROVIDE APPROPRIATE SUBSTRATE PRIOR TO INSTALLING NEW FINISHES. AREAS NOTED TO BE PATCHED OR REPAIRED ON THE DRAWINGS ARE GIVEN FOR REFERENCE AND SHALL NOT BE INTERPRETED TO BE THE LIMIT THE SCOPE OF WORK REQUIRED.
- G. PROVIDE CONTROL JOINTS (C.J.) IN GYPSUM BOARD WALL CONSTRUCTION AS INDICATED. WHERE NOT SHOWN, PROVIDE MAXIMUM SPACING BETWEEN JOINTS OF 30'. VERIFY FINAL CONTROL JOINT LOCATIONS, WHETHER OR NOT INDICATED ON THE DRAWINGS, WITH ARCHITECT PRIOR TO STARTING WORK.
- H. PROVIDE WATER-RESISTANT GYPSUM BOARD ON WALLS WITH OPERABLE PLUMBING FIXTURES AND WITHIN 4'-0" OF DRINKING FOUNTAINS OR WATER COOLERS.
- I. PROVIDE FRP PANELS AND/OR ACRYLIC PANELS 2" PAST THE EDGE OF ALL MOP SINKS AND TO A HEIGHT OF 4'. CAULK ALL EDGES.
- J. PROVIDE FINISHED END PANELS, FILLERS, SUPPORTS, ETC. REQUIRED FOR A COMPLETE CABINERY INSTALLATION. PROVIDE CUTOOTS, ACCESS PANELS AND REMOVABLE COMPONENTS AS REQUIRED BY NEW OR EXISTING CONDITIONS SUCH AS ELECTRICAL OUTLETS, JUNCTION BOXES, CLEANOUTS, ETC. MOUNT TOP OF WALL CABINETS AT +7'-0" A.F.F. UNLESS OTHERWISE INDICATED.
- K. VERIFY MOUNTING HEIGHTS OF ACCESSORIES, EQUIPMENT, DOOR HARDWARE, CASEWORK, ETC., AND PROVIDE SOLID BLOCKING BEHIND ITEMS REQUIRING ANCHORAGE. PROVIDE FIRE TREATED WOOD BLOCKING OR METAL STRAPS BETWEEN FRAMING MEMBERS AS REQUIRED TO SUPPORT WEIGHT AND USE OF ITEMS TO BE SUPPORTED. WHERE MOUNTING HEIGHTS ARE NOT INDICATED, MOUNT ITEMS IN ACCORDANCE WITH RECOGNIZED INDUSTRY STANDARDS. COORDINATE LOCATIONS WITH MANUFACTURER OR SUPPLIER AND REFER MOUNTING HEIGHT QUESTIONS TO ARCHITECT FOR INTERPRETATION.
- L. PROVIDE SEALANT BETWEEN HOLLOW METAL FRAME PERIMETERS AND SURROUNDING WALL CONSTRUCTION UNLESS OTHERWISE INDICATED.
- M. PROVIDE SEALANT BETWEEN INTERIOR AND EXTERIOR WINDOW AND STOREFRONT FRAME PERIMETERS AND SURROUNDING CONSTRUCTION UNLESS OTHERWISE INDICATED.
- N. PROVIDE SEALANT BETWEEN DISSIMILAR MATERIALS SUCH AS GYPSUM BOARD AND MASONRY, MASONRY AND CONCRETE, COUNTERTOPS AND WALLS, ETC.
- O. PROVIDE BUTYL TAPE BETWEEN DISSIMILAR METALS TO PREVENT GALVANIC ACTION.
- P. REPAIR AND PATCH SPRAYED FIRE-RESISTIVE AND FIRESTOP MATERIALS WHERE DAMAGED DUE TO INSTALLATION OF NEW MATERIALS TO RESTORE SPECIFIED FIRE RATING.
- Q. DO NOT BEGIN WORK THAT MAY REQUIRE COORDINATION, SUCH AS CEILING INSTALLATION, PRIOR TO FINAL SUBMITTAL OF MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS TO ARCHITECT NOR PRIOR TO RESOLUTION AND APPROVAL OF COORDINATION ISSUES.
- R. REFER TO LIFE SAFETY PLAN DRAWINGS AND CODE SUMMARY FOR FIRE-RATED FLOOR, WALL, CEILING AND ROOF LOCATIONS. INSTALL FIRESTOPPING AT PENETRATIONS IN RATED CONSTRUCTION AND AT TOPS OF RATED WALLS.
- S. COORDINATE BLOCKING AND MEP CONNECTIONS AS REQUIRED FOR NOTED EQUIPMENT.

ARCH PLAN KEYNOTES

1. ALIGN FINISH FACE OF WALLS AS INDICATED
2. WALL MOUNTED COUNTERTOP. REFER TO ELEVATION FOR MORE INFORMATION.
3. WALL MOUNTED TV LOCATION. PROVIDE IN-WALL BLOCKING AS NEEDED. REFER TO ELEVATION FOR MORE INFORMATION.
4. TECHNOLOGY EQUIPMENT. REFER TO MEP AND TECHNOLOGY DRAWINGS FOR MORE INFORMATION.
5. DASHED LINE INDICATES CEILING ABOVE. REFER TO REFLECTED CEILING PLAN FOR MORE INFORMATION.
6. INFILL TICKET OPENING IN GLAZING SYSTEM WITH ANODIZED ALUMINUM PANEL TO MATCH FRAME.
7. EXISTING CONSTRUCTION AND FINISHES TO REMAIN. PATCH AND REPAIR AS NEEDED TO ACCOMMODATE MEP WORK.
8. INSTALL NEW CONTINUOUS GYP BD ACROSS EXISTING AND NEW FRAMING
9. INSTALL TYPE A SIGN TO WALL IN ACCORDANCE WITH IU STANDARDS. AT GLASS LOCATIONS, PROVIDE BACK PLATE ON OPPOSITE SIDE OF GLASS TO COVER VISIBLE ADHESIVE. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
10. INSTALL TYPE F SIGN TO WALL IN ACCORDANCE WITH IU STANDARDS. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
11. TYPICAL. EXTEND DRYWALL TO DECK ON ALL EXISTING WALLS AND COLUMN WRAPS
12. TYPICAL. EXTEND DRYWALL TO DECK ON ALL EXISTING WALLS AND COLUMN WRAPS



INDIANA UNIVERSITY INDIANAPOLIS
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ARCHITECT

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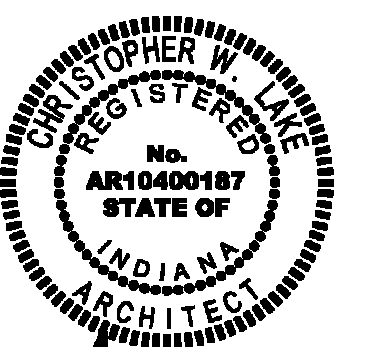
MEP

Primary Engineering Inc
9785 Crosspoint Blvd, Suite 103
Indianapolis, IN 46256

TECHNOLOGY

American Sound
6500 Technology Center Dr, #300
Indianapolis, IN 46278

CONSTRUCTION DOCUMENTS



Christopher W. Lankford

No.	Description	Date
A	ADDENDUM 01	08/30/2024
B	ADDENDUM 02	09/10/2024

CLIENT PROJ. #: IU20230101
PROJECT #: 24-013
ISSUE DATE: 09 JUL 2024
DRW: KMM | CHK: JSS

ARCHITECTURAL PLAN

A121

EQUIPMENT SCHEDULE

MARK	NAME	REMARKS	FURN / INSTL
E1	WALL MOUNTED TV	PROVIDE BLOCKING IN WALL AS REQUIRED. COORDINATE WITH MONITOR SIZE/MOUNT	C.F.C.I.
E2	LOCKERS	BRADFORD SYSTEMS DAY USE LOCKERS: 15"W X 18"D X 72" TOTAL HEIGHT; FINISH TO BE SELECTED FROM MANUFACTURER'S FULL RANGE	C.F.C.I.

INT. ELEVATION GEN. NOTES

- ALL DIMENSIONS ARE TAKEN TO THE FACE OF FINISHED MATERIAL.
- INSTALL WOOD BLOCKING TO STUDS TO SUPPORT ALL WALL-MOUNTED CABINETRY AND EQUIPMENT AS REQUIRED.
- CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTING CABINETRY.
- ALL CASEWORK SHALL BE FINISHED IN PLASTIC LAMINATE UNLESS NOTED OTHERWISE.
- COORDINATE BULKHEAD HEIGHTS INDICATED HERE WITH THAT SHOWN ON THE REFLECTED CEILING PLAN. CONFIRM ANY DISCREPANCIES WITH THE ARCHITECT PRIOR TO CONSTRUCTION.
- COORDINATE ALL WALL OUTLETS TO AVOID CONFLICTS WITH CASEWORK.

INTERIOR ELEV. KEYNOTES

- HATCH PATTERN INDICATES EXISTING STAINLESS STEEL PANELS TO REMAIN.
- EXISTING GLAZING SYSTEM, DOORS, AND HARDWARE TO REMAIN.
- HATCH PATTERN INDICATES ACRYLIC LIGHT BOX WITH 1/8" THICK, SURFACE APPLIED LETTERING ON FINISH FACE. ACRYLIC FINISH AND SIGNAGE TO BE DESIGNED TO MEET NEW IU STANDARDS AS PART OF ALLOWANCE AS INDICATED IN PROJECT MANUAL. ACRYLIC TO RECEIVE LED EDGE LIGHTING. REFER TO DETAILS AND MEP DRAWINGS FOR MORE INFORMATION.
- RETURN STAINLESS STEEL PANELS TO EXISTING WALL. REFER TO DETAILS FOR MORE INFORMATION.
- RETURN BACK-LIT LIGHTBOX PANELS TO EXISTING WALL. REFER TO DETAILS FOR MORE INFORMATION.
- WALL MOUNTED PLASTIC LAMINATE (PL1) TRANSACTION COUNTER AND SHROUD TO REPLACE EXISTING COUNTERTOP. REFER TO DETAILS FOR MORE INFORMATION.
- RECESSED LINEAR LIGHT MOUNTED IN WALL IN VERTICAL ORIENTATION. REFER TO MEP DRAWINGS FOR MORE INFORMATION.
- BAFFLE CEILING ABOVE. REFER TO REFLECTED CEILING PLAN FOR MORE INFORMATION.
- EXISTING STONE WALL PANELS TO REMAIN.
- GRAPHIC WALLCOVERING (WC1). INSTALL AS CONTINUOUS MURAL.
- TYPICAL: PROVIDE NEW STOREFRONT FRAME FASCIA CAPS TO MATCH EXISTING AND INFILL GLAZING POCKETS WHERE GLAZING WAS REMOVED.
- ALIGN TRANSACTION SURFACE AND SHROUD WITH INSIDE FACE OF MULLION AS INDICATED.
- STAINLESS STEEL WALL BASE. FINISH TO MATCH EXISTING STAINLESS STEEL PANELS AT ENTRY. BASE TO BE CONTINUOUS ON ALL FACES OF WALL.
- 1/2" REVEAL: FRY REGLET DRYWALL REVEAL MOLDING, DRM-50-50 (OR APPROVED EQUAL). REVEAL TO BE CONTINUOUS ON ALL EXPOSED FACES OF WALL. FINISH TO BE SELECTED FROM MANUFACTURER'S FULL RANGE.
- CORNER GUARD. INSTALL ABOVE WALL BASE. REFER TO FINISH PLAN FOR TYPE.
- STAINLESS STEEL #4 PANELS TO MATCH EXISTING SIZE, SPACING, AND FINISH. WRAP ALL EXPOSED FACES. ALIGN HORIZONTAL REVEALS WITH EXISTING REVEALS. REFER TO ELEVATION FOR MORE INFORMATION.



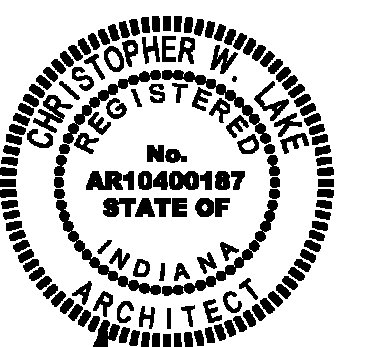
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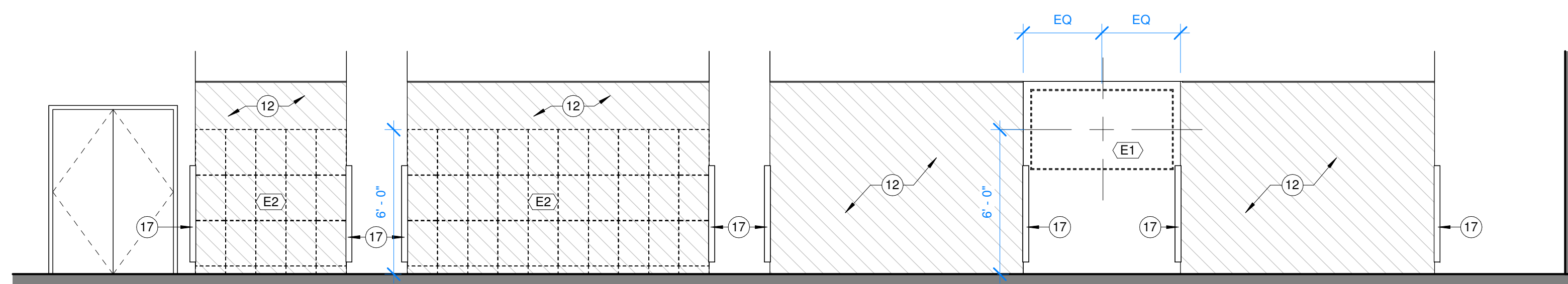
Christopher W. Lyle

No.	Description	Date
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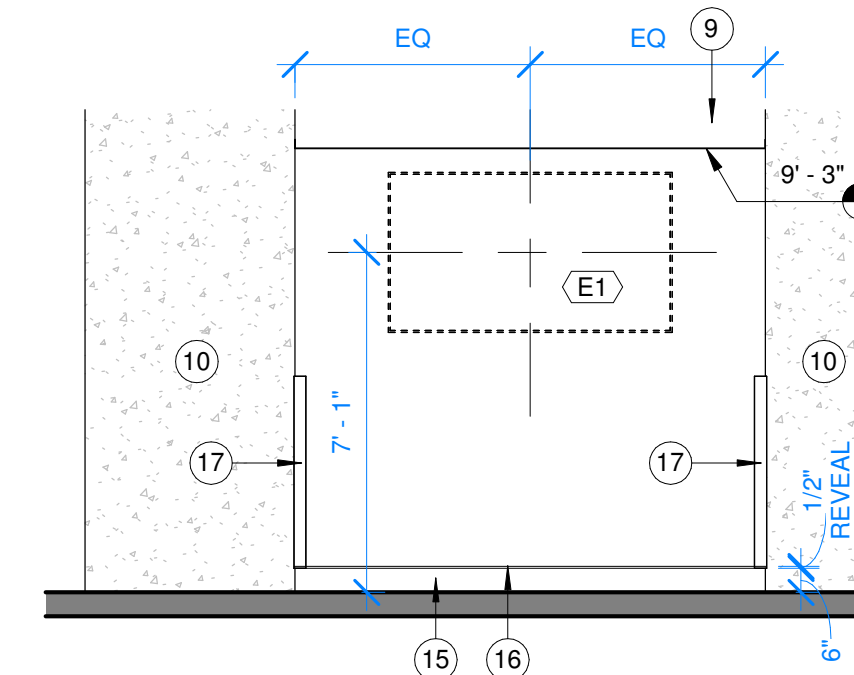
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DRW: KMM | CHK: JSS

INTERIOR ELEVATIONS

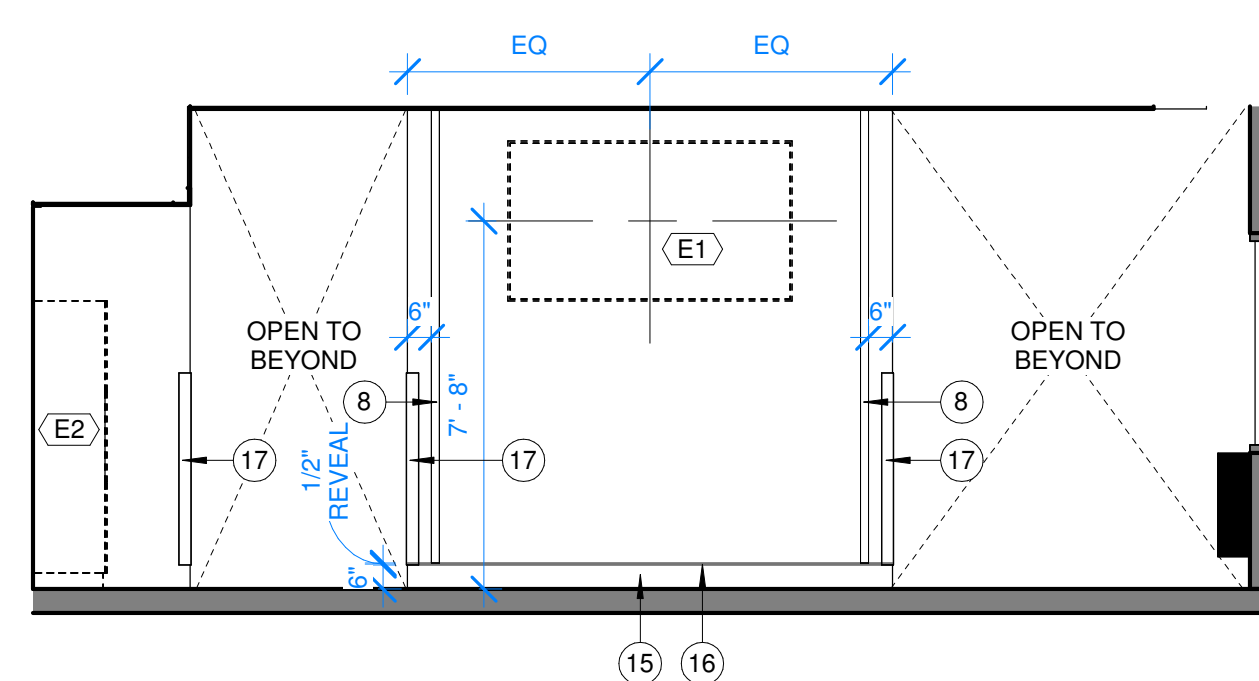
A420



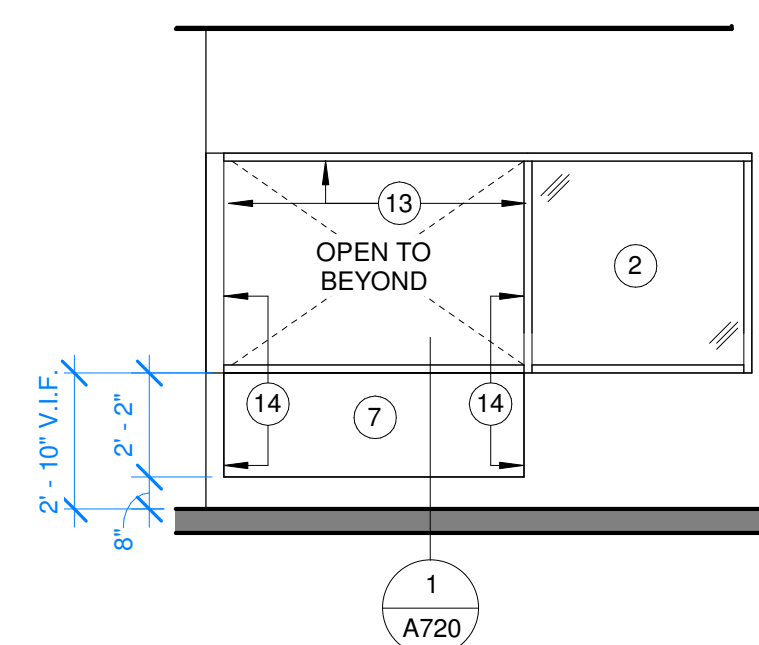
5 PC GAMING WALL
1/4" = 1'-0"



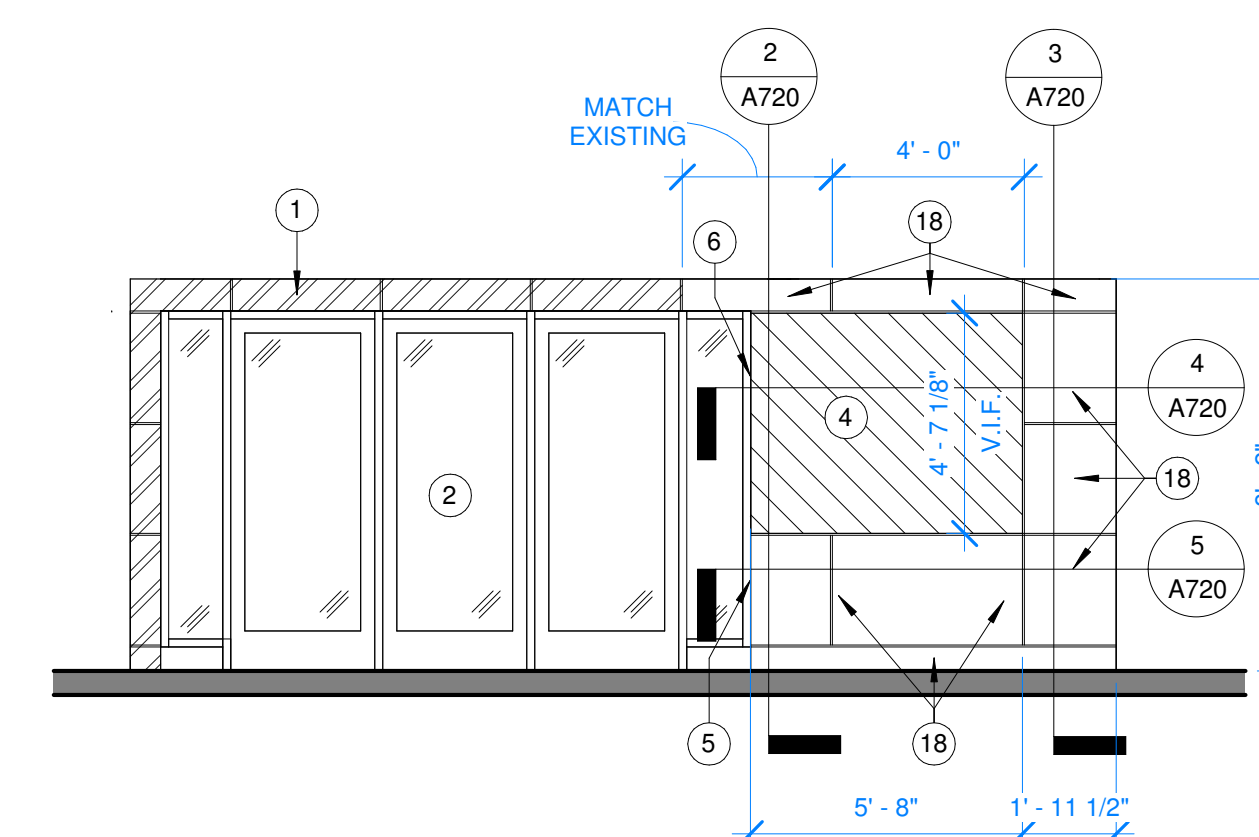
4 CONSOLE GAMING WALL
1/4" = 1'-0"



3 ENTRY WALL
1/4" = 1'-0"

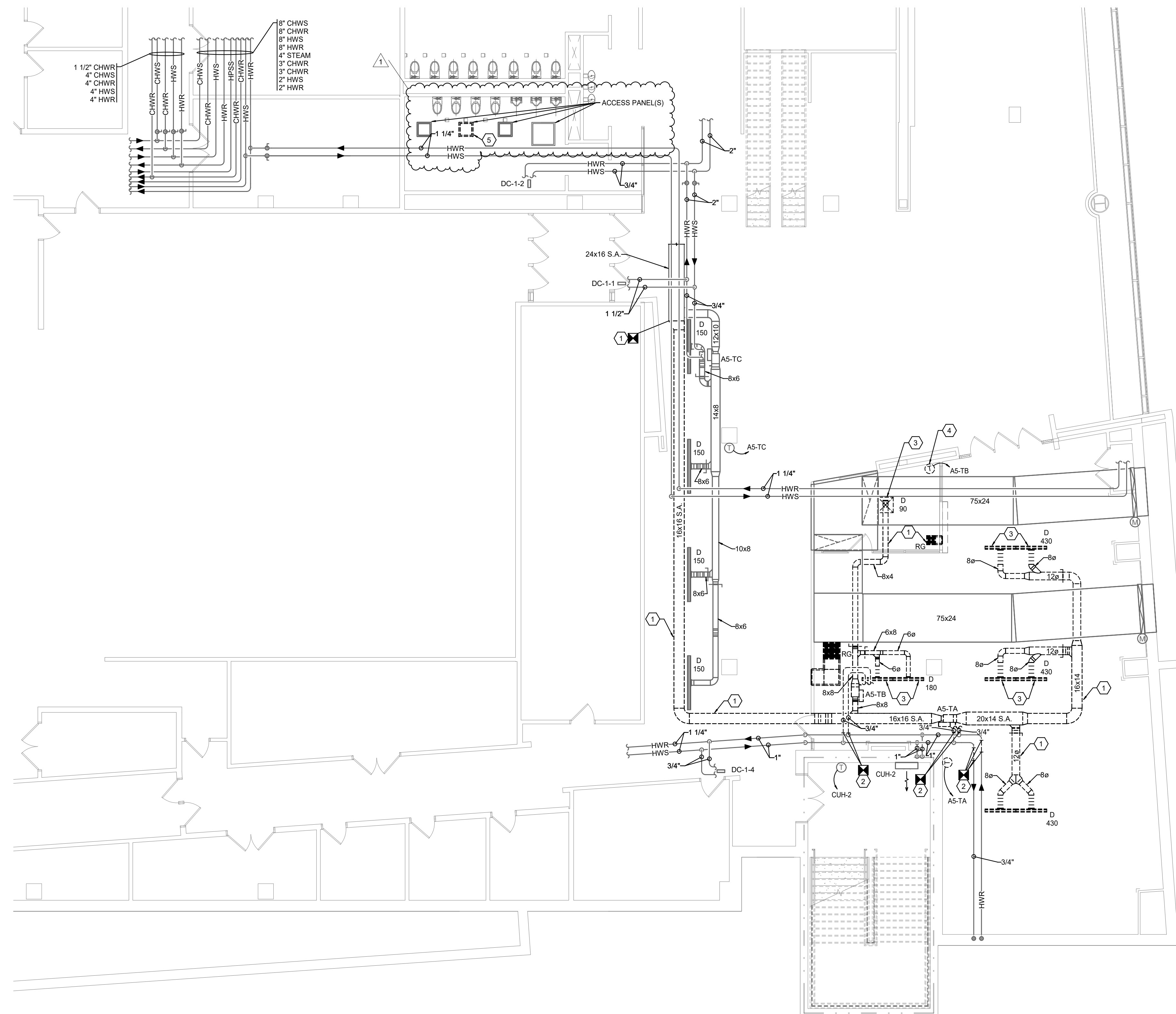


2 CHECK-IN DESK
1/4" = 1'-0"



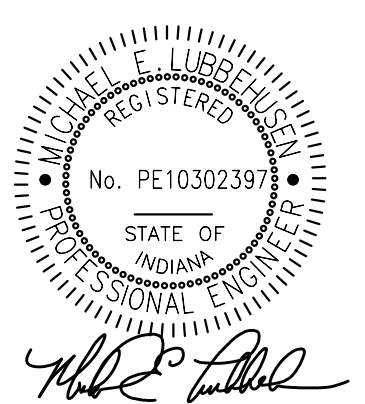
1 ENTRY
1/4" = 1'-0"

- DEMOLITION PLAN NOTES**
1. REMOVE EXISTING DUCTWORK COMPLETE INCLUDING ASSOCIATED HANGERS BACK TO EXTENT SHOWN.
 2. REMOVE EXISTING HYDRONIC PIPING COMPLETE INCLUDING ALL ASSOCIATED HANGERS AND SUPPORTS BACK TO EXTENT SHOWN.
 3. REMOVE ALL EXISTING DIFFUSERS/GRILLES COMPLETE.
 4. REMOVE EXISTING THERMOSTAT AND ALL CONTROL WIRING BACK TO SOURCE. PREPARE BACK BOX FOR REUSE OR DEMO AND PATCH TO MATCH ADJACENT SURROUNDINGS IF REQUIRED.
 5. REMOVE EXISTING ACCESS PANEL AND PREPARE OPENING FOR NEW.



LOWER LEVEL -
MECHANICAL DEMOLITION PLAN
1/8\"/>

CONSTRUCTION DOCUMENTS

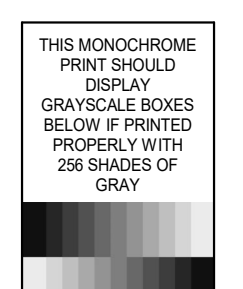


No.	Description	Date
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CLIENT PROJ. #: IU20230101
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DRW: IJL | CHK: CSM

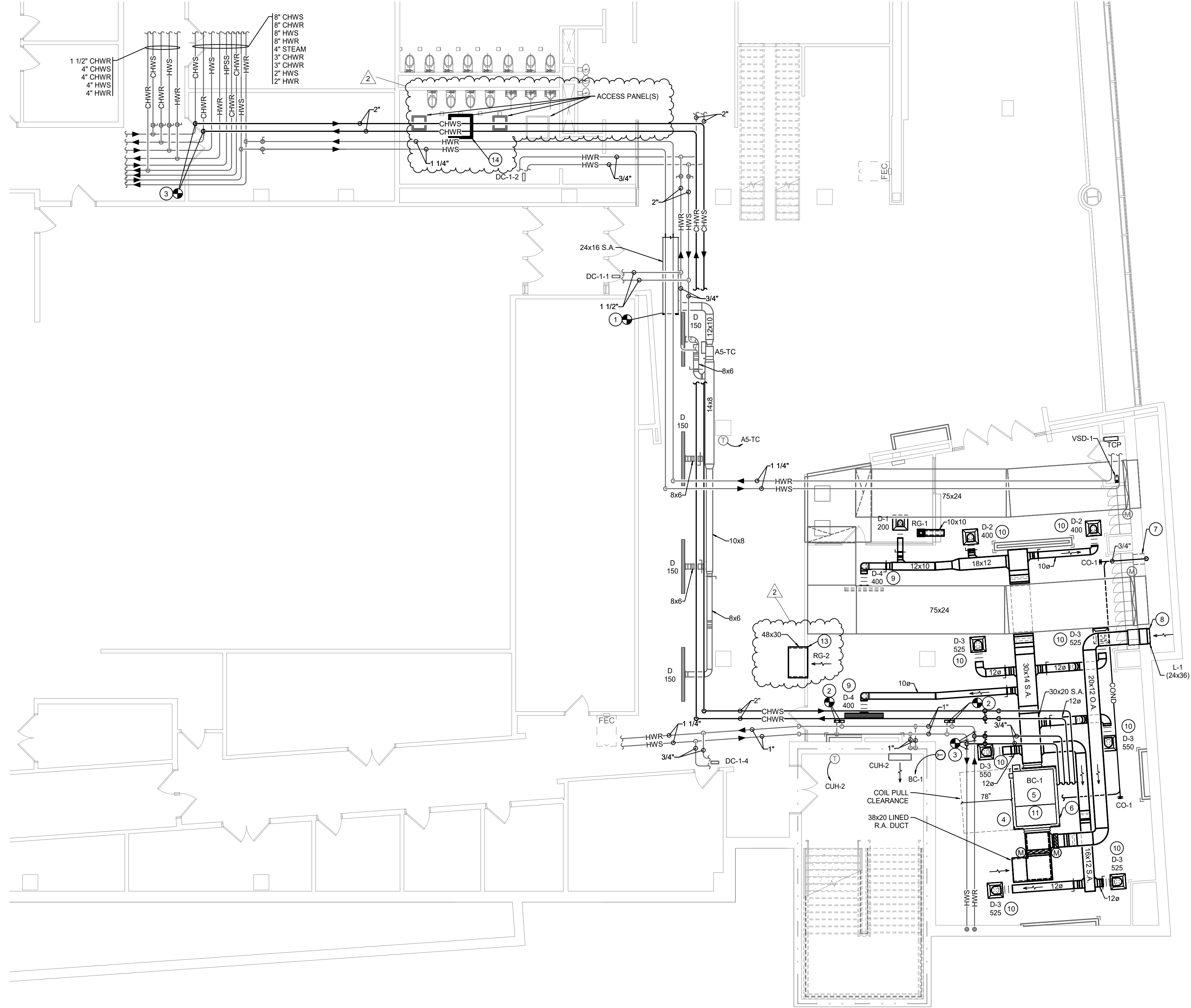
MECHANICAL DEMOLITION PLAN

M101



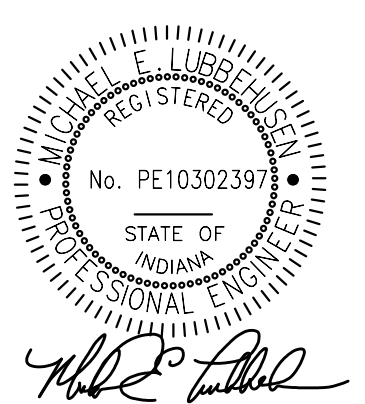
- PLAN NOTES**
- CAP EXISTING DUCTWORK AT LOCATION SHOWN.
 - CAP EXISTING HYDRONIC PIPING AT LOCATION SHOWN.
 - TIE-IN TO EXISTING HYDRONIC PIPING AT LOCATION SHOWN.
 - ROUTE HYDRONIC HOT AND CHILLED WATER PIPING TO AIR HANDLER. REFER TO COIL CONNECTION DETAIL ON SHEET M401 FOR MORE INFORMATION.
 - AIR HANDLER SHALL BE SUSPENDED FROM STRUCTURE. PROVIDE AND INSTALL NEOPRENE VIBRATION ISOLATION HANGERS. REFER TO MANUFACTURER'S INSTALLATION REQUIREMENTS FOR MORE INFORMATION.
 - PROVIDE AND INSTALL STAINLESS STEEL AUXILIARY DRAIN PAN WITH WATER LEVEL DETECTION DEVICE TIED TO AIR HANDLER. MINIMUM 1 1/2" DEPTH AND MINIMUM 3" LARGER THAN UNIT ON ALL SIDES.
 - CUTCORE FOUNDATION WALL TO ROUTE CONDENSATE PIPING OUTSIDE TO DRAIN. SEAL PIPE PENETRATION AIR/WATER TIGHT.
 - CUTCORE FOUNDATION WALL TO INSTALL OUTSIDE AIR INTAKE LOUVER. SEAL OPENING AIR/WATER TIGHT. REFER TO LOUVER PLENUM DETAIL ON SHEET M401 FOR MORE INFORMATION.
 - INSTALL LINEAR DIFFUSER IN BAFFLE CEILING CLOUD.
 - INSTALL DIFFUSER IN METAL MESH CEILING GRID.
 - AIR HANDLER SHALL BE FIELD DISASSEMBLED/ASSEMBLED TO FIT THROUGH 3' DOOR.
 - PROVIDE AND INSTALL TEMPERATURE CONTROL PANEL. REFER TO DETAIL ON SHEET M401 FOR MORE INFORMATION.
 - MOUNT BOTTOM OF RG-2 APPROXIMATELY 11" AFF.
 - PROVIDE AND INSTALL NEW ACCESS PANEL APPROXIMATELY 36"x36". COLOR SHALL BE BY ARCHITECT. COORDINATE WITH OWNER PRIOR TO INSTALL FOR PROPER LOCK/KEY. MATCH ADJACENT PANELS.

ALL EXISTING AND NEW DUCTWORK INSULATION SHALL BE PREPARED TO ACCEPT PAINT. COLOR BY ARCHITECT.



LOWER LEVEL MECHANICAL PLAN
1/8" = 1'-0"

CONSTRUCTION DOCUMENTS

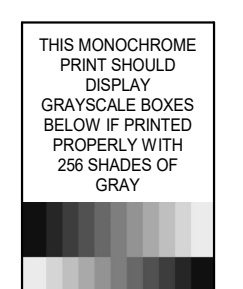


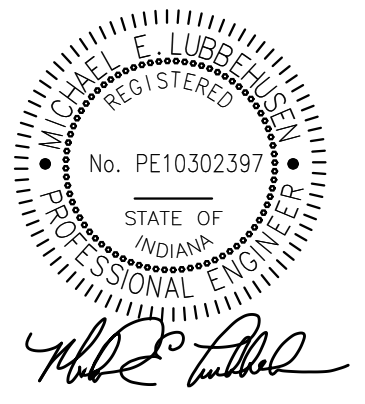
No.	Description	Date
1	ADD-01	08/30/24
2	ADD-02	09/10/24

CLIENT PROJ. #: IU20230101
PROJECT #: 24-013
ISSUE DATE: 09 JUL 2024
DRW: IJL | CHK: CSM

MECHANICAL PLAN
M201

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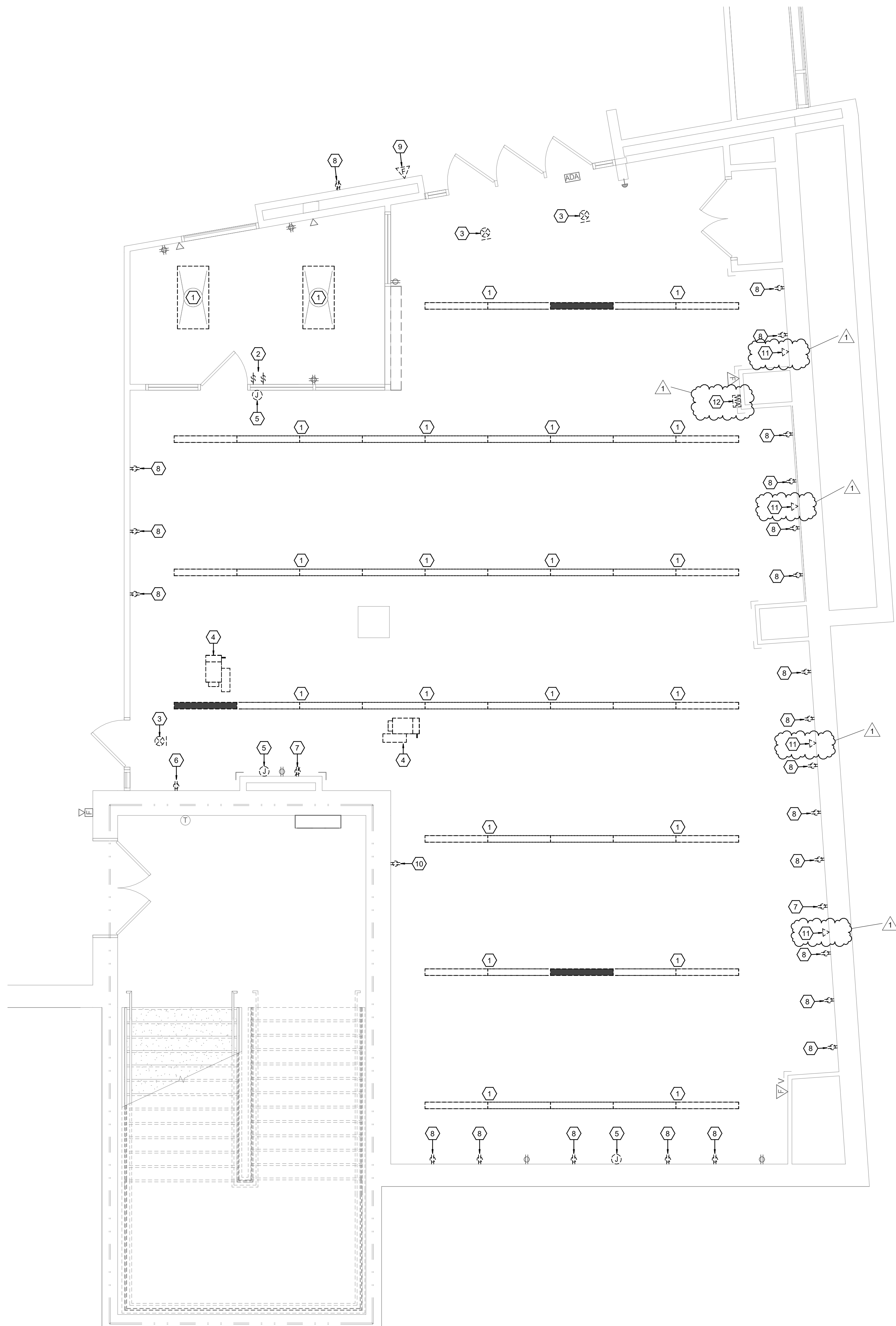


No.	Description	Date
1	ADD-02	09/10/24

CLIENT PROJ. #: IU20230101
PROJECT #: 24-013
ISSUE DATE: 09 JUL 2024
DRW: SBA | CHK: SBA

- DEMO PLAN NOTES**
- DISCONNECT AND REMOVE LIGHT FIXTURE, CONDUCTORS, CONDUIT, AND ASSOCIATED JUNCTION BOXES TO REMAIN. EXTEND EXISTING CONDUCTORS AS REQUIRED TO CONNECT NEW LIGHT FIXTURE. TYPICAL OF ALL FIXTURES IN THIS ROOM UNLESS OTHERWISE NOTED.
 - REMOVE EXISTING SWITCHES AND WALL PLATE. CONDUCTORS SHALL REMAIN AND BE UTILIZED TO CONNECT NEW LIGHTING CONTROL DEVICE.
 - DISCONNECT AND REMOVE EXIT SIGN, CONDUCTORS, CONDUIT, AND ASSOCIATED JUNCTION BOXES TO REMAIN. EXTEND EXISTING CONDUCTORS AS REQUIRED TO CONNECT NEW EXIT SIGN.
 - DISCONNECT MECHANICAL EQUIPMENT. REMOVE ASSOCIATED CONDUIT, CONDUCTORS, STARTER OR CONTROL PANELS AND DISCONNECTS IN THEIR ENTIRETY BACK TO SOURCE.
 - REMOVE EXISTING JUNCTION BOX, CONDUIT AND CONDUCTORS / CABLING BACK TO SOURCE.
 - REMOVE EXISTING RECEPTACLE AND WALL PLATE. EXTEND CONDUCTORS AS REQUIRED FOR INSTALLATION OF NEW RECEPTACLE AND COVERPLATE.
 - JUNCTION EXISTING CIRCUIT SERVING RECEPTACLE TO CONNECT NEW AV1.
 - REMOVE EXISTING RECEPTACLE AND ASSOCIATED CONDUCTORS, CONDUIT, AND JUNCTION BOXES BACK TO SOURCE / JUNCTION POINT.
 - REMOVE EXISTING FIRE ALARM DEVICE. EXTEND EXISTING CABLING AS REQUIRED TO NEW LOCATION OF FIRE ALARM DEVICE.
 - REMOVE EXISTING RECEPTACLE AND CONDUCTORS BACK TO JUNCTION POINT. ABANDON CONDUIT AND JUNCTION BOX IN WALL. PROVIDE BLANK COVERPLATE.
 - REMOVE EXISTING JUNCTION BOX, CONDUIT, AND CABLING BACK TO SOURCE.
 - REMOVE EXISTING WIRELESS ACCESS POINT COMPLETE. TURN OVER TO OWNER.

GENERAL NOTE
ELECTRICAL CONTRACTOR SHALL NOTIFY MECHANICAL CONTRACTOR IF RE-WORK OF MECHANICAL DUCTWORK IS REQUIRED FOR INSTALLATION OF NEW LIGHTS.
CONTRACTOR SHALL EMPLOY PROPER TRADES TO PATCH OPENINGS IN BUILDING CONSTRUCTION AND FINISH SURFACES TO MATCH ADJACENT AREAS.



1 ELECTRICAL DEMOLITION PLAN
1/4" = 1'-0"



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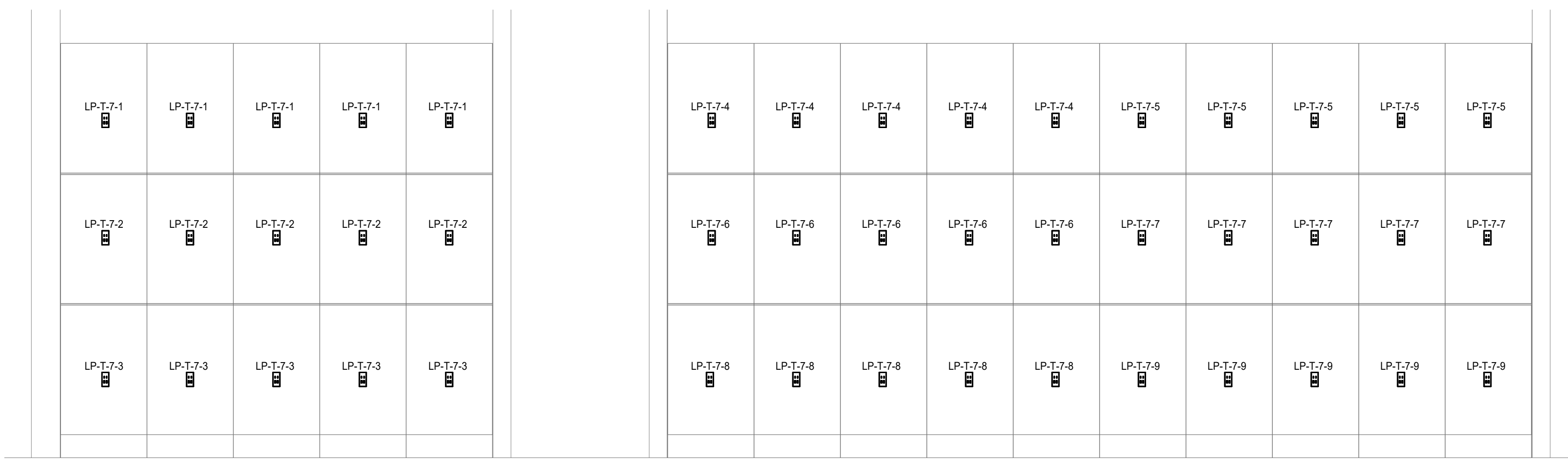
THIS MONOCHROME PRINT SHOULD DISPLAY GRAYSCALE BOXES BELOW IF PRINTED PROPERLY WITH 25% SHADE OF GRAY

- PLAN NOTES**
- COORDINATE LOCATION, ROUGH-IN REQUIREMENTS, AND ELECTRICAL REQUIREMENTS WITH RESPECTIVE CONTRACTOR AND APPROVED SHOP DRAWINGS PRIOR TO ROUGH-IN. REFER TO EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
 - CONNECT NEW PANEL LP-T-7 TO SPARE 225A/3P BREAKER LOCATED IN EXISTING LDP-T-2 ROUTE 2-1/2" C, 4-#40, 1-#4 FROM EXISTING BOARD TO NEW PANEL.
 - PROVIDE AND INSTALL PASS & SEYMOUR ARJ552420W4 USB TYPE A/C OUTLET MODULE WITH COORDINATE OR APPROVED EQUAL. COLOR SELECTION BY ARCHITECT. REFER TO LOCKER ELEVATION FOR BRANCH CIRCUIT INFORMATION.
 - PROVIDE AND INSTALL 20A USB CHARGING RECEPTACLE WITH USB A/C OUTLET. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
 - CONNECT TO EXISTING JUNCTIONED CIRCUIT.
 - ROUTE CONDUCTORS THRU CABLE MANAGEMENT OF FURNITURE. PROVIDE NECESSARY CONNECTORS TO MAKE A COMPLETE AND OPERATIONAL. CIRCUITS SHOWN AT EACH LOCATION.
 - INTERLOCK DUCT DETECTOR SUCH THAT UPON ALARM, MECHANICAL UNIT, AS INDICATED, SHUTS DOWN. CONTRACTOR SHALL PROVIDE AND INSTALL NEW FIRE ALARM DEVICE TO MATCH EXISTING FIRE ALARM SYSTEM. CONNECT NEW FIRE ALARM DEVICE TO EXISTING FIRE ALARM SYSTEM COMPLETE. CONTRACTOR SHALL INCLUDE CABLING, SETUP, AND PROGRAMMING.
 - PROVIDE AND INSTALL TWO (2) DATA JACKS FOR INSTALLATION OF NEW WIRELESS ACCESS POINT. COORDINATE LOCATION WITH OWNER.
 - RECEPTACLE FOR NEW RACK. FIBER TO BE INSTALLED BY UITS. COORDINATE REQUIREMENTS AND LOCATION WITH OWNER. PROVIDE CONDUIT SLEEVES AS REQUIRED FOR CABLING TO GAMING AREA.
 - COORDINATE LOCATION OF DATA OUTLETS WITH CABLE MANAGEMENT OF FURNITURE PRIOR TO INSTALLATION / ROUGH-IN.

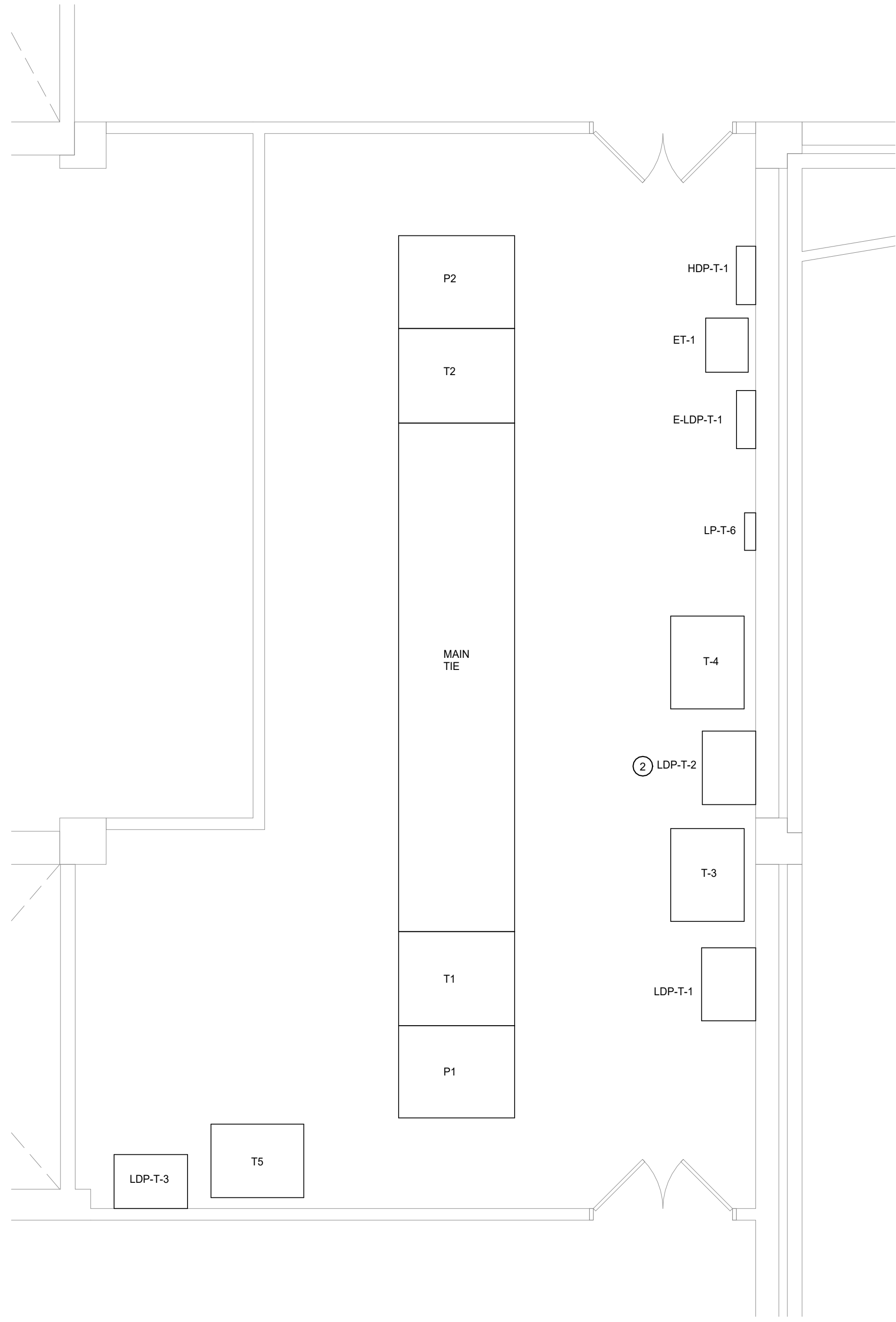
GENERAL NOTE

CONTRACTOR SHALL EMPLOY PROPER TRADES TO PATCH OPENINGS IN BUILDING CONSTRUCTION AND FINISH SURFACES TO MATCH ADJACENT AREAS.

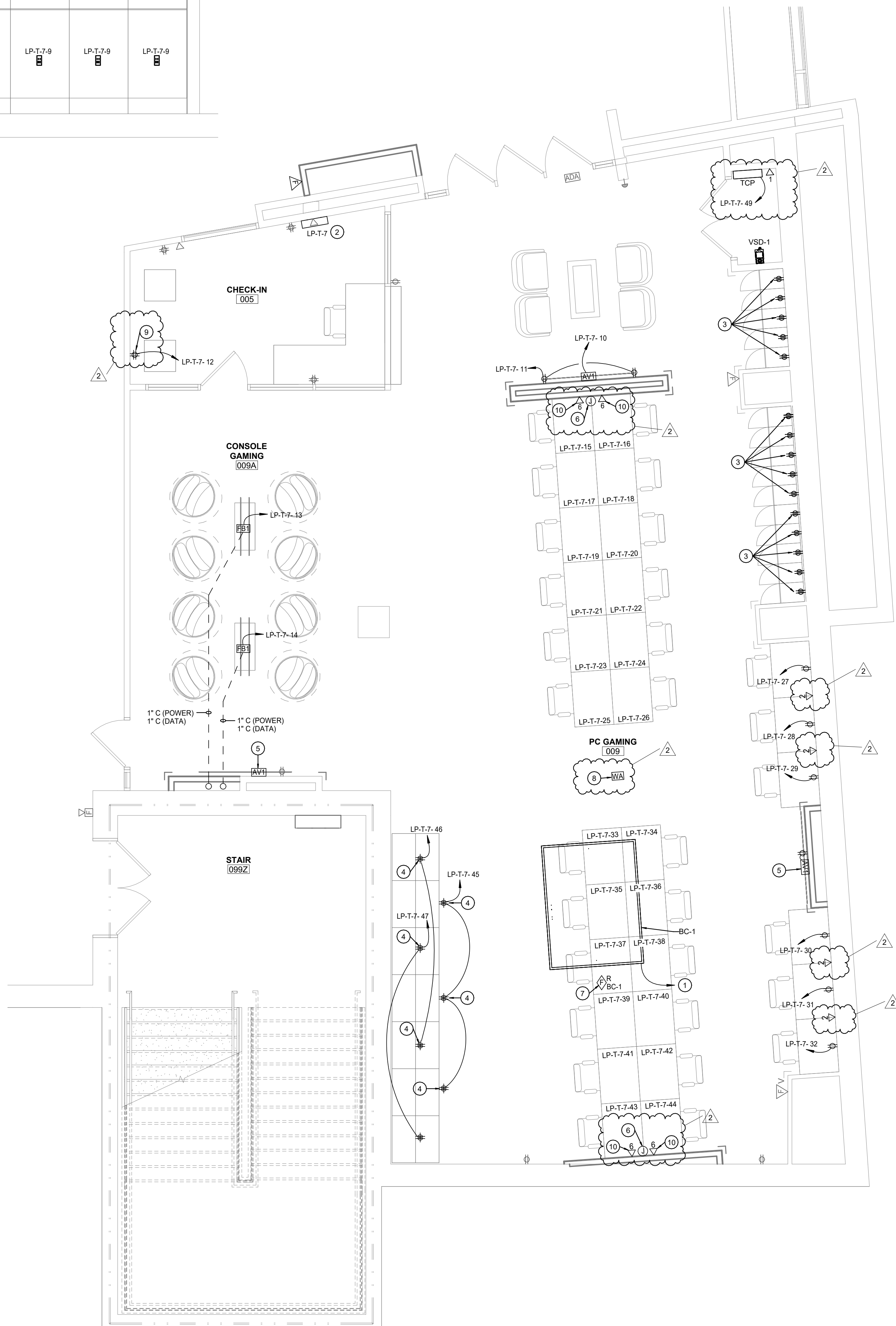
IDE ROOM ROOM 005



3 LOCKER ELEVATION
3/4" = 1'-0"

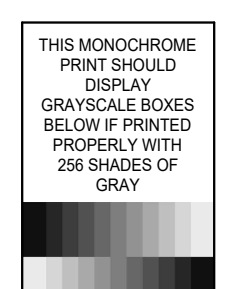


2 AREA C - ELECTRICAL ROOM
1/4" = 1'-0"



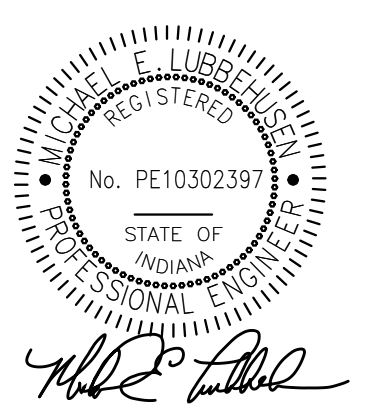
1 POWER AND SYSTEMS PLAN
1/4" = 1'-0"

SHEET PRINTED: 9/9/2024 11:54:06 AM



SCALE: 1/16" = 1'-0" SCALE: 3/32" = 1'-0" SCALE: 1/8" = 1'-0" SCALE: 1/4" = 1'-0" SCALE: 1/2" = 1'-0" SCALE: 3/4" = 1'-0" SCALE: 1" = 1'-0"

**CONSTRUCTION
DOCUMENTS**



No.	Description	Date
1	ADD-01	08/30/24
2	ADD-02	09/10/24

CLIENT PROJ. #: IU20230101
PROJECT #: 24-013
ISSUE DATE: 09 JUL 2024
DRW: SBA | CHK: SBA

**POWER & SYSTEMS
PLAN**

E201