

**THE
UNIVERSITY OF
ILLINOIS
AT
CHICAGO**



Telecommunications Standards Manual

8/18/2020

Version 4.4

Items highlighted in grey have been added / edited from version 4.3.1

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This document is a guide to all Architects, Engineers, Consultants, and Contractors pertaining to the construction design, review, comments, and approval procedures for Telecommunication and Network services as required by the University of Illinois at Chicago.

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For a complete list of all building standards for UIC please visit:

<https://cppm.uic.edu/construction/construction-codes-building-standards/building-standards/>

A. OVERVIEW

1. This document is a guide to all Architects, Engineers, Consultants, and Contractors pertaining to the construction design, review, comments, and approval procedures for Telecommunication and Network services as required by the University of Illinois at Chicago. Deviations will not be permitted without the consent of ACCC/Telecom Engineering Department. The UIC ACCC/Telecom Engineering Department can be reached at tcomengr@uic.edu
2. The University of Illinois at Chicago leases a CENTREX service from Ameritech for some voice services. Ameritech supplies dial tone to several Nodes on the University property. The dial tone is then delivered to the various campus locations on University owned and maintained copper cable plant. Unified voice services are delivered over the ACCC data network.
3. The University also owns and manages an independent campus fiber optic distribution system that links the various buildings together to provide high speed data service for its users
4. The communications system consists of major elements as follows:
 - a) Dial tone is delivered to Nodes from Ameritech's Monroe Central Office.
 - b) The Nodes are connected by University Cable to all UIC building IDFs (Intermediate Distribution Frames).
 - c) The IDF is connected to all FDFs (Floor Distribution Frames) within the building.
 - d) The FDF is home for each individual TELECOMMUNICATIONS INFORMATION OUTLET.
 - e) Network supported services are distributed over campus fiber optics from University Data Centers to each building IDF and FDF.
 - f) The telecommunication outlet has a minimum of two category 6 or 6a data jacks.
 - (1) For locations with Centrex or analog required services the addition of a voice jack may be required.
 - (2) Any changes to the standard telecommunications outlet must be approved by the ACCC/Telecom Engineering Department
5. All new or remodeled buildings must include both copper cable and fiber optic distribution systems extended to each FDF to properly serve the buildings.
6. These standards are provided to maintain adequate communications facilities in the University Buildings. Communication facilities include the cable distribution plant and cable termination equipment, both copper and fiber.
7. The Project Manager shall abide by these standards and allow no deviations without the consent of the ACCC/Telecom Engineering Department. All consultants shall incorporate this information into the design for all University projects.

B. GENERAL INFORMATION

1. The University's communications systems are complex. The systems that comprise the overall network enable the University to conduct its business. They include a variety of architectures and operate over numerous types of media. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. This standard specifies minimum requirements for telecommunications wiring between and within University buildings at the University of Illinois at Chicago.
3. This standard specifies a media system with a definite topology and specifies allowable distances between system components. The parameters of this media will determine performance, specific connectors and pin assignments to ensure interconnect ability.
4. Although the scope is limited only to the telecommunications aspect of building design, it should be recognized that this standard highly influences the design of other building systems and services; it also impacts space allocation within the building.
5. The term telecommunications as it relates to this standard encompasses all forms of information transport and processing. These will include voice, data, video, security, safety and any other telecommunications ingredients of a modern building.

C. RESPONSIBILITY AND AUTHORITY

1. UIC TELECOMMUNICATIONS DEPARTMENT

- a) The Telecommunications Department at the University of Illinois at Chicago will have the final review, approval, and acceptance authority for all telecommunications systems, facilities, and material. Consulting and coordination assistance is provided by the UIC ACCC/Telecom Engineering Department. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu

2. CONSULTING TELECOMMUNICATIONS ENGINEER

- a) New construction, major remodeling and renovation projects will require the services of a Consulting Telecommunications Engineer. This engineer will be employed the same as a Structural, Mechanical, or other types of Engineers. UIC ACCC/Telecom Engineering Department is to be consulted relative to the need for a Telecommunications Engineer on all projects.
- b) Minimum qualifications for a Telecommunications Engineer are as follows:
 - (1) A Registered Communications Distribution Designer (RCDD) shall be employed within the company. The RCDD shall affix their stamp to the bid document and all subsequent changes to the design.
 - (2) Ten years of working experience in the telecommunications industry and three years working experience in the planning and design of outside plant (OSP) and building riser facilities.
 - (3) Ability to author detailed specifications, construction drawings, bid documents, test requirements, and other documents.
 - (4) Ability to prepare punch lists and as-built drawings.
 - (5) Ability to inspect and supervise projects.
 - (6) Ability to chair progress meetings and resolve differences.
 - (7) Experience in a campus environment.
 - (8) Knowledge of Bell System Practices (BSPs) for outside plant engineering.
 - (9) Two years of experience working with category 6 / 6A cable and fiber optic media facilities.
 - (10) Must have the ability to apply design practices in accordance to the latest BICSI TDMM
- c) The commissioned Project Architect/Engineer is responsible for developing adequate space within the building for telecommunication facilities. This will include the conduits, cable raceways, enclosures, and the FDF wiring rooms (FDFs / IDF / NODEs).
- d) The Project Architect/Engineer is responsible for the detail design of all telecommunications facilities required in the building. It should be noted that unless there is a separate utility project associated, the project Architect/Engineer is also responsible for the extension of the University outside plant facilities from a specific Node to the specified building. The UIC ACCC/Telecom Engineering Department will help in the planning process of the project.

3. TELECOMMUNICATIONS CONTRACTORS

- a) Minimum qualifications for Telecommunications Contractors are:
 - (1) Five years of experience in the Telecommunications industry.
 - (2) Contractors must have BICSI technicians that have at least two years of experience and the ability to install, test and troubleshoot structured cabling systems including multimode and single-mode optical cable plants. These cable plants include intra-building and inter-building cabling. At least one Technician must be certified for crews of 4 or fewer. For every four or less additional techs, one of the four must hold the Technician certification.
 - (3) Three years working experience in outside plant construction and building cable installation.
 - (4) Experience in installing backbone and distribution cables.
 - (5) Experience in a campus environment.
 - (6) Ability to read and interpret construction drawings and specifications.
 - (7) Experience with Northern Telecom Gibabix Cross-Connect Systems and/ or 110 blocks.
 - (8) Ability to terminate the station jacks and all connecting blocks according to Industry and UIC Telecommunications specifications. Technicians must have at least two years of experience.
 - (9) Ability to test and record the results for all copper and fiber cable that is installed as well as the associated hardware, according to UIC ACCC/Telecom Engineering Department Specifications.
 - (10) Ability to terminate, splice and certify Fiber Optic Systems.
 - (11) Ability to terminate and certify gig / 10 gig copper cabling.
 - (12) Ability to produce cable and other record drawings.
 - (13) Have the necessary test equipment and trained technicians to operate the equipment.
- b) The reliance on sub-contractors will be limited on University projects and the level of reliance will be part of the evaluation criteria.
- c) The Telecommunications Contractor shall:
 - (1) Provide all material that is not specifically identified as University provided.
 - (2) Provide material that is new and free from defects, delivered to the job site in the original packing.
- d) All material, equipment, and devices shall be handled and installed in a manner according to the manufacturer's specifications and consistent with industry standards, UIC ACCC/Telecom Engineering Department Building Standards, and all local and national codes. Any deviations from the manufacturer's recommendations shall be reviewed and approved by UIC ACCC/Telecom Engineering Department prior to installation.
- e) Contractors shall be responsible for repairing any damage to floors, ceilings, walls, furniture, grounds, pavement, etc., caused by its personnel and/or operations. Any damages or disfiguration will be restored at the contractor's expense.

- f) Seal all penetrations in walls, floors, and ceilings with NFPA / UL approved fire stopping sealant installed in accordance with the manufacturer's tested methods. Unused conduits will be plugged and capped for fire stopping.
- g) Contractors shall be financially responsible for all services and/or repair cases caused by their employees or company. They will be billed by the University, Ameritech, or others for repairs of the respective facilities.
- h) Contractors shall provide all necessary temporary equipment and material, and shall maintain them in a safe and adequate manner and shall remove them immediately upon completion of the permanent installation.
- i) Contractors shall erect temporary barriers whenever necessary to assure the safety of University personnel, students and visitors, and wherever deemed necessary for securing materials.
- j) Contractor is responsible for insuring minimal disruption of existing telephone, computer, video, and data communications facilities and networks and will coordinate any anticipated outages with Telecommunications Engineering & Design.
- k) If any demolition or remodeling is involved, the Communications Contractor is expected to abide by the following guidelines:
 - (1) Coordination for demolition activities with the University Telecommunication Engineering & Design will be strictly enforced to minimize service disruptions and confusion over what activities must take place.
 - (2) A new drawing of the proposed remodeling floor layout should be available for use by the ACCC/Telecom Engineering Department work force.
 - (3) Upon notification, the UIC ACCC/Telecom Engineering Department will investigate what work operations are required prior to demolition. The UIC ACCC/Telecommunications Engineer will arrange to dispatch a technician to perform the necessary work.
 - (4) No telecommunications information outlets, cabling, telephones, or other hardware shall be moved, disconnected, or removed without prior approval of UIC ACCC/Telecom Engineering Department.
 - (5) After preliminary work is completed, the UIC ACCC/Telecommunications Engineer will inform the Project Coordinator that work can proceed. Any materials removed should be disposed of by the contractor in a proper manner.
 - (6) The Telecommunications Contractor will be responsible for providing the required information for the updating of all records. This information includes:
 - (a) Jack numbers and location (removed or installed).
 - (b) Any cross connects removed or installed with the corrected routing sheets.
 - (c) Any changes in the FDF.
 - (d) All as-builds including Certification and test results

D. CONSTRUCTION DOCUMENTS & WORKING DRAWINGS

(RESPONSIBILITY OF THE COMMISSIONED PROJECT ARCHITECT / ENGINEER)

1. The commissioned Project Architect/Engineer will provide floor plans and details identifying all existing, removed and/or new:
 - a) Telecommunications and information systems.
 - b) Main equipment rooms (IDF).
 - c) Individual floor equipment rooms (FDFs).
 - d) Individual floor telecommunications outlets.
2. These drawings must be on Auto CAD. A paper hardcopy of the drawings must also be submitted. The drawings must conform to the existing UIC numbering scheme. UIC ACCC/Telecom Engineering Department will supply any needed information to meet this requirement. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
3. The telecommunications drawings must show all raceways (conduits, cable trays, ladder racks, floor ducts, junction boxes, pull boxes, splice boxes, manholes, and all associated supports) for all proposed telecommunications facilities.
4. The telecommunications drawings shall be separate from other drawings and will be identified as Telecommunications and System Drawings within the Electrical Section.
 - a) The telecommunication outlet has a minimum of two category 6 or 6a data jacks.
 - (1) For locations with Centrex or analog required services the addition of a voice jack may be required.
 - (2) Any changes to the standard telecommunications outlet must be approved by the ACCC/Telecom Engineering Department
5. When applicable, within the scope of the job, outside plant drawings shall be provided for the distribution (node to building) and riser (within building) cables for both the copper and fiber optic cables including the following information:
 - a) Between building (outside Plant) distribution cable routes for copper, fiber and coax cables.
 - b) Service entrance into the building.
 - c) Detailed riser distribution cable routes.
 - d) Distribution cable support systems.
 - e) Type, size, sheath, gauge, and length of all cable, except the station cables.
 - f) All splice locations with the cable numbers and the counts involved.
 - g) The location and the count of the protector equipment.
 - h) All major hardware locations showing the location and quantities of the specific hardware required. These drawings shall follow the existing patterns of the University.
6. Plans and detail information of the main distribution frames (Nodes), the intermediate distribution frames (IDFs), and the floor distributions frames (FDFs) shall identify the following details:

- a) Room layout (FDF/IDF plans and elevation) showing the location of splices, backboards, protectors, frames, racks, mounts, cage, TMGB or TGB (ground buss bar), wall mounted information outlet, cables, cable counts, and all equipment.
 - b) Location of distribution and riser cable terminations.
 - c) Dimensions of devices, fixtures, etc.
 - d) Details of special supports required for clarification.
 - e) Location of all pull boxes, junction boxes, ladder rack, and cable tray.
 - f) Number of telecommunications outlets that need to be terminated.
 - g) Terminating details and designations.
 - h) Location of Dedicated Power Outlets and convenience outlets.
7. Drawing reviews will be necessary during the design and review procedures of the project and shall show the following information in the specified time frames:
- a) Design development drawings shall be submitted and approved before work is started on final working drawings. They shall show the following information:
 - (1) Preliminary information concerning the work area outlets including the number designation of each outlet. The numbers shall contain a minimum of one alpha and three numerical characters that follow the University numbering scheme: A-001-V, A-001-D1 and A-001-D2. Where "A" Represents the FDF Letter, "001" represents the outlet number, "V" represents Voice and "D-1 & D-2" represents Data 1 and Data 2.
 - (2) Preliminary riser layouts will include the conduit/sleeve sizes, location of the FDFs (including the area the FDF serves), and the cable size, the cable type, cable counts, and cable routing.
 - (3) Sketches of the proposed distribution system complete with building service entrance location, IDF location, size and type of cable, and any splice locations.
 - (4) Sketches of the Node frame termination locations.
 - (5) Communication Bonding and Grounding drawing showing the Bonding Conductor for Telecommunications, TMGB, all TGBs, TBB (including cable size) and GE if required by building size.
 - b) Seventy-five percent Construction Drawings will include the following:
 - (1) All the telecommunication floor outlets (numbered).
 - (2) Telecommunication distribution cables.
 - (3) Telecommunication riser cables.
 - (4) Telecommunications entire raceway network (including all sizes).
 - (5) Detailed drawings showing the GIGA BIX blocks, patch panels, grounding, etc. of IDF and FDF layouts ([See drawing 4e](#)).
 - (6) Comments from the previous Design Development Drawings.
 - (7) General specifications -
 - c) Ninety-five percent Construction Drawings will include the following:
 - (1) Finished working drawings and specifications with the previous comments included.
 - (2) Final telecommunication drawings for the Node, IDF, and each FDF location showing the number and type of telecommunication information outlets to be terminated, and the major hardware required as well as the detailed termination information for both copper cable and the fiber optic media. (The University has drawings detailing existing cable runs, terminal closets, risers, etc.; copies may be obtained from UIC ACCC/Telecom Engineering Department when required).

E. CONTRACTOR REQUIREMENTS FOR BIDDER'S LIST

1. Must be an Electrical / Telecommunications contractor with the installers working directly for the contractor. Work must not be given to a sub-contractor. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. Contractors must have BICSI certified Technicians
 - a) Technicians must have the ability to install, test and troubleshoot structured cabling systems including multimode and single mode optical cable plants. These cable plants include intra-building and inter-building cabling.
 - b) At least one Technician must be certified for crews of 4 or fewer. For every four or less additional techs, one of the four must hold the Technician certification.
 - c) Proof of a current Technician Certification is required prior to work
3. Five years of experience in the Telecommunications industry.
4. Three years working experience in outside plant construction and building cable installation.
5. Experience in installing backbone and distribution cables.
6. Experience in and knowledge of the latest standards as they relate to structured cabling systems
7. Experience in a campus location.
8. Ability to read and interpret construction drawings and specifications.
9. Experience with Northern Telecom GIGABIX Cross-Connect Systems and/or 110 blocks.
10. Ability to install conduit systems and terminate the station jacks and all connection blocks according to UIC Telecommunication Building Standards.
11. Ability to test and record the results for all copper and fiber cable that is installed as well as the associated hardware, according to UIC ACCC/Telecommunications Building Standards.
12. Ability to terminate, splice and certify Fiber Optics Systems.
13. Ability to terminate and certify gig / 10 gig copper cabling.
14. Ability to produce cable and other record drawings.
15. Have the necessary test equipment and trained technicians to operate the equipment.
16. Must be willing to bid on small jobs as well as big projects.
17. Must be willing to have each electrician to work on site, both Electrical and Low Voltage

F. INSTALLER / TECHNICIAN CERTIFICATION REQUIREMENTS

1. Contractors **MUST** provide BICSI Technicians that have at least two years of experience and the ability to install, test, and troubleshoot structured cabling systems including multimode and single-mode optical cable plants. These cable plants include intra-building and inter-building cabling.
 - a) At least one Technician must be certified by BICSI and be on-site for crews of 4 or fewer. For every four or less additional techs, one of the four must hold the Technician Certification.
 - b) The on-site Technician must provide proof of a current credential.
 - c) For bid jobs the contractor must submit the technicians' names and credentials for approval prior to work starting.
2. Copies of current certifications must be sent to tcomengr@uic.edu to be kept on file.
3. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu

G. SCHEDULE

1. The Contractor shall work with UIC ACCC/Telecom Engineering Department representative and develop a time schedule in order to track the progress of the installation. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. The schedule will cover all major portions of the job and will be used to guarantee that UIC ACCC/Telecom Engineering Department can make sample tests and accept the job with enough time to process service orders and deliver all communications services on time to the UIC users.
3. The UIC Facilities Management Project Manager shall inform UIC ACCC/Telecom Engineering Department of the current schedules of any projects involving Telecommunication Outlets or and other work effecting any form of telecommunications.
4. The UIC Facilities Management Project Manager shall inform UIC ACCC/Telecom Engineering Department of any project meetings involving Telecommunications so that a Telecommunications representative may be present at the meeting.
5. The UIC Office of Capital Programs Project Manager shall inform UIC ACCC/Telecom Engineering Department of the current schedules of any projects involving Telecommunication Outlets or and other work effecting any form of telecommunications.
6. The UIC Office of Capital Programs Project Manager shall inform UIC ACCC/Telecom Engineering Department of any project meetings involving Telecommunications so that a Telecommunications representative may be present at the meeting.
7. The UIC ACCC/Telecom Engineering Department shall inform the Office of Capital Programs and Facilities Management Projects Section of any projects that are being done through UIC ACCC/Telecom Engineering Department for their comments.

H. PUNCH LISTS

1. The UIC ACCC/Telecom Engineering Department Inspector shall supply punch list items as he inspects and finds items that do not meet the UIC Standards or the project design.
 - a) On Capital Programs and Facilities Management projects these punch lists shall be given to the project manager.
 - b) On projects managed by UIC ACCC/Telecom Engineering Department the punch lists shall be given to the contractor.
2. Both the material and workmanship will be evaluated and any error will be noted.
3. The contractor shall resolve all punch list items prior to the job being accepted.
4. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
5. Once punch lists are completed activation of network jacks will be coordinated.

I. RECORDS

1. The Electrical Contractor shall submit to UIC ACCC/Telecom Engineering Department a complete set of as-built drawings along with close out documents listing approved substituted methods of installation and substituted materials. These drawings shall show every detail of the construction upon completion of the project. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. Cable records shall be submitted to UIC ACCC/Telecom Engineering Department and shall include complete and accurate documentation showing every splice and cross-connection by cable number and pair, as well as the information outlet numbers and location. The records must conform to the cable numbering system established by the ACCC/UIC Telecommunications Department. See Standards Section [LABELING/ADMINISTRATION](#)
3. With the supervision of UIC ACCC/Telecom Engineering Department representative, the contractor shall test every pair in every cable installed end-to-end after splicing and terminating is completed.
4. For Backbone cabling, the contractor shall prepare and submit to UIC ACCC/Telecom Engineering Department cable distribution "as-built" drawings which reflect the following:
 - a) Exact route of all outside plant cabling from the NODE to the IDF, including underground conduits and tunnel routes. Included shall be a detailed cross-section drawing of all conduits encased in concrete with all dimensions, reinforcements, and sill.
 - b) Cable size, count, gauge, and length of all cables installed.
 - c) Every splice by cable number and pair count.
 - d) The cable numbering system shall conform to the existing University numbering system. See Standards Section [LABELING/ADMINISTRATION](#)
5. For Horizontal infrastructure the contractor shall prepare and submit "as-built" floor plan drawings which reflect:
 - a) Building entry, IDF, FDF, cable tray, raceway, and information outlet locations.
 - b) Corrected risers, conduit sizes, splice locations, cable counts, terminals, and patch panels.
6. For Work area cabling the contractor shall prepare and submit "as-built" floor plans drawings which reflect:
 - a) Any demoed existing infrastructure including jack identifiers which were removed
 - b) Any new infrastructure with the appropriate identifiers. See Standards Section [LABELING/ADMINISTRATION](#)
7. Label each drawing "AS-BUILT" in neat, large printed letters. Markings must be legible and with permanent ink. These drawings will also be submitted in Auto CAD.
8. The Communications Contractor shall provide the University with field corrected floor plan drawings prior to acceptance of the work by the University.
9. The Communications Contractor shall provide the University with all testing documentation prior to the University acceptance of the work.
10. All test results shall be submitted in both PDF and test equipment format. See Standards Section [TESTING](#)
11. Approved Substitutions
 - a) Where methods or materials are approved for substitution, these methods or materials must be submitted for prior approval of work and again for final acceptance of the job. These will be placed in the close-out documents.

- b) For substituted materials, the contractor must provide a manufacturer's spec sheets showing the equivalent substitution.

J. WARRANTY

1. The Telecommunications Contractor shall have a BICSI Technician on site during all phases of the project. Refer to Standards Section Responsibility and Authority. For on-site moves or changes response time for corrections shall be within two hours from the time the contractor is notified of a problem. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. The Communications Contractor shall warranty all labor and material for a period of one year from the acceptance date.
3. Response time for warranty work performed after building activation shall be a maximum of two working days.
4. During the warranty periods the contractor shall repair or replace any defective items at no cost to the University.
5. The contractor shall provide the University all test documents and as built drawings prior to acceptance and activation.

K. CODES, STANDARDS, REGULATIONS AND GUIDELINES

1. Electrical and building codes, standards and guidelines govern the installation practices and materials used in the construction of telecommunications facilities. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. Equipment and material used at UIC shall be Underwriters' Laboratories (UL) or Canadian Standards Association (C.S.A.) listed and labeled.
3. The latest editions and amendments of the following codes, standards and guidelines are minimum requirements:
 - a) Municipal Code of Chicago Relating to Electrical Inspection (City of Chicago Electrical Code).
 - b) NFPA 70 National Electrical Code (NEC).
 - c) ANSI/TIA/EIA-568-C Series of standards and Addendums
 - d) ANSI/TIA/EIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces.
 - e) ANSI/EIA/TIA-570-B Residential and Light Commercial Telecommunications Wiring Standard.
 - f) ANSI/EIA/TIA-598-C - Optical Fiber Cable Color Coding.
 - g) ANSI/TIA/EIA-606-A - The Administration Standard for the Telecommunications Infrastructure of Commercial Building
 - h) ANSI/TIA/EIA-607-B Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - i) ANSI/TIA/EIA-758-C Customer-Owned Outside Plant Telecommunications Cabling Standard.
 - j) ANSI/TIA 942 Telecommunications Infrastructure Standard for Data Centers
 - k) ANSI/TIA 526 Optical Fiber Systems Test Procedures
 - l) NECA/FOA 301 Standard for Installing and Testing Fiber Optics Cables
 - m) Federal Communications Commission's (FCC) Part 15 - FCC Rules Addresses electromagnetic radiation
 - n) Federal Communications Commission's (FCC) Part 68 - FCC Rules provides regulations for connecting premises cabling and customer-provided equipment to the regulated networks.
 - o) The Americans with Disabilities Act of 1990 as it relates to telecommunications is covered in "Title IV: Telecommunications," which covers the functionality of devices for hearing and speech impaired individuals and in "Appendix B. Section 4.3.1: Telephones," which covers accessibility to telephones and communications devices by the physically impaired. ADA Amendments Act of 2008 (P.L. 110-325) 2010 ADA Standards for Accessible Design
 - p) Telecommunications Distribution Methods Manual, Building Industry Consulting Services International (BICSI).
 - q) Customer-Owned Outside Plant Design Manual, Building Industry Consulting Services International (BICSI).
 - r) Information Transport Systems Installation Method Manual ITSIMM, (BICSI).
 - s) BICSI - DD120 Grounding and Protection Fundamentals for Telecommunications Systems.
 - t) International Association of Electrical Inspectors - Soares Book on Grounding.
 - u) Municipal Code of Chicago Relating to Fire Prevention (City of Chicago Fire Code)
 - v) National Fire Protection Association Life Safety Code (NFPA 101)
 - w) Any other UIC applicable codes, standards and guidelines not listed.

L. EMERGENCY TELEPHONE UNITS (ETUS), SILENT PANIC BUTTONS AND PARKING ASSISTANCE UNITS (PAUS)

1. The University has "specially designed emergency telephones" that are used outdoors in bollards, on poles, on walls and in parking lots. They are also used indoors in elevators, elevator lobbies, washrooms, hallways and some building entrances throughout the campus. Another "specially designed parking assistance telephone" is used in parking assistance bollards located at the entrance to UIC parking lots. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. In the planning stage of new buildings and remodeling, the need for outside and inside emergency telephones will be discussed and the locations will be determined. Locations shall be discussed with the University Police Department and UIC Telecommunications Engineering & Design for approval. The UIC VCAS group vcas@uic.edu in conjunction with the UIC police must give the final approval for each location.
3. All units shall be installed in accordance to the most current ADA height requirement.
 - a) ADA height requirements from the 2010 ADA Revision:

308 Reach Ranges

308.1 General. Reach ranges shall comply with 308.

| <p>Advisory 308.1 General. The following table provides guidance on reach ranges for children according to age where building elements such as coat hooks, lockers, or operable parts are designed for use primarily by children. These dimensions apply to either forward or side reaches. Accessible elements and operable parts designed for adult use or children over age 12 can be located outside these ranges but must be within the adult reach ranges required by 308.</p> | | | |
|---|----------------|------------------|-------------------|
| Children's Reach Ranges | | | |
| Forward or Side Reach | Ages 3 and 4 | Ages 5 through 8 | Ages 9 through 12 |
| High (maximum) | 36 in (915 mm) | 40 in (1015 mm) | 44 in (1120 mm) |
| Low (minimum) | 20 in (510 mm) | 18 in (455 mm) | 16 in (405 mm) |

308.2 Forward Reach.

308.2.1 Unobstructed. Where a forward reach is unobstructed, the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

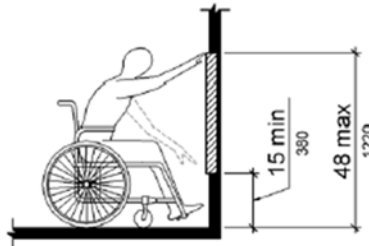


Figure 308.2.1 Unobstructed Forward Reach

308.2.2 Obstructed High Reach. Where a high forward reach is over an obstruction, the clear floor space shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches (1220 mm) maximum where the reach depth is 20 inches (510 mm) maximum. Where the reach depth exceeds 20 inches (510 mm), the high forward reach shall be 44 inches (1120 mm) maximum and the reach depth shall be 25 inches (635 mm) maximum.

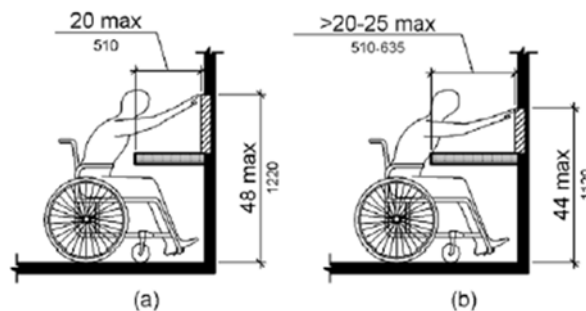


Figure 308.2.2 Obstructed High Forward Reach

308.3 Side Reach.

308.3.1 Unobstructed. Where a clear floor or ground space allows a parallel approach to an element and the side reach is unobstructed, the high side reach shall be 48 inches (1220 mm) maximum and the low side reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

EXCEPTIONS:

1. An obstruction shall be permitted between the clear floor or ground space and the element where the depth of the obstruction is 10 inches (255 mm) maximum.
2. Operable parts of fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum measured from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

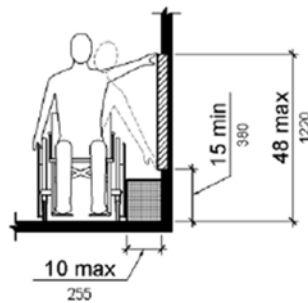


Figure 308.3.1 Unobstructed Side Reach

308.3.2 Obstructed High Reach. Where a clear floor or ground space allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches (865 mm) maximum and the depth of the obstruction shall be 24 inches (610 mm) maximum. The high side reach shall be 48 inches (1220 mm) maximum for a reach depth of 10 inches (255 mm) maximum. Where the reach depth exceeds 10 inches (255 mm), the high side reach shall be 46 inches (1170 mm) maximum for a reach depth of 24 inches (610 mm) maximum.

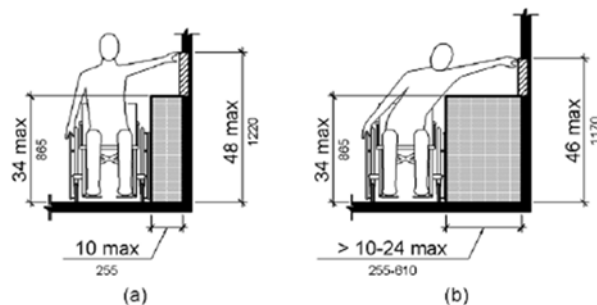


Figure 308.3.2 Obstructed High Side Reach

4. Required material for Bollard installations (With Integrated Police Camera):

- a) One Code Blue Bollard Model Code Blue CB1-S
(1) UIC Supplied/Contractor Installed
- b) One Code Blue LED Strobe Light.
(1) UIC Supplied/Contractor Installed
- c) One special modified Gai-Tronics speaker phone unit
(1) UIC Supplied/UIC Installed
- d) One Code Blue Overhead Camera Mount.
(1) UIC Supplied/Contractor Installed
- e) One UIC Police Specified IP Surveillance Camera.
(1) UIC Supplied/UIC Installed
- f) OCPPM/FM can purchase hardware thru UIC ACCC/Startel Department.

5. Required material for Bollard installation:

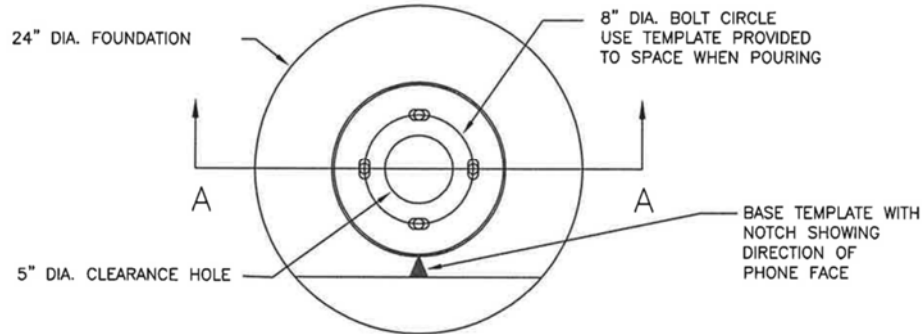
- a) One Code Blue Bollard Model Code Blue CB1-S
(1) UIC Supplied/Contractor Installed
- b) One Code Blue LED Strobe Light.
(1) UIC Supplied/Contractor Installed
- c) One special modified Gai-Tronics speaker phone unit
(1) UIC Supplied/UIC Installed
- d) OCPPM/FM can purchase hardware thru UIC ACCC/Startel Department.

6. Installation Procedures:

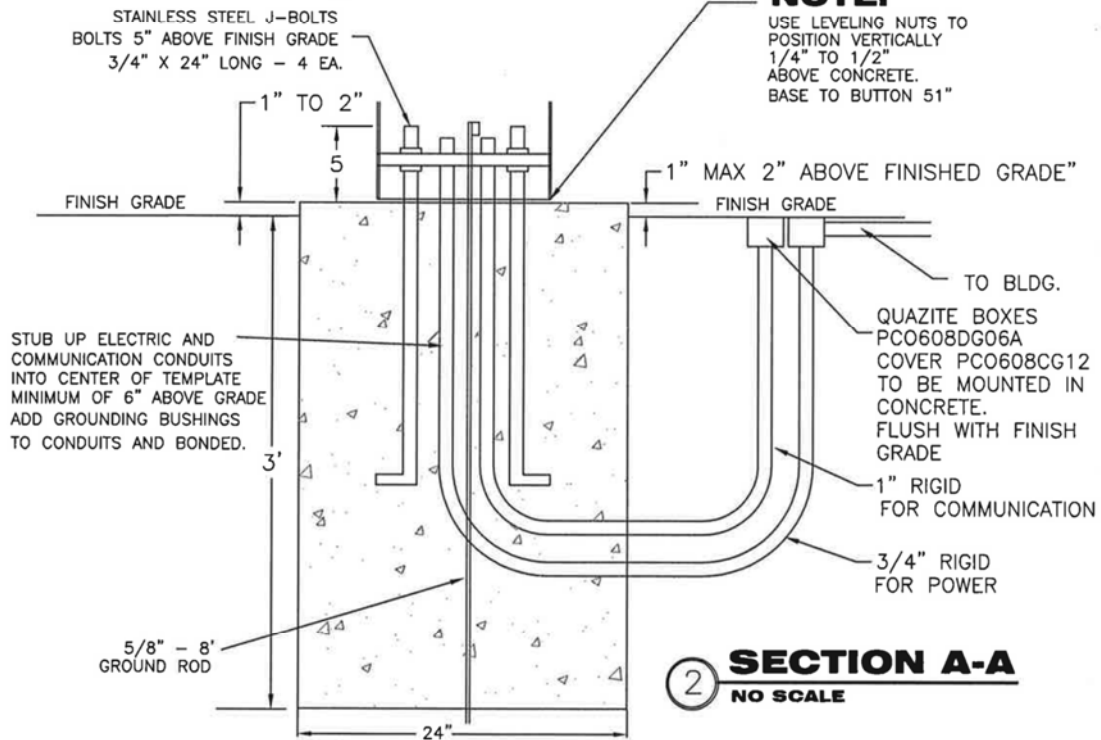
- a) Bollard Communication Cable:
 - (1) For outside ETU installs use Hitachi black jacketed 30180-8 outdoor rated Category 6 cable or UIC ACCC/Telecom Engineering Department approved equivalent.
 - (2) For inside ETU installs use Hitachi green jacketed 30024-8 Plus Riser rated Category 6 cable or UIC ACCC/Telecom Engineering approved equivalent.
- b) Bollard Communication Cable Terminations:
 - (1) The communications cable shall be installed in an approved raceway from the bollard to a local FDF wiring closet in the building without splices.
 - (2) A Suttle SE625A-6 jack shall be installed at the telephone height inside the bollard. Holes are not to be drilled in the bollard, ty-rap the jack to the existing cords.
 - (3) The cable shall be terminated in the closest FDF on the next available Gigabix block or in succession with all new ETU's on a new construction projects.
 - (4) The communication cable shall be marked at both ends in accordance to the **LABELING** section of this standard.
 - (5) The contractor shall certify the cable in accordance to the **TESTING** Section of this standard. Length tests may fail if distances are over the 295' Ethernet standard.
- c) Bollard Camera Fiber Optics Cable:
 - (1) Shall be General Cable OM4 I/O Plenum Tight Buffered 6 Strand General Cable or UIC ACCC/Telecom Engineering Department approved equivalent.
 - (a) A 10' service coil is to be placed at the bollard.

- (2) Bollard fiber terminations shall be placed in a **Panduit CBXF6BL-AY** Mini-Com Fiber Box with **Panduit CMDAQSCZBL** SC Duplex adapters. Use SC Factory Pre-Polished Terminations. See [PRODUCT](#) section for approved Manufacturers.
- (3) FDF/IDF Terminations shall be placed in an existing or new Ortronics Fiber Cabinet. See [PRODUCT](#) section for approved Manufacturers
- (4) Terminations shall be completed by a Bicsi Technician
- (5) The communication cable shall be marked at both ends in accordance to the [LABELING](#) section of this standard.
- (6) The contractor shall certify the cable in accordance to the [TESTING](#) Section of this standard.
- d) Power Conductors:
 - (1) Shall be three #10 THHN conductors connected to the emergency power panel in the building on a dedicated circuit unless otherwise approved by ACCC/Telecom Startel Department and the UIC Police Department.
 - (2) There shall be a double duplex outlet mounted inside the bollard.
- e) The base shall be installed per [diagrams 17B & 17I](#).

BOLLARD BASE FOR STANDARD E.T.U.'s & P.A.U.'s



1 BOLLARD PLATE NO SCALE



2 SECTION A-A NO SCALE

DIAGRAM 17B

| | | |
|--------------------------------------|--------------------|----------------------------------|
| FILE: BOLLARD.DWG | DRAWN BY: T. E. D. | UNIVERSITY OF ILLINOIS AT |
| DWG: E.T.U. & P.A.U. BOLLARD BASE | DATE: 03/31/15 | CHICAGO |
| | SHEET: 1 OF 1 | TELECOMMUNICATIONS DEPARTMENT |
| | SCALE: NO SCALE | |

ETU AND PAU CONDUIT INSTALLATION

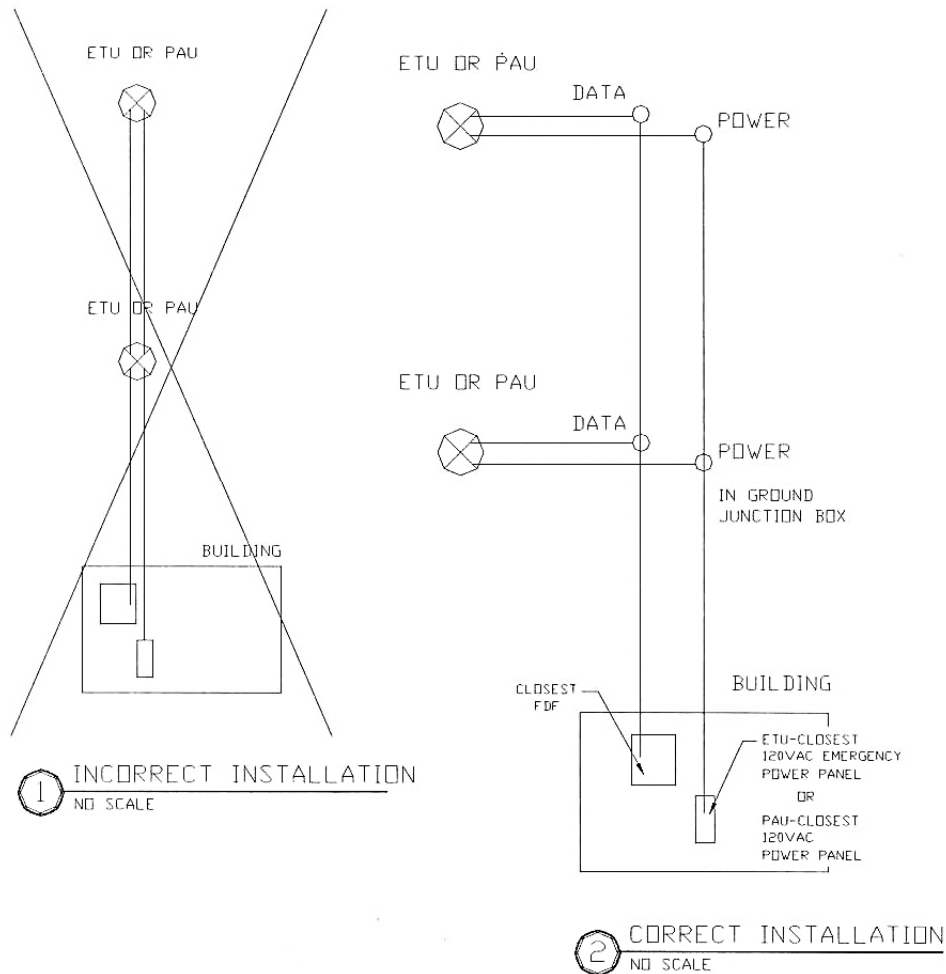


DIAGRAM 17i

| | | |
|-------------------|--------------------|------------------------|
| FILE: ETUDIGRMDWG | DRAWN BY: T. E. D. | UNIVERSITY OF ILLINOIS |
| DWG: ETU - PAU | DATE: 07.30.97 | AT CHICAGO |
| CORRECT | SHEET: 1 OF 1 | TELECOMMUNICATIONS |
| INSTALLATION | SCALE: NO SCALE | DEPARTMENT |



- f) Bollard Conduits:
 - (1) ¾" Heavy Wall for Power
 - (2) 1" Heavy Wall for Communications (Radius Fittings Only)
 - (3) Provide Heavy Wall or PVC with approved by UIC ACCC/Telecom Engineering Department From the Quazite Box to the building
 - (4) The conduit into the base of the bollard **must** be ¾" and 1" heavy wall steel ridged conduit.
 - (5) The conduits must have insulated grounding bushings bonded to the ground rod with #6 green insulated stranded copper cable.
 - (6) All outdoor in ground junction and pull boxes shall be Quazite part number PCO608DG06A box with a Quazite part number PCO608CG12 cover.
 - (a) Separate conduit runs for power and data are to be installed. With separate junction boxes.
 - (b) The covers are to be marked "ETU Power" or "ETU Data" according to their use.
 - (7) All applicable electrical codes must be followed.
 - g) Each bollard shall be grounded with a 5/8" or 3/4" diameter eight foot long copper plated ground rod.
 - h) The access cover at the base of the bollard shall be clearly marked with a permanent machine generated label, on the inside of the cover, the following information:
 - (1) The building number, FDF number, and jack number the data cable comes from.
 - (2) The building number, emergency power panel number, emergency circuit number, and the room number the panel is located in that the emergency power comes from.
 - i) Bollards shall not be used as a pass through for other bollards.
 - (1) In- ground junction boxes shall be installed close to the bollard for that purpose, one for the power and a separate one for the voice circuit. They shall not share the same junction box, even if it is properly divided.
 - j) The ETU Communication circuits shall not pass through any other device in route to the bollard.
7. Contractor Coordination:
- a) Install conduits, power wiring, communication cable, concrete base including the galvanized "J" bolts, ground rod, Bollard (or stainless steel box and strobe light if a bollard is not used), and lamp. The contractor shall make all power connections. The contractor must check with UIC ACCC/Telecom Startel Department before starting work on the ETUs or PAUs.
 - b) UIC ACCC/Telecom Startel Department shall determine the FDF or IDF the ETU or PAU shall be fed from.
 - c) The contractor shall contact UIC ACCC/Telecom Startel Department for an inspection at least 24 hours prior to pouring any concrete or installing any blacktop.
 - (1) If this is not complied with, the rework caused will be at the contractor's expense.
 - d) UIC ACCC/Telecom Startel Department will determine, with the UIC Police, the direction of the Bollard, unless shown on the drawings provided. This will dictate the placement of the "J" bolts.
 - e) When the contractor has completed his work he shall contact the UIC ACCC/Telecom Startel Department to indicate the job is ready for inspection.

8. Parking PAUs:

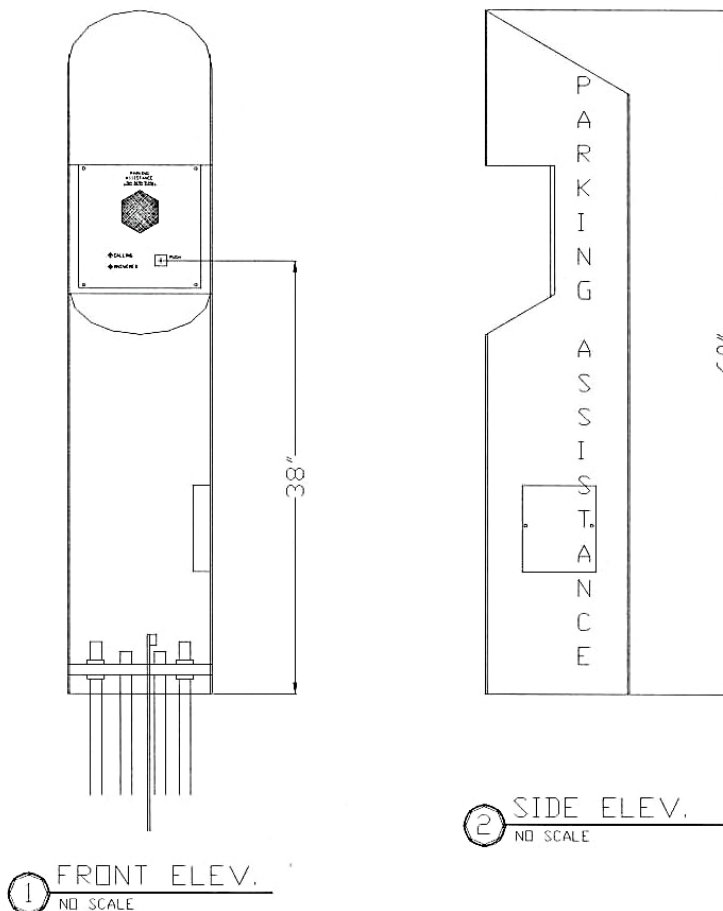
- a) PAU's shall meet the same standards as the ETUs except for the following exceptions:
 - (1) Their power is not to come from an emergency power panel.
 - (a) The power may come from the gate cabinet power; however, the voice cable may not pass through the gate equipment cabinet.
 - (2) PAU's do not contain cabling for Police Cameras

UNIVERSITY OF ILLINOIS AT CHICAGO
ACCC Telecommunications Building Standards

VERSION 3.0
October 15, 1999

PARKING ASSISTANCE UNIT - BOLLARD

GATEKEEPER CUT FOR GAI-TRONICS



1 FRONT ELEV.
NO SCALE

2 SIDE ELEV.
NO SCALE

diagram 17d

| | | |
|------------------------------------|--------------------|---|
| FILE: P. A. U. DWG | DRAWN BY: T. E. D. | UNIVERSITY OF ILLINOIS AT CHICAGO |
| DWG: PARKING ASSISTANCE UNIT | DATE: 07. 10. 97 | TELECOMMUNICATIONS DEPARTMENT |
| | SHEET: 1 OF 1 | |
| | SCALE: NO SCALE | |



9. Required material for Wall Mount Exterior ETU installation:

- a) Locations are to use a stainless steel box that measures 10" x 10.5" x 3".
 - (1) Owner furnished / Contractor installed.
- b) A heavy duty dual purpose strobe light manufactured by Gai-Tronics Company.
 - (1) UIC Supplied/Contractor Installed
 - (2) The strobe light shall be mounted on a light pole or on an outside wall 14 feet above the ground, with the Emergency Telephone mounted below in the stainless steel box. Inside parking structures the strobes shall be mounted as high as possible and still be clearly seen.
- c) One special modified Gai-Tronics speaker phone unit
 - (1) Owner furnished / Contrac
- d) Follow part 6 for cabling guidelines. See [PRODUCT](#) section for approved Cabling and connectivity Manufacturers or UIC ACCC/Telecom Engineering Department approved equivalent.
- e) Exterior ETU's are to have an integrated wall mount IP Surveillance camera installed .
 - (1) Cabling for the camera with distances over 330' shall employ Fiber Optics
 - (a) Camera Fiber Optics Cable:
 - (b) 6 strand OM4 Multimode General Cable TIGHT BUFFERED I/O 6ST
 - (i) See [PRODUCT](#) section for approved Manufacturers or UIC ACCC/Telecom Engineering Department approved equivalent.
 - (ii) SC fiber terminations See [PRODUCT](#) section for approved Manufacturers
 - (iii) FDF/IDF Terminations shall be placed in an existing or new Ortronics Fiber Cabinet. See [PRODUCT](#) section for approved Manufacturers
 - (iv) Terminations shall be completed by a Bicsi Technician
 - (v) The communication cable shall be marked at both ends in accordance to the [LABELING](#) section of this standard.
 - (vi) The contractor shall certify the cable in accordance to the [TESTING](#) Section of this standard.
 - (2) Cabling for the camera within the distance limit shall follow the [IP Video Surveillance](#) section of this standard
- f) Consult UIC VCAS (vcas@uic.edu), ACCC Engineering and Startel Department for part numbers and installation procedures for integrating the camera with the ETU Call phone
- g) ACCC Engineering shall dictate where cabling for cameras are to be terminated.

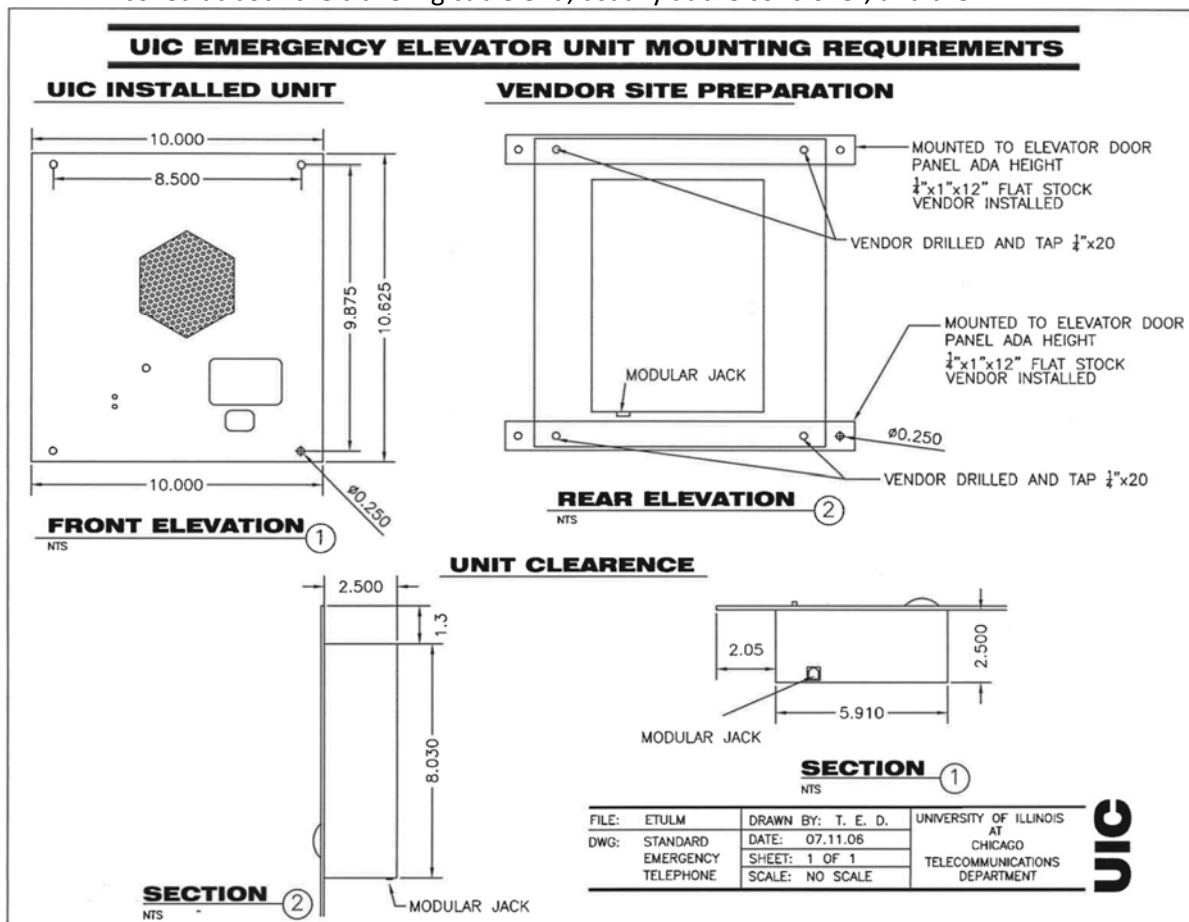
10. Required material for Indoor installation:

- a) There are two style boxes used indoors:
 - (1) A Surface mounted stainless steel box that measures 10" x 10.5" x 3" deep.
 - (a) UIC Supplied/Contractor Installed
 - (2) A Flush mount (recessed into the wall) galvanized box that measures 10" x 10.5" x 3" deep with wings for mounting to the wall studs. This box is to be mounted prior to the drywall, or other wall covering material, installation.
 - (a) UIC Supplied/Contractor Installed
- b) Follow part 6 for cabling guidelines. See [PRODUCT](#) section for approved Cabling and connectivity Manufacturers or UIC ACCC/Telecom Engineering Department approved equivalent.
- c) One special modified Gai-Tronics speaker phone unit

- (1) Owner furnished/Owner installed
- d) ETU's do not contain cabling for Police Cameras

11. Required material for Elevator installation:

- a) The units are mounted in two ways:
 - (1) Inside the elevator car station panel.
 - (a) On new installations UIC ACCC/Telecom Engineering Department will provide a unit to be sent to the factory to be installed at the factory when the elevator is built.
 - (b) The mounting holes for the Emergency Telephone SHALL be drilled and tapped for 1/4-20 security screws used by the university. The unit may come out installed with standard 1/4-20 screws; they will be changed when the UIC installer programs the telephone.
 - (2) Inside a special enclosure built to match the specifications below
- b) One special modified Gai-Tronics speaker phone unit
 - (1) Owner furnished/Owner installed
- c) Since every elevator ETU installation presents a different situation, the contractor will run conduit and communications cable from the end of the elevator traveling cables to the closest FDF closet in the building, with the direction of a representative from UIC Telecommunications Engineering & Design. The cable shall be marked at both ends and left coiled at both the traveling cable end, usually at the controller, and the FDF.



12. Required material for Silent/Panic Startel installation:

- a) Hardware is Owner furnished Owner installed.
- b) The Unit requires (1) green category 6 cable terminated on a green cat 6 keystone at a standard single gang work area outlet face plate. See [PRODUCT](#) section for approved Cabling and connectivity Manufacturers or UIC ACCC/Telecom Engineering Department approved equivalent.

M. UIC OUTSIDE PLANT DISTRIBUTION SYSTEM

1. The University has steam and pedestrian tunnels and an existing underground duct system that shall be utilized wherever possible for campus distribution of underground cables to their respective buildings. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. New underground conduit must be installed, as part of any project, to those buildings not directly served by the existing tunnel or duct system. The location of the new structure will determine which one of the nodes will be used to serve the building. The routing of the fiber optic cables will be determined by UIC ACCC/Telecom Engineering Department.
3. For all newly proposed conduit runs, please specify the following:
 - a) Duct size, material, number, formation, and locations.
 - b) Depth of placement.
 - c) Selected backfill, cover, and locating marker tape.
 - d) Allowable number of turns and bends.
 - e) Radius factor of turns and bends.
 - f) Chair placement detail including rebar.
 - g) Concrete specifications.
4. An industry-standard of 4" PVC of at least schedule 40 or equivalent must be used for underground conduit structures. These structures must be encased in concrete with a minimum of 2 inches between conduits and a minimum of 3 inches of perimeter concrete
(See diagram 6a).
5. All new buildings will be diversely dual fed with backbone fiber as directed by the project designs.

CONCRETE ENCASED DUCT BANK WITH CHAIR SUPPORTS

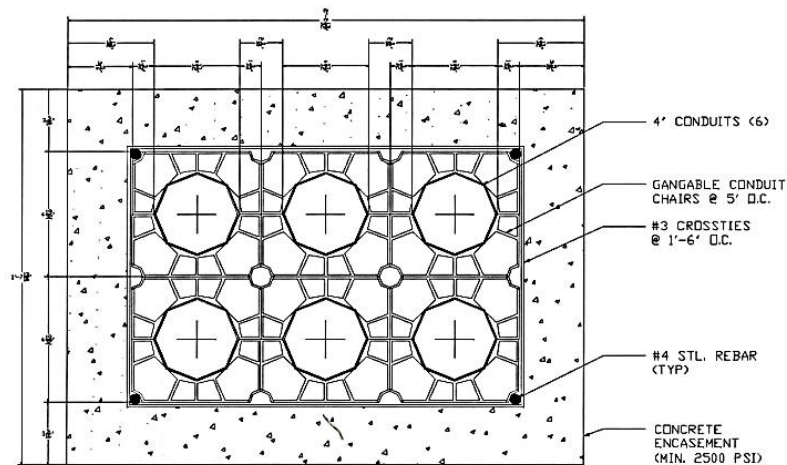


diagram 6a

| | | |
|-------------------|----------------------|------------------------|
| FILE: FED-STD.DWG | DRAWN BY: T.E.D. enr | UNIVERSITY OF ILLINOIS |
| DWG: ENCASED DUCT | DATE: 07/26/96 | AT CHICAGO |
| BANK W/ CHAIR | SHEET: 1 OF 1 | TELECOMMUNICATIONS |
| SUPPORTS | SCALE: NO SCALE | DEPARTMENT |



6. All underground conduit structures shall utilize industry standard, preformed spacers placed at or near joints no more than 5 feet apart to keep ducts uniformly separated. Ducts need to be staked down before pouring. All work performed in manholes shall be performed by two or more workers, with one remaining above ground. Safety regulations shall be strictly adhered to. When the underground ducts are placed in the trench, UIC ACCC/Telecom Engineering Department shall inspect the installation before the pouring of any concrete, and inspect again before any backfilling is started.
7. Provide a pre-lubricated conduit measuring tape in at least one conduit in any given duct run and provide a polypropylene twisted yellow rot and mildew resistant pull rope in all conduits. Minimum size is 3/8" outside diameter with 2400 pounds tensile strength.
8. All underground duct systems shall remain a minimum of 24-inch ground cover throughout the run. To prevent accidental digging up of the duct bank, detectable warning tape shall be placed above the duct bank approximately 12 inches below grade.
9. Provide 4 inch screw type adjustable plugs in vacant ducts at both manhole and building entrances that open into the main building telephone room (IDF). Seal all cable conduits with an approved sealant installed in accordance with the manufacturer's tested methods.
10. The University standard requires that a minimum of four inch conduits enter major buildings to serve the various media used on campus. Of these four one must be constructed with three one and one half inch ducts contained within it. The design must assure at least one empty four inch duct as a spare after all media has been installed. During the design and review process the

telecommunications consultant and the UIC ACCC/Telecom Engineering Department will specify the exact number if the standard four conduits are not enough for particular applications.

11. Elements of the service entrance facilities design shall include the following:

- a) Type, size, gauge, and sheath type of the distribution cables from the Node to the new/existing building IDF.
- b) Type and quantity of the hardware/material required by UIC Telecommunications Engineering & Design at both the Node and the building IDF.
- c) Location of cables and hardware/material.
- d) Size, type, and quantity of associated structures to support or house the cables and terminal hardware such as:
 - (1) Building entry conduit.
 - (2) Underground conduit system.
 - (3) Manholes.
 - (4) Cable trays.
 - (5) Strand.
 - (6) Pull and splice boxes.
 - (7) Frames.
 - (8) Racking.
 - (9) Cabinets.
 - (10) Communications circuit protectors.

12. All new service entrance conduits shall be at least four inch trade size and will terminate in the building main distribution room (IDF).

13. Conduits entering the IDF through the wall shall be reamed; bell fittings will be placed at the ends and terminated not more than four inches from the entrance wall. All metallic conduits shall have grounding bushings installed and bonded to the local TGB or TMGB in accordance to ANSI/TIA 607-B and the Grounding and Bonding section of the UIC Standard.

14. Conduits entering the IDF from below shall be terminated four inches above the finished floor. All metallic conduits shall have grounding bushings installed and bonded to the local TGB or TMGB in accordance to ANSI/TIA 607-B and the Grounding and Bonding section of the UIC Standard.

15. All cable trays must be approved by UIC ACCC/Telecom Engineering Department prior to their inclusion in drawings and specifications and must be made with solid bottom and sides. All cable trays shall be continuous and bonded to a local TGB or TMGB in accordance to ANSI/TIA 607-B and the Grounding and Bonding section of the UIC Standard.

16. Cable tray shall be sized for a minimum growth of fifty percent.

17. Pulling of the underground cable shall follow the following requirements:

- a) All necessary cable data, including maximum pulling tensions and minimum bending radii, shall be obtained by the Contractor from the manufacturer before any cable is pulled.
 - b) The equipment used to pull cable shall have adequate capacity to ensure a steady continuous pull.
 - c) A suitable flexible feeder tube, guide protectors or sleeves shall be used to protect and guide cable from the cable reel through manholes and into conduit or duct. The radius of the feeder tube shall be as large as possible.
 - d) Pulling rope used may be nylon, polypropylene, or manila rope.
 - e) Basket weave type grips, wedge type pullers, and swivel harnesses may be used for pulling cables within manufacturer's recommended safe working loads.
 - f) Only cable pulling lubricants compatible with the cable jacket shall be used when pulling cable through conduits.
 - g) Before pulling cable through conduit and duct runs, a mandrel or plug having a diameter close to the diameter of the conduit shall be pulled through to check for obstructions. If an obstruction is encountered, a mandrel followed by a swab shall be used to clean out any lint or foreign matter.
 - h) When pulling cables through conduits, cable tray, and ducts that are supported by rod angle hangers, they shall be braced to withstand the tensions used for pulling cable.
 - i) When cables are installed in their permanent locations, they shall not be bent beyond the radial limitations recommended by the cable manufacturer.
 - j) Fiber optic cables pulled through inner duct shall not be twisted or flexed during installation. A Swivel Harness must be used when pulling in all fiber optics cable and MaxCell inner-duct to minimize twisting.
 - k) Manufacturer's minimum bend radius must be observed for all pulls.
18. Splicing of underground cable (Specific brands and part numbers are given. However, a UIC ACCC/Telecom Engineering Department approved equivalent may be used).
- a) All cables splices shall be supported by a minimum of two cable hooks. Horizontal racking for support may utilize 3M brand RC-100 rack adapters, manhole racks, or UIC ACCC/Telecom Engineering Department approved equivalent.
 - b) 3M 2-Type and 4-Type Enclosure splicing systems, or a UIC ACCC/Telecom Engineering Department approved equivalent, shall be used for splicing throughout the underground system. The 3M 2-Type and 4-Type Enclosure splicing systems case will be used at building entrance splices at NODE and IDF locations requiring a closure of five inches in diameter or more.
 - c) All closures and end-caps must be flame retardant and no splice cases will be permitted in cable trays.
 - d) All splicing will be performed according to industry standard practices.
 - e) Rigid bonding and strain relief bars must be an integral part of the finished closure.
 - f) All splices in manholes are to be encapsulated. Re-enter able polyurethane compound, 3M 8882 Series shall be used in accordance to manufacturer's specifications.
 - g) Splicing of cross-connect terminals, and secondary cable access stubs, shall utilize Scotchlok-ULG splicing connectors or equivalent. 3M brand MS2 modular connectors shall be used with the cable on the outside plant side of the NODE. The distribution side shall be terminated on the distribution frame.

- h) Underground cable splicing shall utilize 3M MS2-4000 series super-mini modular connectors. Mark each splice with the cable identification number and the pair counts.
- i) All cables MUST be tagged or marked showing the cable number and pair count. Markings may be placed on UIC Telecommunications Engineering & Design acceptable plastic ty-wrap tags.
- j) All fiber optic splicing in manholes shall be done with fusion splices.
- k) 3M™ Fiber LightLinker System splice closures, or UIC ACCC/Telecom Engineering Department approved equivalent, will be used for splicing and encapsulation in manholes throughout the campus system.
- l) All fusion splices shall be tested at a loss no greater than .3dB at 850nm and 1300nm for multi-mode and 1310nm and 1550nm for single mode. Testing shall be bi-directional. See the Testing section of the UIC Standard.
- m) Grounding and Bonding
 - (1) Refer to the grounding and bonding section of the UIC ACCC/Telecom Specification along with ANSI/TIA 607-B and NFPA 70 for information on grounding and bonding procedures for OSP copper and optical cabling.

19. EXCAVATION

- a) The contractor shall be required to do all the excavation for the installation of underground mechanical piping and performance of all auxiliary work that may be required. Before work begins, the contractor shall:
 - (1) Receive approval for trenching from the UIC Facilities Management Department.
 - (2) Erect temporary barriers whenever necessary to assure the safety of University personnel, students and visitors, and wherever deemed necessary for securing materials.
- b) UIC ACCC/Telecom Engineering Department has drawings of existing conduit runs and has access to Facilities Management drawings of other existing facilities. UIC Telecommunications Engineering & Design can locate the underground facilities within campus boundaries. Other public utilities can be located by calling "DIGGER" 312-744-7000 or by calling the utility direct. The contractor shall be responsible for locating and protecting all utilities.
- c) All trenching with public right-of-way owned by, or under the jurisdiction of, the City of Chicago must conform to appropriate city standards. The contractor is responsible for obtaining cut and trench permits, from the City of Chicago. The contractor has the responsibility to insure that the work complies with the most current standards and codes.
- d) Pavement shall be saw-cut at a full depth, in a straight line.
- e) Walks and drives are to be saw-cut at existing joints. For replacement road patches, which are near existing joints, the saw cut will be extended to existing joints. New concrete will be saw-cut 1/3rd of the total thickness for joints at intervals not to exceed 15 feet. These saw cuts shall be sealed with rubberized asphalt after cleaning.
- f) All underground construction work, during progress and after completion, shall conform truly to lines and grades.
- g) The width of the trench shall be per the construction drawings. Where sheeting is required, this width shall be increased by the thickness of the sheeting.

- h) Should the trenching be excavated to a greater depth than that given, the contractor shall, at his own expense, purchase suitable material as directed to bring such excavation to required grade.
- i) The excavated material shall be deposited along, and at least two feet from, the side of the trench in such a manner as to create the least possible inconvenience.
- j) Special care shall be taken to keep all fire hydrants and gate valves on water mains accessible at all times.
- k) The contractor shall not obstruct the gutter of any street or driveway, but shall use all proper means to provide for a free passage of surface water along the gutter into storm water inlets. The contractor shall provide channels where necessary.
- l) Wherever necessary, the sides of a trench shall be shored and braced in strict accordance to the rules, orders, and regulations of the City of Chicago, the State of Illinois, and OSHA.
- m) The contractor shall maintain access to all areas required by UIC. The contractor is liable for all damage suffered by the University, resulting from the contractor's negligence or lack of cooperation.
- n) Where groundwater or soft, yielding, or otherwise unsuitable material is encountered in the bottom of the trench, such material shall be excavated from the full width of the trench to a satisfactory depth. Said depth shall be a minimum of six inches. The resulting space shall be back filled with suitable imported materials, properly compacted.
- o) Industry standard 4" PVC schedule 40, or greater, conduit must be used for underground infrastructure conduit systems. Subsidiary conduit may be of different sizes and types as appropriate for the particular application, but shall be limited to a two inch minimum size.
- p) Underground conduit structures must be encased in minimum 2500 PSI concrete with #4 rebar run parallel with the conduit on all four corners. UIC Telecommunications Engineering & Design approved chair supports shall be interlocked and placed a minimum of every five feet along the entire length of the run. The ducts shall be staked down at each set of chairs and #3 cross-ties installed.
- q) The remainder of the trench shall be back filled with native soil in lifts no greater than twelve inches and shall be mechanically compacted by tamping so as to maintain a minimum relative density of ninety percent.
- r) Surplus earth from the trenches, after tamping, shall be removed and disposed of by the contractor in a proper manner.
- s) Any asphalt pavement cut shall be replaced and shall conform in kind and quality to the type of pavement removed, but in no case less than twelve inches of base rock shall be placed beneath the pavement. Where asphalt concrete surfacing exists, pavement shall be no less than three inches thick.
- t) All concrete roads will have expansion joints at intervals not to exceed forty five feet with 2 inch wide preformed joint material at least six inches deep. Expansion joints shall be placed between all new and existing concrete.
- u) All new concrete pavements shall be a minimum of six bag mix with a minimum of six percent and a maximum of eight percent air entrainment and two inch slump. New concrete is to match existing surface or is to be broom finished, as desired by the University. Concrete is to be sloped for proper drainage. Concrete pavement shall conform to the requirements of the City of Chicago.
- v) All patches in roads and curbs are to be doweled with 2 inch by 18 inch smooth rebar spaced at not less than 18 inch intervals, placed nine inches into existing concrete. Bar in new concrete is to be greased and wrapped.

- w) Curing time for concrete with accelerator is to be three days with and seven days without accelerator. Traffic load may be delayed up to fourteen days beyond cure period.
- x) Concrete sidewalks are to be scored every five feet, at a one half inch minimum depth, and expansion joints placed every twenty four feet or change in direction. If a different pattern exists in the area involved, the existing pattern is to be matched.
- y) Field tests will be conducted and paid for by the University to determine compliance of compaction methods with specified density in accordance with:
 - (1) ASTM D 2922 Tests for density of soil and soil aggregate in place by nuclear methods.
 - (2) ASTM D 1556 Tests for density of soil in place by the sand code method.
 - (3) ASTM D 2167 Tests for density of soil in place by rubber-balloon method.
- z) Compaction shall be to the following densities (reference ASTM D 698 or AASHTO T 99 unless otherwise indicated):
 - (1) Subgrade: under footings or foundation – 100%
 - (2) All other locations – 95%
 - (3) Barrier material – 95%
- aa) Pipe Bending
 - (1) Lightly compacted select soil – 80%
 - (2) Carefully compacted select soil – 90%
 - (3) Compacted granular material – 80% (ASTM D 249)
 - (4) Barrier material – 95%
- bb) Trench back fill:
 - (1) State highways:
 - (a) For paved areas and shoulder slope – 100%
 - (b) For all other areas – 95%
 - (2) Paved roadways, sidewalks, and other areas to receive payment
 - (a) Top four feet – 95%
 - (b) Remainder of trench – 90%
 - (3) Gravel roadways – 90%
 - (4) Under-footings, foundations, or structures – 100%
 - (5) All other locations – 95%
- cc) Bricks, block, and other debris removed from trenches will not be used as fill for the trenches.
- dd) Where granular material is used in lieu of cohesive soils, reduce the above percentages by 15% to arrive at the relative density and ASTM D 2049 shall apply.
- ee) Grass will be replaced by a method approved by UIC Facilities Management.
- ff) Moisture Content:
 - (a) Compact soils within plus or minus 2% of optimum moisture.
 - (b) Add water, harrow, disc, lade, or other work material as required to insure uniform moisture content specified.

20. MANHOLES AND HANDHOLES

- a) Precast, equipped with terminators, necessary collars, pulling eyes, frames and complete hardware package, including ladders in manholes, must conform to specifications of concrete products manufactured by Utility Concrete Products, Inc., Plainfield, Illinois or Chicago Precast Products Company, P.O. Box 69, Naperville, Illinois.

- b) The standard size for manholes used with major underground conduit structures of four ducts or more will be six feet wide, twelve feet deep, and seven feet high. Alternate sizing will be permitted only with the permission of the UIC ACCC/Telecom Engineering Department.
- c) Hand holes with minimum dimensions of four feet wide, five feet long, and four feet high may be used instead of manholes for major conduit structures of two ducts or more.

21. MATERIAL/EQUIPMENT LISTS

- a) PVC telephone duct shall be a minimum of Schedule 40, Class C Commercial Telephone Duct, 20 feet length, belled on one end, with high tensile strength and good impact qualities. Must conform to requirements for AT&T-8546 and GTE-8343 specifications.
 - (1) Outside diameter 4.350"
 - (2) Inside diameter 4.000"
- b) Polypropylene rope to be twisted yellow, rot and mildew resistant, minimum 3/8 inches in diameter with 2400 strength pounds.
- c) Conduit measuring tape must be water proof tape with permanent printed footage. Must be able to be pulled in or back easily with standard rodding retrieval systems.
- d) Adjustable duct plug with metal base, screw type with expandable rubber outer surface.
- e) Building penetration sealant shall be a City of Chicago and UIC Telecommunications Engineering & Design approved fire protection sealant, installed in the manufactures approved manner.

22. OUTSIDE PLANT SAFETY REQUIREMENTS

- a) All encroachments in city highway rights-of-way shall be designed, made and maintained in accordance with the follow rules:
 - (1) Conformance-- Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, or applicable statutory requirements of authority having jurisdiction.
 - (2) Operations on or about traffic areas and provisions for regulating traffic will be subject to the regulations of governmental agencies having jurisdiction over the affected areas.
 - (3) Keep traffic areas free of excavated material, installation equipment, pipe, and other materials and equipment.
 - (4) Flagmen are required to provide for public safety and the regulation of traffic.
 - (5) Warning signs, lights, and audible signal are required.
 - (6) Protect all roadways by effective barricades which have warning signs.
 - (7) Provide barricades and warning signs for open trenches, other excavations and obstructions.
 - (8) Illuminate by means of warning lights all barricades and obstructions from sunset to sunrise.
 - (9) Provide an audible warning for all barricades and obstructions at all times for the visually impaired.

N. EQUIPMENT ROOMS: IDFs and FDFs

1. Follow the design guidelines listed in the BICSI TDMM and the ANSI/TIA 569-B standard on pathways and spaces. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. **GENERAL EQUIPMENT ROOM REQUIREMENTS:**
 - a) Any Telecommunications room containing electronic equipment shall be considered an equipment room
 - b) Because of the variations in size, location, and usage each building must be evaluated separately to correctly plan the space allocation and equipment requirements. Sizing should include projected future (as well as present) requirements. When designing the equipment room floor space, allowance shall be made for non-uniform occupancy throughout the building. The practice is to provide 0.07 m² (0.75 ft²) of equipment room space for every 10 m² (100 ft²) of work area space. The equipment room should be designed to a minimum of 14 m² (150 ft²). The minimum clear room size shall be 10 foot x 11 foot x 8 foot 6 inches high and have a minimum of a one hour fire rated assembly.
 - c) The building FDFs are connected to the IDF with conduit or cored holes with sleeves through the floor. The FDFs should be "stacked" vertically in multi-story buildings. The number of conduits connecting the FDFs to the IDF is to be specified during design stage. The minimum diameter shall be four inches for these paths.
 - d) The room shall be permanently located and not subject to change due to building alterations or rearrangement of interior partitions.
 - e) The floor space allotted should be of adequate size to accommodate fifty percent future expansion of the equipment.
 - f) The room shall house only equipment directly related to the telecommunications system and its environmental support systems.
 - (1) Hardware supporting access control, security, building automation etc shall be located in "other" spaces.
 - g) The room shall be directly accessible from public corridors and spaces and keyed for unrestricted access by Telecommunications personnel.
 - h) All Equipment Rooms must be environmentally controlled 24 hours a day seven days a week. If the building system cannot assure continuous operation, a stand-alone unit shall be provided for the equipment room. If a standby power source is available in the building, consideration should be given to connecting the HVAC system serving the telecommunications equipment room to the standby supply.
 - (1) HVAC shall be included in the design of the room to maintain a temperature between 64 and 75 degrees Fahrenheit.
 - (2) A positive pressure differential with respect to surrounding areas should be provided.
 - (3) The humidity must be maintained between 30 and 55 percent.
 - (4) The filters in the HVAC system should have an ASHRAE dust spot rating of 85% or better.
 - i) All rooms should be free of all safety hazards and should have no suspended ceilings. They should not be placed adjacent to electrical rooms or equipment. The walls must be continuous from floor to underside of the floor above. The space allotted shall be dry and free from the danger of flooding. No exposed water, gas, or steam pipes shall enter in or run

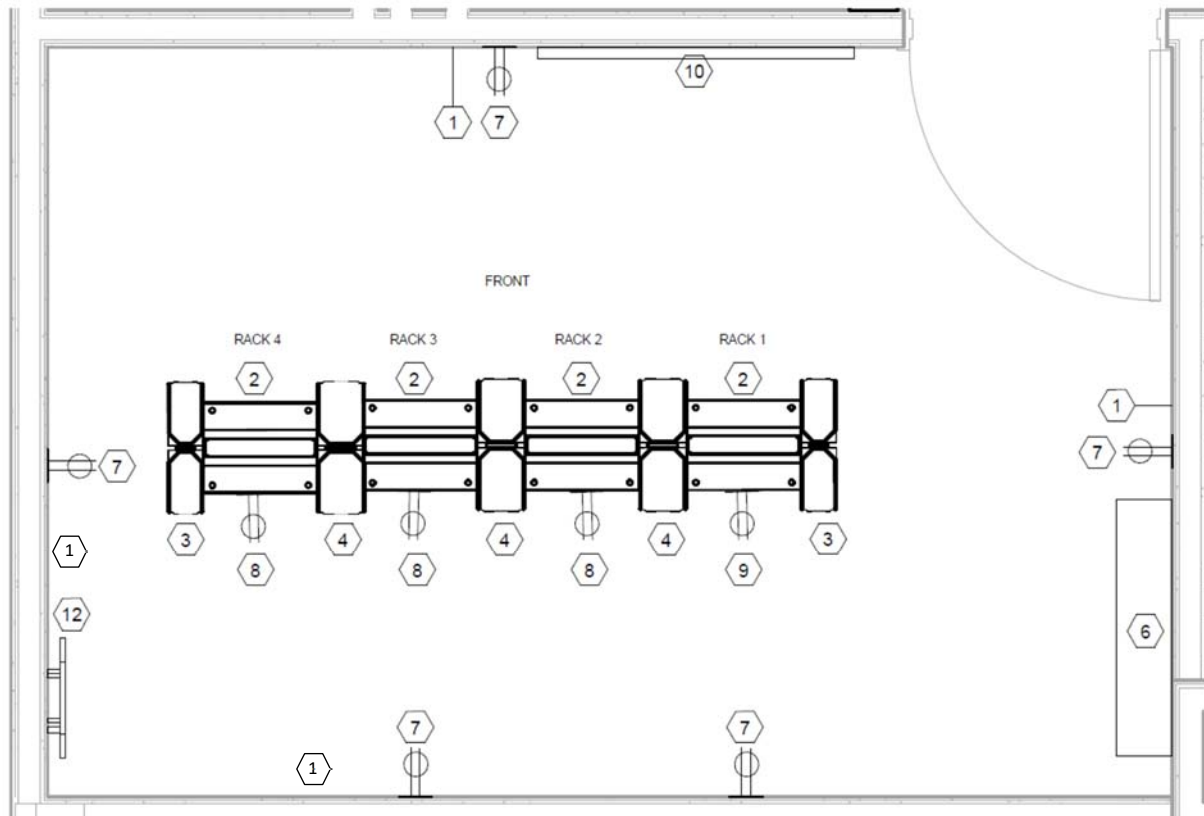
- through this room. No drains duct, or clean-outs will be permitted. If necessary, sump pumps should be incorporated in the environmental design.
- j) The room shall be located away from sources of electromagnetic interference. Special attention shall be given to electrical power supply transformers, motors and generators, x-ray equipment, radio or radar transmitters, and induction sealing devices.
 - k) There shall be no automatic fire sprinklers except as required by building code. If sprinklers are required within the equipment area, the heads shall be provided with wire cages to prevent accidental operation. Drainage troughs shall be placed under the sprinkler pipes to prevent leakage onto the equipment within the room. For some applications, consideration should be given to the installation of alternate fire-suppression systems.
 - l) A minimum of three walls shall be lined with plywood backboards.
 - m) All plywood backboards shall meet the following minimum requirements.
 - (1) All plywood shall be void free 3/4 inch x 4 foot x 8 foot, mounted vertically.
 - (2) All plywood shall be smooth on one side with the smooth side exposed.
 - (3) The plywood shall be painted on all six sides with a light color fire retardant paint.
 - (4) The top of the Plywood shall be mounted at 8 foot 6 inches in basements and other flood prone areas. All other areas the top of the plywood shall be at 8 foot.
 - (5) The Plywood shall be securely anchored to the wall.
 - (a) In new hollow wall construction solid blocking shall be installed and the plywood shall be fastened to the solid blocking with steel screws.
 - (b) In existing hollow wall construction toggle bolts shall be used to fasten the plywood to the wall.
 - (c) Steel expansion anchors shall be used to fasten the plywood to solid concrete walls.
 - n) The walls, floor, and ceiling should be finished in such a manner as to eliminate dust and static electricity. Walls and ceilings shall receive primer and finish coat of a light-colored paint. Floors shall be seal coated and receive an anti-static finish.
 - o) **Firestopping**
 - (1) ***Only employees trained/certified by the firestopping manufacturer shall apply firestopping materials.***
 - (2) ***Maintain the fire rating of all penetrated fire barriers. Fire stop and seal all penetrations made during construction.***
 - (a) Provide firestopping material for through and membrane penetrations of fire-rated barriers.
 - (b) Install fire stops in strict accordance with manufacturer's detailed installation procedures.
 - (c) Install fire stops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, local fire and building authorities, and applicable codes and standards. Apply of sealing material in a manner acceptable to the local fire and building authorities.
 - (d) ***Firestopping material used to seal open penetrations through which cable passes shall be re-usable/re-enterable. Fire caulk is not allowed inside a conduit.***
 - (e) For demolition work, apply firestopping to open penetrations in fire rated barriers where cable is removed. Apply firestopping regardless of whether or not the penetrations are used for new cable or left empty after construction is complete.
 - p) A minimum lighting level of 50 foot candles maintained 3 foot off the floor must be provided.

- q) General Purpose 115 volt 20 amp grounded, non-switched, Quad receptacles should be provided every ten linear feet.
- r) 115VAC 20 AMP surge protected outlets on 2 dedicated circuits must be provided.
 - (1) The receptacles should be connected to emergency power sources, if available.
 - (2) These two receptacles shall be located on the rear of Each of the 19" Rack or at the rack depending on job specifications.
 - (3) Additional 2 pole circuits may be required for network hardware see project requirements.
- s) Grounding to be installed per Section on [Grounding and Bonding](#) in these standards.
- t) The space for riser and voice information outlet terminations shall be located on one continuous wall.
- u) Termination Frames
 - (1) All new distribution and protector frames and the terminal hardware MUST be the same as what UIC is presently using. This equipment is part of the GIGABIX Cross-Connect System. It should be sized to accommodate initial requirements plus twenty five percent growth.
 - (2) Refer to the material list for all part numbers of the required equipment. NO SUBSTITUTIONS WILL BE PERMITTED unless approved, in advance, by the UIC ACCC/Telecom Engineering Department.
 - (3) Where new frames are required, the new frames will be butted to and aligned with the existing frames.
 - (4) All frames will be installed and bonded in accordance with the manufacturer's and industry standard practices and all applicable building codes.
 - (5) A minimum of one 7 foot 19 inch rack shall be provided in each IDF and FDF.
- v) Plastic wire ties shall not be used with category 6 or fiber optic cable. Velcro wire ties shall be used.
- w) **The room should have a door equipped with a UIC standard lock set and the keys readily accessible to the UIC ACCC/Telecommunications employees during construction. The doors should be a minimum of three feet by seven feet and should open outward. After construction has been completed the door should be keyed to the ACCC/Telecommunication Department equipment room key for the type of room built.**
- x) FDF/IDF signage shall read "ACCC FDF"
- y) New FDF's / IDF's shall be equipped with Card Access Control.
 - (1) Consult UIC VCAS/Electrical Shop for system design/integration vcas@uic.edu.
- z) Portable fire extinguishers shall be provided and maintained within the equipment room per applicable code.
- aa) See [PRODUCTS](#) Section for approved hardware.

3. IDF REQUIREMENTS:

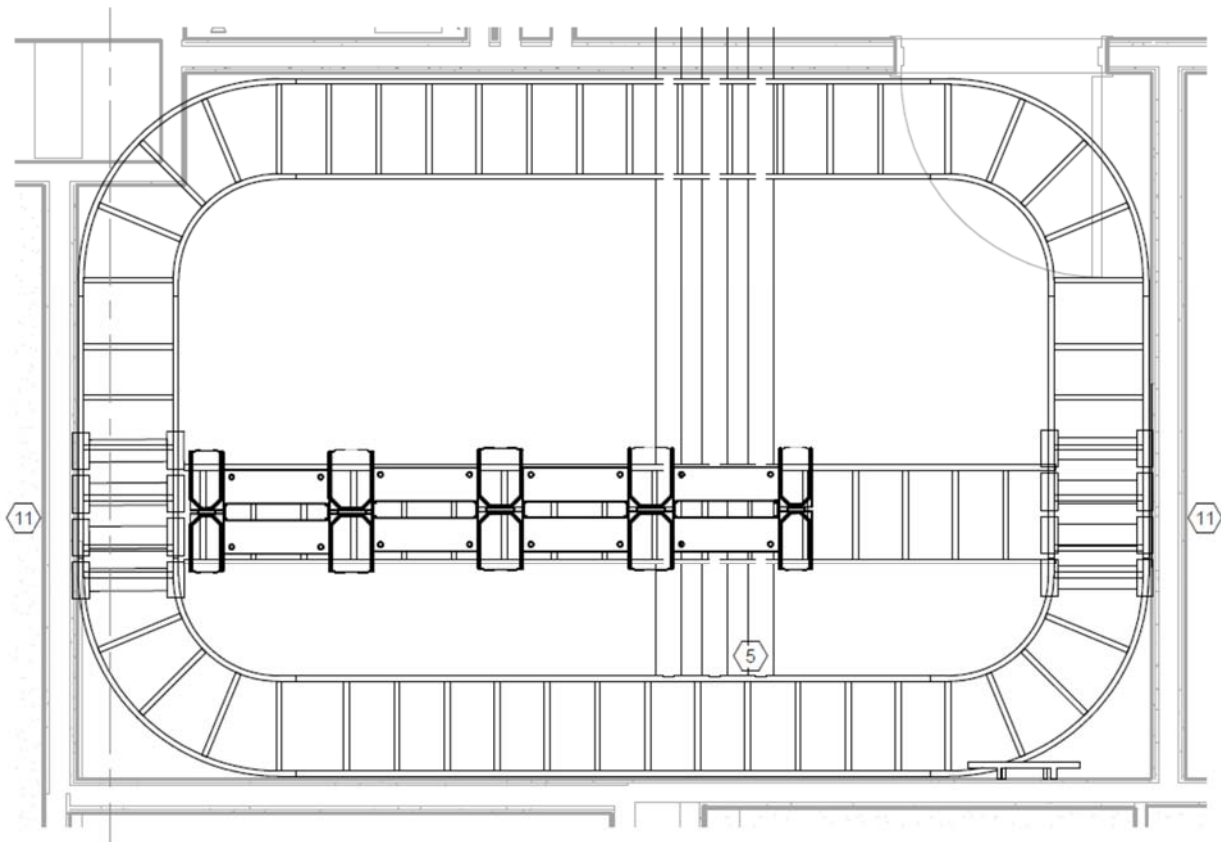
- a) All buildings shall have one main building equipment room (IDF). This location will house the entrance facility and provide space for the termination of the outside plant facilities (copper and fiber) and building riser cables. It may contain network interface devices, telecommunication data equipment, fiber optic, and other elements of telecommunications.
- b) Protectors must be placed within 50 feet of the telecommunications point of entrance to the building, preferably in the IDF. The location of the IDF should be such that the cable length from the point of entry to the protectors does not exceed 50 feet.

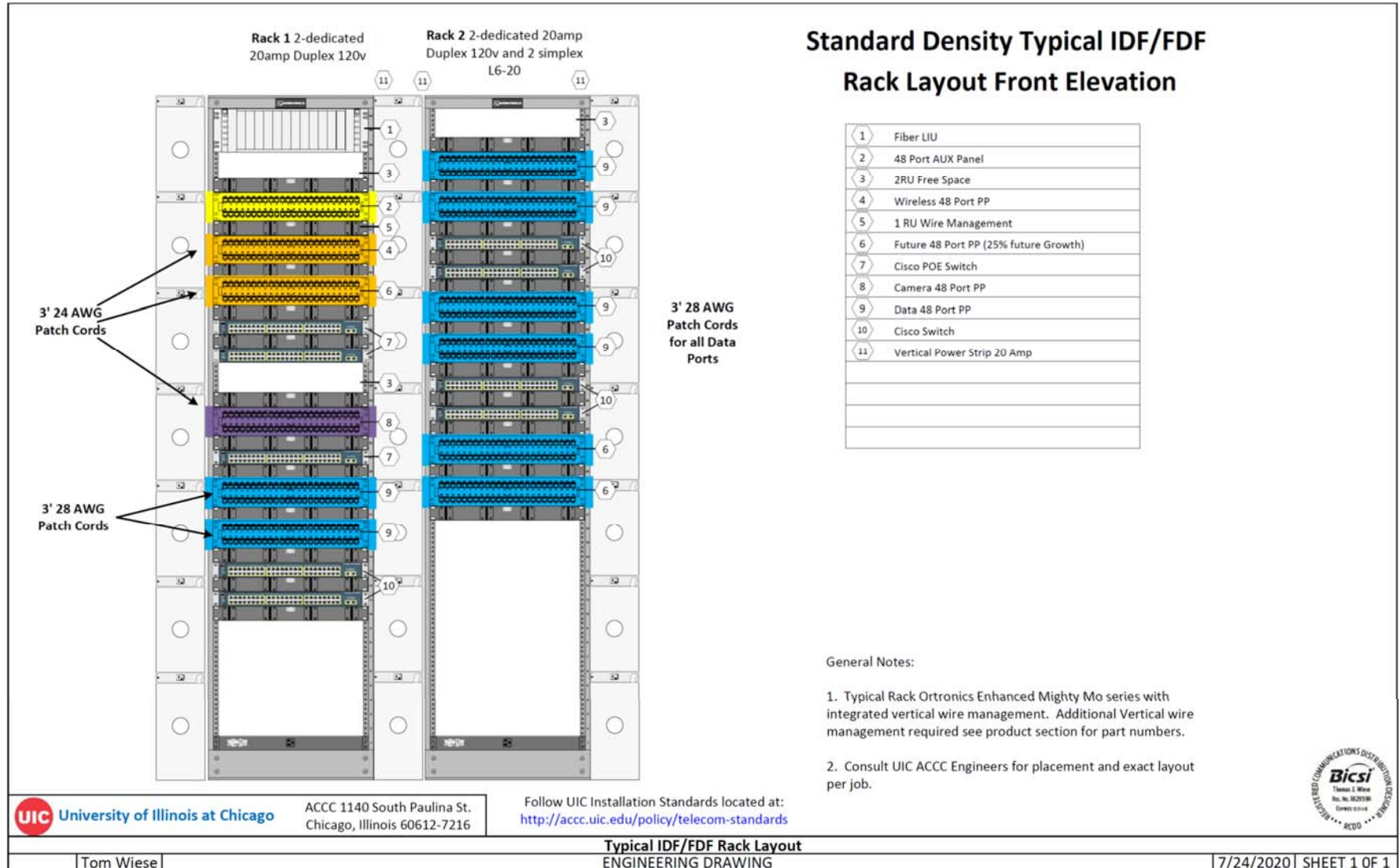
- c) The IDF should be located on the basement level as close as possible to the utility building entrance.
- d) Copper splice cases in the IDF for incoming cable are to be mounted to backboards unless otherwise indicated, using the appropriate hardware and supports
- e) Plastic wire ties shall not be used with category 6 or fiber optic cable. Velcro wire ties shall be used.
- f) The IDF should comply with the typical IDF layout drawings consult individual project requirements:

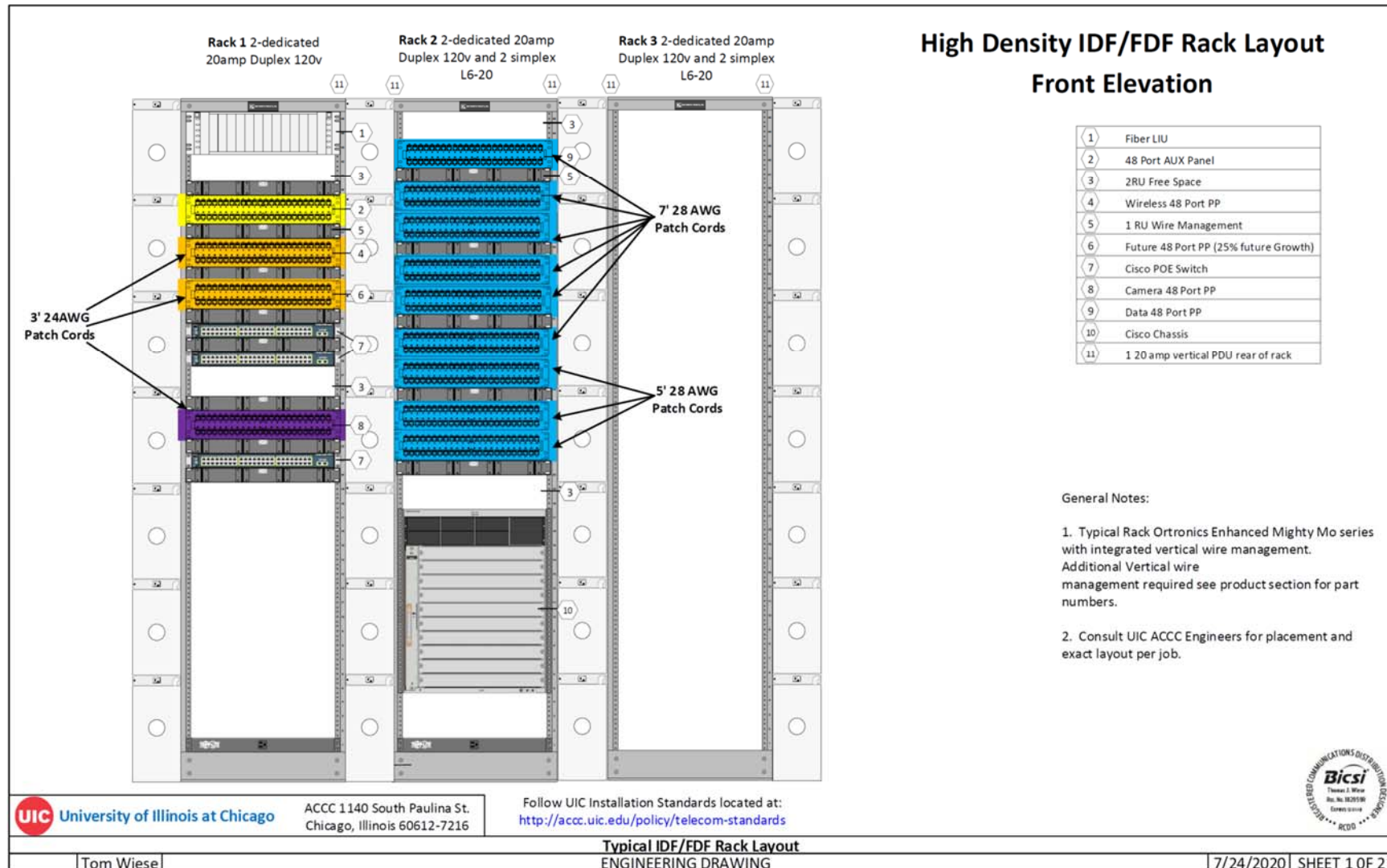


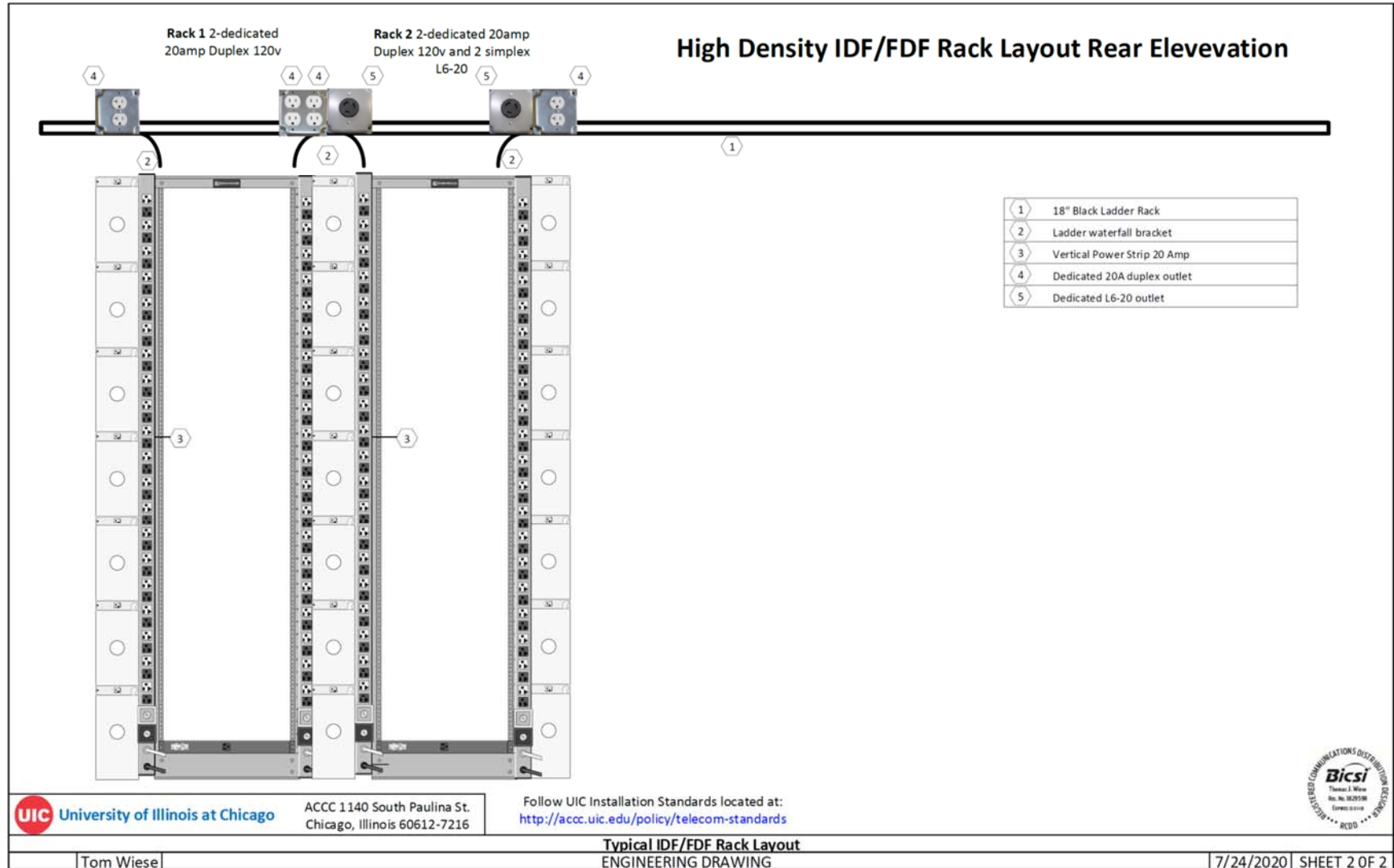
SHEET KEYNOTES:

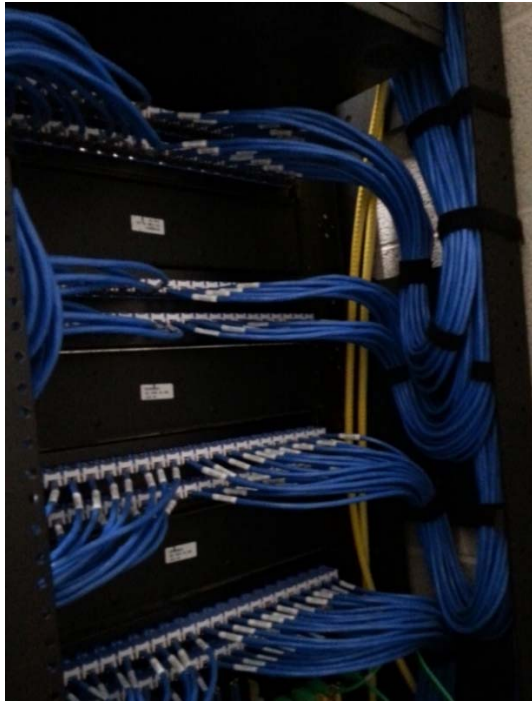
- ① 3/4" FIRE TREATED PLYWOOD
- ② EQUIPMENT RACKS - 2-POST
- ③ 6" VERTICAL WIRE MANAGER
- ④ 10" VERTICAL WIRE MANAGER
- ⑤ 18" LADDER RACK/CABLE RUNWAY
- ⑥ 100 AMP DEDICATED SUB-PANLE ON GENERATOR POWER
- ⑦ (1) QUAD 5-20R CONVENIENCE RECEPTICALS
- ⑧ (2) DEDICATED 20 AMP DUPLEX 120V AND 2 SIMPLEX L6-20 RECEPTICALS
- ⑨ (2) DEDICATED 20 AMP DUPLEX 120V
- ⑩ COPPER BACKBONE WALL FIELD
- ⑪ EZ-PATH SERIES 44
- ⑫ GROUND BUSBAR



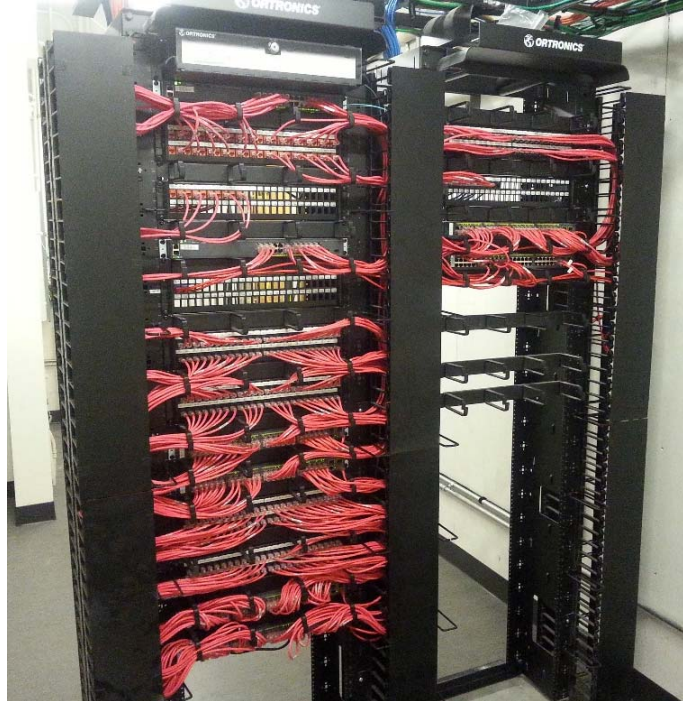








Rear Waterfall of Cabling

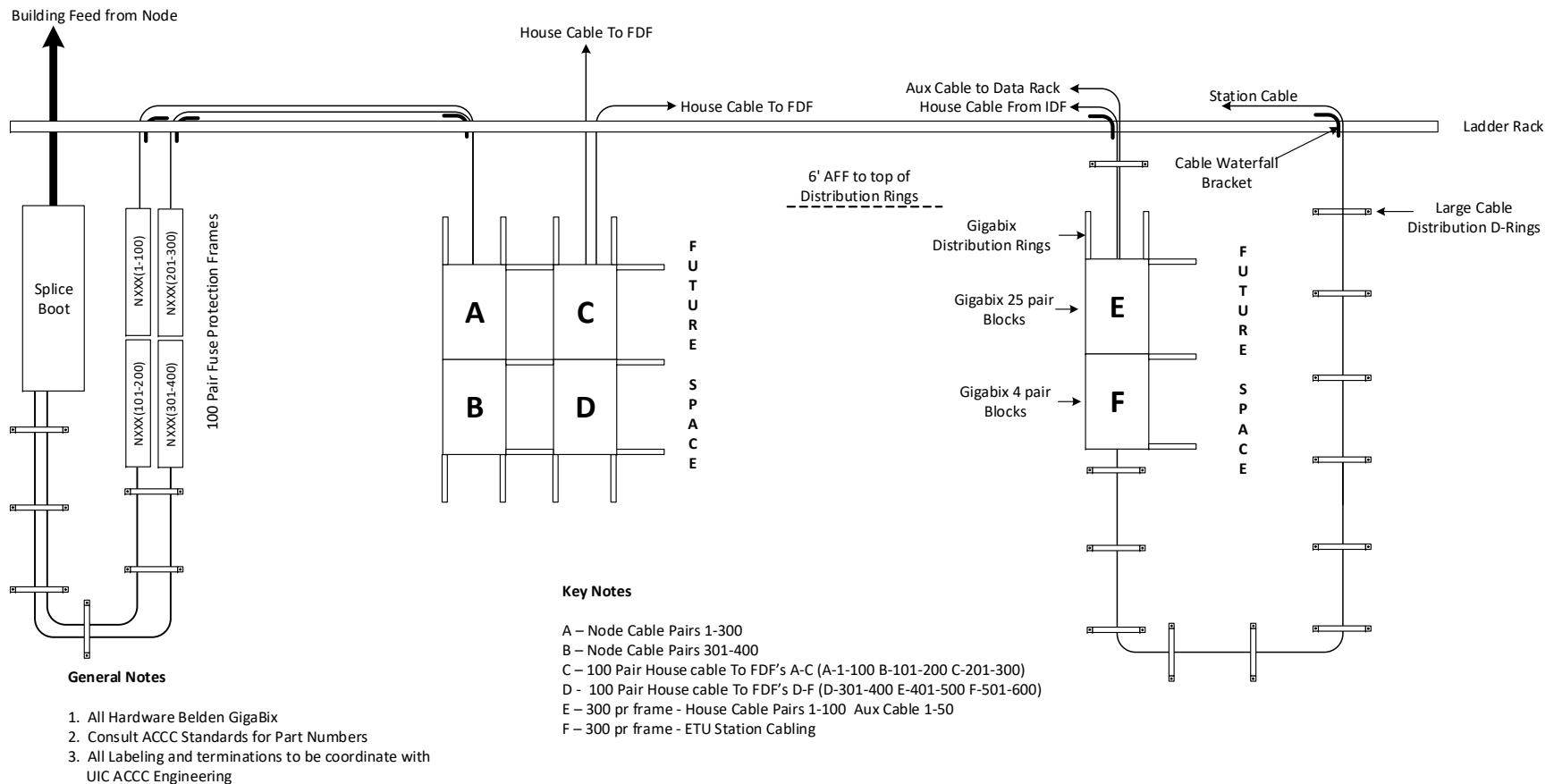


Standard Density



High Density

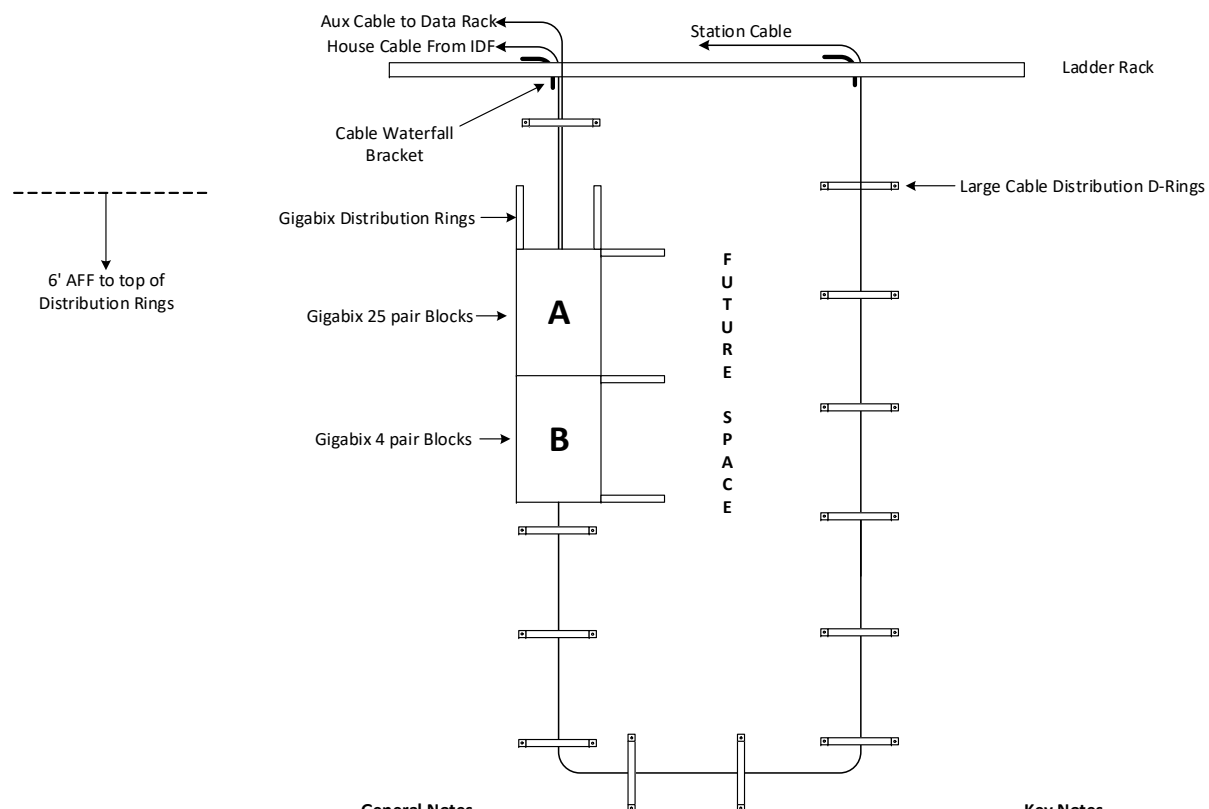
Gigabix Typical IDF/FDF Layout



4. FDF REQUIREMENTS:

- a) Must be accessible through a door that opens directly into a public corridor or area.
- b) FDFs should be designed to accommodate the riser cables from the riser system.
- c) GIGABIX Frames shall be laid with direct oversight of ACCC/ Telecom Engineering
- d) The following diagram shall be used as a basis:

Gigabix Typical FDF Layout



General Notes

1. All Hardware Belden GigaBix
2. Consult ACCC Standards for Part Numbers
3. All Labeling and terminations to be coordinate with UIC ACCC Engineering

Key Notes

- A – 300 pr frame - House Cable Pairs 1-100 Aux Cable 1-50
 B – 300 pr frame - ETU Station Cabling

Typical Backbone and Station Cable Labeling FDF

**Typical ETU GIGA-Bix Field (FDF -A)
No Voice Cabling (New Layout)**

[illegible]

**Typical Voice GIGA-Bix Field (FDF -A)
Where Voice Cabling is installed**

| | | | | | |
|-------|-------|-------|-------|-------|-------|
| A-001 | A-002 | A-003 | A-004 | A-005 | A-006 |
| A-007 | A-008 | A-009 | A-010 | A-011 | A-012 |
| | | | | | |
| A-013 | A-014 | A-015 | A-016 | A-017 | A-018 |
| A-019 | A-020 | A-021 | A-022 | A-023 | A-024 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| A-301 | A-302 | A-303 | A-304 | A-305 | A-306 |
| A-307 | A-308 | A-309 | A-310 | A-311 | A-312 |

Place ETU Cables
at the end of the
voice count

Typical Backbone (F-3) (909 Building FDF -A)

[illegible]

100 Pair Feed
from IDF To FDF-
(909 represents
Building #)

50 Pair Feed from
Bix to Data Rack -
Aux Cable Cat5e
50 pair

Typical Backbone (F-2) (909 Building Feed)

| | | | | | |
|----------------|-----|-----|-----|-----|---|
| 1 | 5 | 10 | 15 | 20 | |
| 26 | 30 | 35 | 40 | 45 | |
| 2909 (1-50) | | | | | |
| 51 | 55 | 60 | 65 | 70 | |
| 76 | 80 | 85 | 90 | 95 | 1 |
| 2909 (51-100) | | | | | |
| 101 | 105 | 110 | 115 | 120 | 1 |
| 126 | 130 | 135 | 140 | 145 | 1 |
| 2909 (101-150) | | | | | |
| 151 | 155 | 160 | 165 | 170 | 1 |
| 176 | 180 | 185 | 190 | 195 | 2 |
| 2909 (151-200) | | | | | |

200 Pair Building
Feed

This building example is a 200 pair Backbone cable from Node 2 to the 909 building.

2909 (2) represents Node 2 and (909) the building #

- e) The FDF should comply with the typical FDF layout drawing. FDFs should be designed to accommodate all of the Telecommunications Information Outlet cabling mounting frames and backboards.
 - (1) Nineteen-inch equipment rack(s).
 - (2) The size of the cables, conduits, and location of closets on each floor will be decided after the number of information outlets (jacks) is determined.
 - (3) The FDFs shall be centrally located and stacked in multi floor buildings.
- f) Every floor, basement and above, will have at least one FDF. The UIC numbering scheme used to designate the various FDFs must be followed for all buildings. The FDF and IDF may share the same room.
- g) The FDF location shall be as close as possible to the center of the area it is intended to serve. The area being served should not extend out farther than 150 feet in any direction. This should insure that no horizontal cable run will exceed the maximum of 295 feet. FDFs on any given floor shall be not more than 300 feet apart. This requirement will dictate how many FDFs are required on a given floor.
- h) The placement of FDFs adjacent to building columns and exterior walls greatly restricts flexibility with regard to layout of a raceway system and the subsequent routing of cables and should be avoided.
- i) Terminal cabinets shall not be installed in lieu of closets without written approval of UIC Telecommunications Engineering & Design. Any buildings which have cabinets presently installed and would require additional termination space, **MUST** be reviewed by the UIC Telecommunications Engineering & Design before any additional cabinets are installed. Any additional cabinets must be approved by UIC Telecommunications Engineering & Design, which will supply ordering details when required.
- j) Major remodeling of any large space must address the updating of the FDFs located in or supplying service to the area involved. UIC Telecommunications Engineering & Design must be contacted early in the concept design phase of the project.

5. NODE REQUIREMENTS:

- a) Additional Nodes shall not be planned unless agreed to by the UIC ACCC/Telecom Engineering Department in writing signed by the department head.
- b) A Node shall have an Emergency Power Source and a UPS sized large enough to maintain telephone, data, and emergency systems that are powered within the Node.
- c) A Node shall meet all the same requirements as any equipment room.
- d) Nodes shall have sufficient space for all termination and electronic equipment required for copper, fiber, and any other media required. It shall be large enough for multiple service providers' equipment with space for future expansion.

O. RACEWAYS

1. GENERAL

- a) Outline of this section
 - (1) **General**
 - (2) **Conduit Systems**
 - (a) General
 - (b) Sizing
 - (c) Runs
 - (d) Bends
 - (e) Sleeves
 - (3) **Pull Boxes and Termination Boxes**
 - (a) General
 - (b) Work Area Boxes
 - (c) Pull Boxes
 - (d) Floor Boxes
 - (4) **Cable Trays**
 - (a) Type
 - (b) Installation
 - (c) Grounding/Bonding
 - (5) **Hangers and Supports**
 - (a) Supporting Conduits
 - (b) Supporting Boxes
 - (c) Supporting Trays
 - (6) **Surface Mounted Raceway**
 - (7) **In Floor Raceways**
 - (8) **Modular Furniture**
 - (9) **Inspection**
- b) Raceways for Network infrastructure are to be used solely for the delivery of the campus Enterprise Network. Under no circumstances other system cabling, connectivity or hardware is to be installed in or on network infrastructure. If found it will be removed/demoed.
 - (1) Divided Cable tray (although not recommended) is allowed but careful planning and installation is needed to provide full separation of systems.
- c) Consult with ACCC/Telecom Engineering Department for materials to use in exposed areas. All finishes are to be maintained throughout occupied spaces. In areas that locations can be recessed behind a wall, this is the approved method. In areas that cannot be recessed, then surface mounted raceway is to be used. Exposed conduit is only allowed by the approval of ACCC/Telecom Engineering Department. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
- d) Consult UIC's Director of Campus Architecture for variations of aesthetics policy 200726 located at the end of this section.
- e) See **PRODUCTS** Section for approved material
- f) Grounding/Bonding
 - (1) Grounding and bonding work shall comply with the Uniform Building Code, Uniform

Fire Code, National Electrical Code, and UL 467, ANSI/TIA/EIA standards, as well as local codes, which may specify additional grounding and/or bonding requirements. See the **GROUNDING AND BONDING** Section of this standard.

- g) Codes and Standards
 - (1) Follow standards established in accordance to the latest ANSI/TIA 569B Standard for Commercial Building Pathways and Spaces.
 - (2) Follow all local and national codes (NFPA-70).
- h) Fire-Stopping
 - (a) All wall and floor penetrations shall be fire-stopped to maintain the same fire rating of the wall or floor prior to penetration.
 - (b) All fire-stopping systems must be submitted and must be reviewed by Telecom Engineering Department prior to authorization of work.
 - (c) All conduit sleeves with cabling shall employ a fire-stop system that can be re-entered for future access. Fire caulk is not allowed inside a conduit.
 - (d) All cable trays shall be fire-stopped using fire pillows.

2. CONDUIT SYSTEMS

- a) **General**
 - (1) Conduit shall be metallic and run in the most practical direct route.
 - (2) EMT is suitable for general installations
 - (3) Color coding for conduit shall be Green for Network Infrastructure
 - (4) Rigid conduit is suitable for underground installations
 - (5) Schedule 40 PVC is suitable for underground installations
 - (6) Flexible metallic conduit shall only be allowed in non-accessible locations and limited to 6' in accessible locations.
 - (7) Innerduct is only allowable for optical fiber
 - (8) All conduits shall be bonded to the local TMGB or TGB using a #6 THHN.
 - (9) The use of "J" hooks or bridal rings is not allowed.
- b) **Conduit Sizing**
 - (1) The minimum trade size for all conduit is 1"
 - (a) Flexible Metallic Conduit is ¾"
 - (2) For new construction installations, it is recommended to install a 1" conduit feeding a work area containing four or more cables.
 - (3) Size the conduits in accordance to the **40% fill rate listed by the cable manufacturer.**
 - (4) The accepted *general* fill rate for horizontal pathways is:
 - (a) 1" conduit – 6 category 6 cables
 - (5) Riser conduit runs for distribution cables shall be no less than three inches trade size. They shall be equipped with 3/8" nylon or larger pull line rated two hundred pounds test (minimum).
 - (6) In multi-level structures, where FDF closets are designed so they are stacked one above the other, a minimum of three 4 inch conduits will connect the closets. These conduits must be threaded and capped at both ends. Conduit in the closet below should extend only far enough below the ceiling to permit installation of a bushing and cap. The closet above the conduit should extend a minimum of three inches but less than four inches above the finished floor. This end shall have grounding bushings installed.
- c) **Conduit Runs**

- (1) Conduit sections shall be no more than 100 feet
- (2) Conduit runs for more than 100 feet, or with bends totaling more than 180 degrees, shall require a pull box.
- (3) All connectors and couplings shall be the compression type, screw type connectors and couplings **shall not be allowed**.
- (4) All connectors shall have plastic bushings installed except where the grounding bushing is required for FDFs and IDFs
- (5) Make conduit terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
- (6) Make threaded connections waterproof and rustproof by applying a watertight, conductive thread compound. Clean threads of cutting oil before applying thread compound.
- (7) Conduits entering the IDFs and FDFs through the wall shall be reamed, bushed with grounding bushings, grounded, and terminated not more than four inches from the entrance wall.
- (8) Conduits entering the IDFs and FDFs from below, shall be reamed, bushed with grounding bushings, grounded, and terminated not more than four inches or less than 3" above the finished floor.
- (9) Keep conduit away from sources of electromagnetic interference as follows:
 - (a) 5 inches from fluorescent lighting
 - (b) 12 inches from conduit and cables used for electrical power distribution
 - (c) 48 inches from motors or transformers
- (10) Install conduit as a complete, continuous system.
- (11) Install exposed conduit in lines parallel or perpendicular to building lines or structural members except where the structure is not level. Follow the surface contours as much as practical. Do not install crossovers or offsets that can be avoided by installing the conduit in a different sequence or a uniform line.
 - (a) Run parallel or banked conduits together, on common supports where practical.
 - (b) Make bends in parallel or banked runs from same centerline to make bends parallel.
- (12) Keep conduit at least 6 inches away from parallel runs of flues and steam or hot-water pipes or other heat sources operating at temperatures above one-hundred degrees Fahrenheit. Install horizontal conduit runs above water piping.
- (13) Ream conduits to eliminate sharp edges and terminate with metallic insulated grounded throat bushings. Seal each conduit after installation (until cable is installed) with a removable mechanical-type seal to keep conduits clean, dry and prevent foreign matter from entering conduits
- (14) Install a pull string in each conduit.
- (15) Where conduits terminate at a cable tray, the conduits shall be bonded to the cable tray.
- (16) Conduit entering the FDF spaces from the station outlets shall penetrate the closet walls at a height above the plywood panels and extend only far enough to install connectors with grounding bushings having plastic collars.
- (17) Where conduits cross building expansion joints, use suitable sliding or offsetting expansion fittings. Unless specifically approved for bonding, use a suitable bonding jumper.
- (18) After installation all conduits shall be labeled for identification. See Section [LABELING AND ADMINISTRATION](#) for details.

(19) Conduit shall be clean, dry, and penetrations fire-stopped.

d) **Bends**

- (1) All offsets shall be rated equivalent to a 90 degree bend.
- (2) Conduit bends will be standard ten times the outside diameter of conduit unless otherwise approved by UIC ACCC/Telecom Engineering Department.
- (3) Bends shall not exceed 90 degrees. (No "Goose Necks")
- (4) Do not exceed 180 degrees for the sum total of conduit bends for a section of conduit.
- (5) 90-degree elbows (LBs) and electrical elbows are not acceptable.

e) **Sleeves**

- (1) Provide sleeves where required, sized as noted in the job scope. Where not noted, sleeve sizing shall be determined by the type and quantity of cable to be routed through the sleeve per TIA/EIA 569 cable capacity standards, **plus an additional 50% for future expansion.**
- (2) Seal between sleeve and wall or floor in which the sleeve is installed. Fire stop penetration to restore wall or floor to pre-penetration fire-rating.
- (3) Grounding bushings are required on all sleeves regardless of length.

3. **PULL BOXES AND TERMINATION BOXES**

a) **General**

- (1) Attach boxes securely to building structure with a minimum of two fasteners. Provide attachments to withstand a force of one hundred pounds minimum, applied vertically or horizontally.
- (2) Verify that the appropriate cover type and depth is provided for each type of wall and finish. Provide extension rings as needed.
- (3) Telecommunication outlet boxes shall NOT be placed back to back with another telecommunication outlet box or any other box.
- (4) Install boxes in dry locations (not wet, corrosive, or hazardous).

b) **Work Area Boxes**

(1) **Size**

- (a) Recessed GEM Boxes shall only be used for fishing walls during light renovation and shall be at least 2 ¾" deep
- (b) Outlet boxes shall be 4 11/16" x 4 11/16" x 2 1/8" deep. AKA 11B box
- (c) See Surface mounted raceway for sizing of surface mounted boxes

(2) **Location**

- (a) Install boxes at the following heights to the center of the box, except where noted otherwise:
 - (i) Workstation telecommunications outlets shall be mounted at the same height as the electrical power receptacles.
 - (ii) **Wall mounted telephones: 48 inches above finished floor.**
 - (iii) **Workstation outlets: 16 inches above finished floor.**
 - (iv) Place boxes for outlets on cabinets, countertops, shelves, and similar boxes located above countertops two inches above the finished surface or two inches above the back splash. Verify size, style, and location with the supplier or installer of these items prior to outlet box installation.
 - (v) ADA height requirements from the 2010 ADA Revision:

308 Reach Ranges

308.1 General. Reach ranges shall comply with 308.

| <p>Advisory 308.1 General. The following table provides guidance on reach ranges for children according to age where building elements such as coat hooks, lockers, or operable parts are designed for use primarily by children. These dimensions apply to either forward or side reaches. Accessible elements and operable parts designed for adult use or children over age 12 can be located outside these ranges but must be within the adult reach ranges required by 308.</p> | | | |
|---|----------------|------------------|-------------------|
| Children's Reach Ranges | | | |
| Forward or Side Reach | Ages 3 and 4 | Ages 5 through 8 | Ages 9 through 12 |
| High (maximum) | 36 in (915 mm) | 40 in (1015 mm) | 44 in (1120 mm) |
| Low (minimum) | 20 in (510 mm) | 18 in (455 mm) | 16 in (405 mm) |

308.2 Forward Reach.

308.2.1 Unobstructed. Where a forward reach is unobstructed, the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

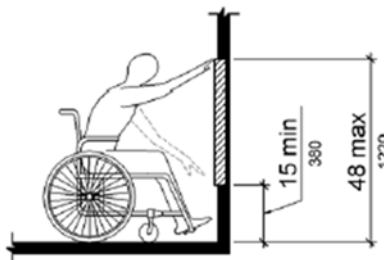


Figure 308.2.1 Unobstructed Forward Reach

308.2.2 Obstructed High Reach. Where a high forward reach is over an obstruction, the clear floor space shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches (1220 mm) maximum where the reach depth is 20 inches (510 mm) maximum. Where the reach depth exceeds 20 inches (510 mm), the high forward reach shall be 44 inches (1120 mm) maximum and the reach depth shall be 25 inches (635 mm) maximum.

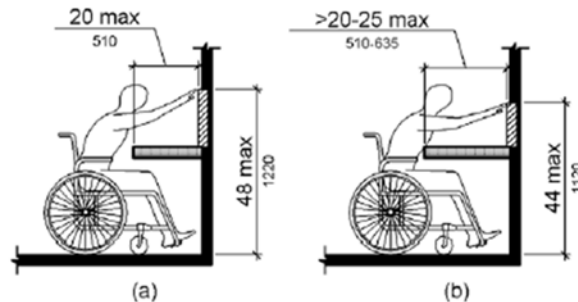


Figure 308.2.2 Obstructed High Forward Reach

308.3 Side Reach.

308.3.1 Unobstructed. Where a clear floor or ground space allows a parallel approach to an element and the side reach is unobstructed, the high side reach shall be 48 inches (1220 mm) maximum and the low side reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

EXCEPTIONS:

1. An obstruction shall be permitted between the clear floor or ground space and the element where the depth of the obstruction is 10 inches (255 mm) maximum.
2. Operable parts of fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum measured from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

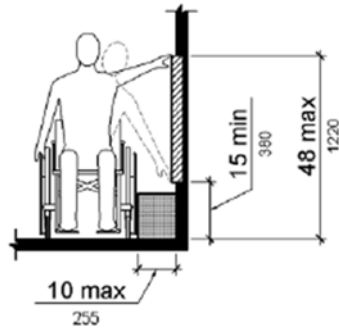


Figure 308.3.1 Unobstructed Side Reach

308.3.2 Obstructed High Reach. Where a clear floor or ground space allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches (865 mm) maximum and the depth of the obstruction shall be 24 inches (610 mm) maximum. The high side reach shall be 48 inches (1220 mm) maximum for a reach depth of 10 inches (255 mm) maximum. Where the reach depth exceeds 10 inches (255 mm), the high side reach shall be 46 inches (1170 mm) maximum for a reach depth of 24 inches (610 mm) maximum.

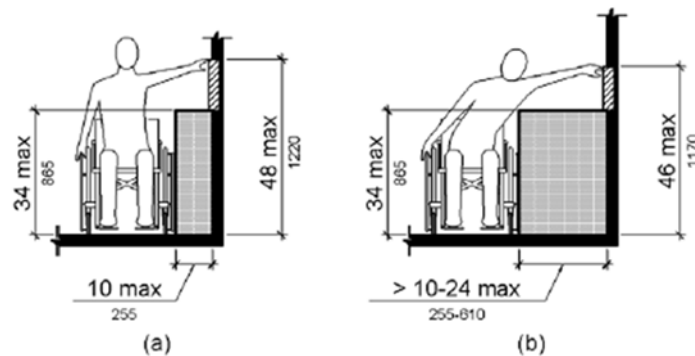
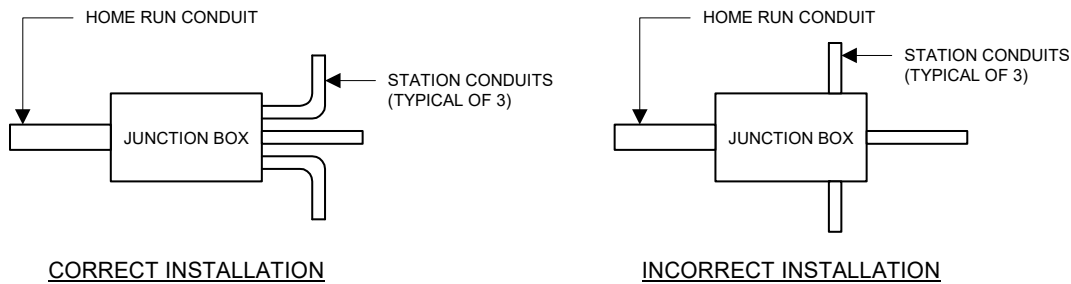


Figure 308.3.2 Obstructed High Side Reach

c) Pull Boxes

- (1) All pull boxes shall be placed in a straight section of conduit. **A box must not be used in**

lieu of a bend. **90 degree fittings (LBs) are not acceptable.**



- (2) All boxes shall be covered with blanks and marked for communications circuits.
- (3) Align the corresponding conduits at each end of the box with each other.
- (4) Provide boxes with a suitable marked and, if possible, hinged cover.
- (5) In a non-accessible ceiling a hinged access panel shall be provided in the ceiling directly below all pull boxes.
- (6) All boxes shall be properly and adequately secured by a minimum of two attachment points. They are not to be supported by the conduits entering the box.
- (7) Install pull boxes in easily accessible locations.
- (8) Riser system cables and outlet jack distribution cables cannot share the same conduit system or pull/junction boxes
- (9) **Size:**
 - (a) The minimum size junction or pull box is a 12" x 12" box for trade sizes 1" and above.
 - (b) Where sizing is not shown on the Contract Documents, size pull boxes as follows:

| Size of Largest Conduit | Box Width | Box Length | Box Depth |
|-------------------------|-----------|------------|-----------|
| 1" | 4" | 12" | 4" |
| 1-¼" | 6" | 12" | 4" |
| 1-½" | 8" | 12" | 4" |
| 2" | 8" | 24" | 4" |
| 2-½" | 10" | 24" | 6" |
| 3" | 12" | 36" | 6" |
| 3-½" | 12" | 48" | 6" |
| 4" | 15" | 48" | 6" |

- (c) For horizontal runs where a pull box is required with conduits 1" trade size or smaller, an outlet box may be used as a pull box. Where outlet boxes are used as pull boxes, the outlet boxes shall be dedicated for use as a pull box and shall not host cable termination hardware.
- d) **Floor Boxes**
 - (1) Set device boxes plumb, level, square and flush with floor.
 - (2) For floor boxes with combined power and telecommunications circuits, provide metal dividers to separate power from telecommunications circuits.

- (3) All Floor Boxes must be approved by UIC Telecommunications Engineering & Design prior to their inclusion in drawings and specifications.

4. CABLE TRAYS

a) Type:

- (1) All cable trays must be approved by UIC ACCC/Telecom Engineering Department prior to their inclusion in drawings and specifications.
- (2) Solid bottom and solid sided tray is the required raceway method. Ladder type or ladder rack shall not be used outside the telecommunication room. Cable tray shall be complete with all tray supports, materials, and incidental and miscellaneous hardware required for a complete cable tray system.
 - (a) Only Factory made Radius Fittings are to be used.
 - (b) Width: Widths shall be as shown on the Contract Documents. Where cable tray width is not shown on the Contract Documents, it shall be sized according to the amount of cable to be placed in the trays plus an additional 100% for future expansion capability.
 - (c) Minimum Depth: 6 inches.
 - (d) The maximum fill for cable tray is 50% fill when pulling in an existing tray as per ANSI/TIA 569 Standards
- (3) When approved as a substitute by the ACCC/Telecom Engineering Department, Welded Wire cable tray shall be allowed: Cable tray shall be constructed of welded wire mesh (high strength steel wires) with a continuous safety edge wire lip. Cable tray shall be complete with all tray supports, materials, and incidental and miscellaneous hardware required for a complete cable tray system.
 - (a) Solid bottom tray inserts are to be installed in all exposed areas. Non- solid bottom welded wire tray may be installed above closed ceilings (drop ceilings) when approved by ACCC/Telecom Engineering Department.
 - (b) Finish: Carbon steel with electro-plated zinc galvanized finish.
 - (c) Only Factory made Radius Fittings are to be used.
 - (d) Width: Widths shall be as shown on the Contract Documents. Where cable tray width is not shown on the Contract Documents, it shall be sized according to the amount of cable to be placed in the plus an additional 100% for future expansion capability.
 - (e) Minimum Depth: 4 inches.
 - (f) Mesh: 2 x 4 inches.
 - (g) The maximum fill for cable tray is 50% fill when pulling in an existing tray as per ANSI/TIA 569 Standards

b) Installation:

- (1) Cable tray shall be installed plumb, level and square with finished building surfaces
- (2) Provide factory-manufactured connection hardware between each cable tray segment. Cable tray segments shall be mutually aligned. Connection hardware shall be installed according to the manufacturer's requirements.
- (3) Any non-continuous section of tray shall be coupled with conduits. The conduits shall be sized to equal the capacity of the tray. The conduits shall be bonded on both ends

along with a bonding jumper to attach both tray sections.

- (4) Supports:
 - (a) Supports shall be attached to structural ceiling or walls with hardware or other installation and support aids specifically designed for the cable tray and designed to support the cable tray's weight and required cable weight and volume.
 - (b) Where cable trays abut walls, provide wall-mounted supports.
 - (c) Do not attach cable tray supports to ceiling support system or other mechanical support systems.
 - (d) Supports shall be minimally every 5' except when the manufacturer's recommendation differs.
 - (e) Supports shall be trapeze type. Center support is not allowed.
- (5) Clearance requirements for cable tray accessibility:
 - (a) Maintain a clearance of 6" between top of cable tray and ceiling structure or other equipment or raceway.
 - (b) Maintain a clearance of 12" between at least one side of cable tray and nearby objects.
 - (c) Maintain a clearance of 6" between bottom of cable tray and ceiling grid or other equipment or raceway.
 - (d) Maximum of 24" above finished ceiling height to the top of the tray.
- (6) Clearance requirements from sources of electromagnetic interference (EMI):
 - (a) Maintain a clearance of 5" or more from fluorescent lighting.
 - (b) Maintain a clearance of 12" or more from conduit and cables used for electrical power distribution.
 - (c) Maintain a clearance of 48" or more from motors or transformers.
 - (d) Pathways shall cross perpendicularly to electrical power cables or conduits.
 - (e) Maintain a clearance of at least 6 inches from parallel runs of flues and steam or hot-water pipes or other heat sources operating at temperatures above one-hundred degrees Fahrenheit.
- c) **Grounding/Bonding:**
 - (1) In accordance with ANSI/NFPA 70 Section 318: cable tray shall be complete with bolted splicing hardware for grounding/bonding throughout the entire cable tray system.
 - (2) Bond metallic raceway (including cable tray) together and to the nearest TGB. Ensure that bonding breaks through paint to bare metallic surface of painted metallic hardware.
 - (3) Cable tray bonding splices: Provide cable tray splices according to manufacturer requirements to create a continuous bonding conductor throughout the entire cable tray.
 - (4) Bonding conductors:
 - (a) Bond distribution conduits to the cable tray with a #6 bonding conductor.
 - (b) Provide bonding jumpers at expansion joints, sleeves and any other locations where electrical continuity is interrupted.
 - (5) In a mesh tray installation, a #6 bonding conductor shall be installed the entire length of the system. This conductor shall be bonded to the TMGB or TGB. This conductor shall also be bonded to each tray section and radius fittings. The bonding conductor shall be placed along one side of the tray the entire length as not to cross or have slack inside the tray to impede pulling cabling.

5. HANGERS AND SUPPORTS

(1) Supporting Conduits

- (a) Conduits and equipment shall be independently supported, free from any other mechanical system.
- (b) Provide anchors, hangers, supports, clamps, etc. to support the conduits from building structures in or on which they are installed. Do not space supports farther apart than five feet.
- (c) Provide sufficient clearance to allow conduit to be added to racks, hangers, etc. in the future.
- (d) Conduit runs for horizontal distribution cables utilizing the trapeze hanger method to support the conduits, shall utilize threaded rods of not less than 3/8" inch diameter.
- (e) Support conduit within three feet of each outlet box, junction box, gutter, panel, fitting, etc.

(2) Supporting Boxes

- (a) All boxes shall be self-supported from building structure at a minimum of 2 points.

(3) Supporting Trays

- (a) Provide anchors, hangers, supports, clamps, etc. to support the tray from building structures in or on which they are installed. Do not space supports farther apart than five feet.
- (b) Conduit and cable tray support systems shall be securely and adequately installed to preclude movement of conduit and cable tray during pulling operations.

(4) Supporting methods approved by UIC Telecommunications Engineering & Design are as follows:

- (a) Toggle bolts in hollow masonry.
- (b) Expansion bolts in concrete
- (c) Wood screws or bolts in wood.
- (d) Machine screws or bolts in metal surfaces.
- (e) Use of powder powered (shot) anchors is prohibited.
- (f) Where outlets are installed in steel stud type systems, provide additional cross bracing and/or straps to make the outlet completely rigid prior to application of the wall facing material.

6. SURFACE MOUNTED RACEWAYS

- a) Wiremold 2400 series surface mounted raceway and its associated fittings shall be the minimum size surface mounted raceway used.
- b) Wiremold 2400 series 2 ¼" boxes shall be the minimum depth boxes used for all data locations.
- c) Only radius type FO fittings may be used on raceways encasing category rated cabling.
- d) Boxes for jacks shall be mounted vertically.
- e) Only manufacture's components may be used. No field modified components.
- f) See [PRODUCTS](#) Section for approved material

7. IN FLOOR RACEWAYS

- a) This is not a recommended or approved raceway by The UIC Telecommunications Engineering Department. This type of raceway shall not be used in new construction.
- b) In the case of existing in floor raceways, the raceway may be used as long as the following rules are applied:
 - (1) Extreme care must be taken when pulling the cable.
 - (2) The bend radius of the cable is must be maintained.
 - (3) Assure that excessive force is not used to pull cable.
 - (4) Telecommunication outlet boxes, nipples, and reducing bushings shall be installed after cable is pulled.
 - (5) Extreme care must be taken not to twist the cables at the in-floor junction boxes.

8. MODULAR FURNITURE

- a) In order to support category six cabling, modular furniture shall contain the following elements:
 - (1) Have metal raceways large enough to easily accommodate all telecommunications and electrical wiring needed.
 - (2) The telecommunications wiring and the electrical wiring must not share the same raceway. This is accomplished by installing the electrical wiring in green-field. The telecommunication cables may be run in the raceway open, but may not be fastened to the green-field.
 - (3) The furniture shall contain both horizontal and vertical raceways.
 - (4) Vertical raceways, to match the furniture, must be available to extend the raceways into the ceiling.
 - (5) Fittings must be available to connect other forms of raceway to the furniture (For example, connecting conduit to the furniture raceway).
- b) The snap on covers at the base must contain knockouts for standard single gang openings.
- c) The use of furniture bezels for jacks are required to maintain the proper depth for cabling.
- d) When design considerations require alternate means, note the following:
 - (1) Utilize Poke-Through Devices / Floor Box solutions.
 - (2) Furniture with a divided City of Chicago approved raceway contained in the furniture.
 - (a) Transitioning from the wall to the furniture must be in a conduit or flexible metallic raceway connection.
 - (3) Surface mounted raceway or conduit beneath a desk for both power and network connections.
 - (4) If tables utilizing a “basket” under mount system for cords and patches are requested then wall terminations are required utilizing the basket system for patch cords.
 - (5) All network/voice connections are to be readily accessible.
 - (6) Under no circumstances are network/voice cables to be tied up or free aired under desks.

9. INSPECTION

- a) UIC ACCC/Telecom Engineering Department must be given 24 hour notice to inspect telecommunications raceways in walls and ceilings prior to their enclosure.

- b) The cabling may not be installed in the raceways prior to raceway inspection by UIC ACCC/Telecom Engineering Department.
- c) UIC ACCC/Telecom Engineering Department must be notified at least 24 hours prior to beginning cable terminations.
- d) Upon notification of job/project completion, the UIC ACCC/Telecom Engineering Department will make a walk thru inspection with the installation contractor. A punch list will be generated at this time. All items on this punch list shall be rectified before a final inspection and acceptance of the job/project.
- e) When telecommunications conduits are to be encased in concrete, UIC ACCC/Telecom Engineering Department must be notified two working days prior to beginning the installation. A UIC ACCC/Telecom Engineering Department representative is to be present at the installation.

July 27, 2020

Electrical and Communication Pathways and Painting Requirements in All State-Supported Facilities

Note: These requirements apply to ALL State-Supported Facilities (which covers every UIC building except those supported by Campus Auxiliary Services, UIH, and Athletics)

Pathways

A. General

- a. *In new construction projects and larger renovations, electrical and communication pathways should be concealed above drop ceilings and within drywall partitions where possible.*
- b. *Exposed pathways should be routed in the most inconspicuous route possible since they are not meant to be seen. The least inconspicuous route may not be the shortest route. Special attention must be given to conduit and wire mold installed in state-supported buildings with exposed structural ceilings and/or masonry and concrete walls. It is suggested that consultants either draw the proposed routing of exposed pathways on the construction documents or a pre-bid meeting be scheduled on-site with a representative from UIC ACCC/Telecom, Contractor, PSPM Project Management, Campus Architecture and Learning Environments. Exposed pathway routing must be reviewed prior to bidding.*
- c. *Pathways should not be mounted in front of wall panels, mechanical grilles, or any other element that might need to be removed for access, service, or cleaning.*

B. Horizontal pathways

a. Ceiling plane

- i. *Conduit or wire mold may be used for power and communication wiring, but must adhere to the following restrictions:*
 - 1. *The clear space between adjacent horizontal pathways should be minimized so they are clustered together in lieu of being*

spaced apart. Pathways should be mounted as high above the ground (i.e. as close to the ceiling structure above as possible) and as close to the wall as possible or supported off the top of the wall.

- 2. If the horizontal pathways must bend around a wall corner then it should be done in a manner that does not cause any modification to the building structure (i.e. no notching or cutting of existing walls or structural members will be allowed)*
- 3. Horizontal pathways that bend around wall corners should be done in a manner that keeps wire mold and conduit tight to the wall surface.*

ii. Cable tray must be solid bottom type in exposed areas, and may only be used if pre-approved by UIC ACCC/Telecom

b. Below ceiling plane

i. Wiremold must be used for horizontal runs below the ceiling plane and must adhere to the following restrictions:

- 1. Horizontal runs inside occupied spaces should be either as high on the wall as possible or at 18" AFF. An exception to this would be if a user requests connections to be installed above desk or counter height.*

c. Wall penetrations: Penetrations must either be as high on the wall as possible or at 18" AFF and preferably near a wall corner or column/pilaster. All penetrations must be sealed. If the penetrations is through a fire rated wall then it must be sealed with a fire rated sealer approved by UIC's Authority Having Jurisdiction.

d. Painting: All horizontal pathways and junction boxes should be painted unless the majority (i.e. over 50%) of the existing pathways in the installation area are not painted. Paint color chips should be submitted to the Office of the Campus Architect for review and approval before painting occurs.

C. Vertical pathways

a. Concealed: Risers or drops should occur inside of telecom rooms, closets or wall cavities whenever possible. Conduit may only be used for vertical pathways when concealed from view.

b. Exposed: If risers or drops are exposed to view, then they should be minimized and shall be placed near a wall corner or on the side of a column or pilaster. Wiremold must be used when vertical pathways are exposed to view.

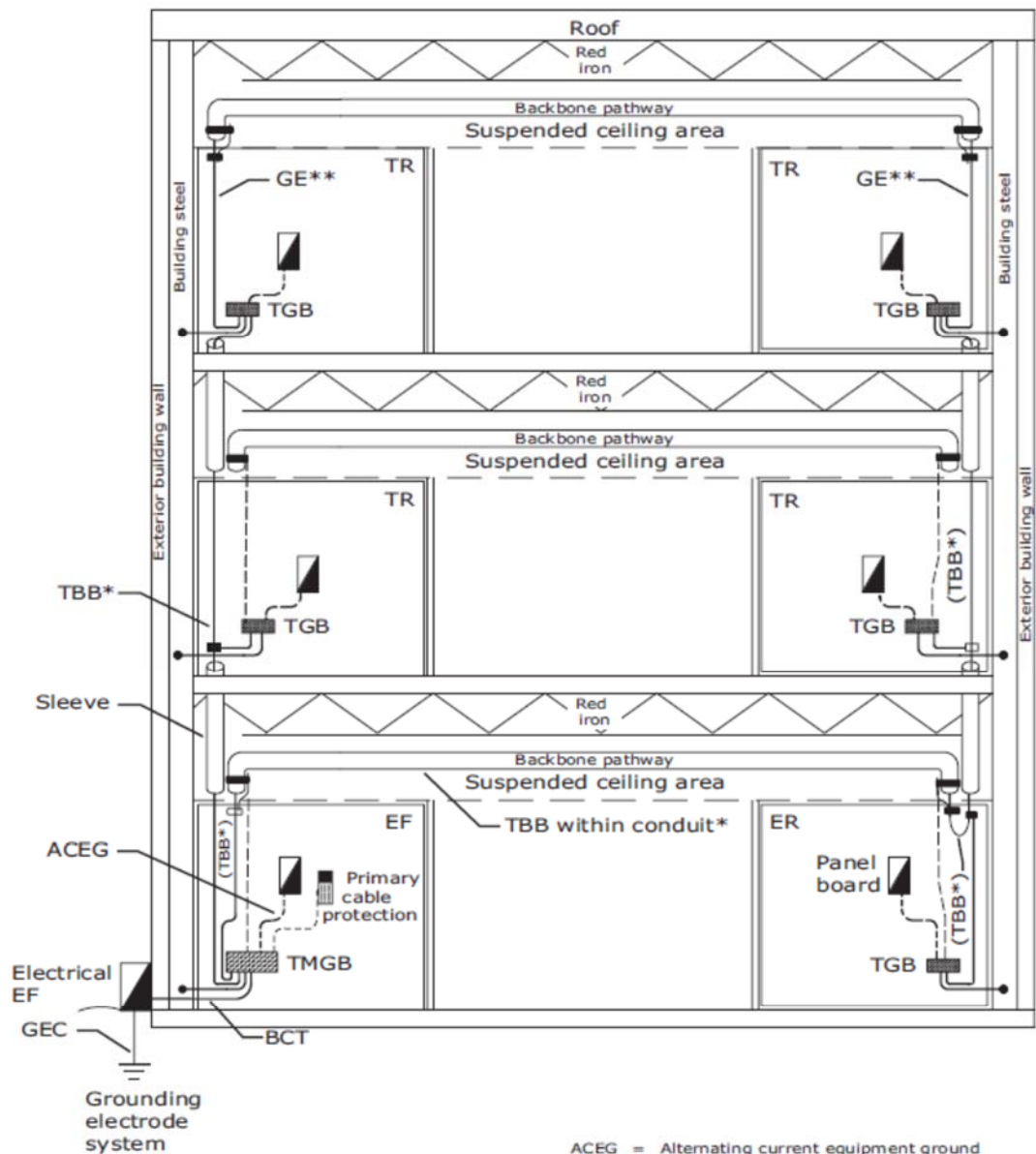
c. Painting: All exposed vertical pathways and junction boxes should be painted to match the surface where they are mounted. Paint color chips should be submitted to the Office of the Campus Architect for review and approval before painting occurs.

D. Questions:

- a. *If there are questions regarding the requirements listed above, then please contact UIC/ACCC Telecom. Telecom will be responsible for interpreting these requirements. In special situations, a site visit may be required to determine how to apply the requirements and would be scheduled through ACCC Engineers with the Associate Director Campus Architecture & Learning Environments.*

P. GROUNDING AND BONDING

1. All UIC Telecommunications Equipment and raceways shall be properly grounded in accordance with ANSI/TIA/EIA-607-B, the NFPA 70 (National Electrical Code), Chicago Electrical Code, and all other applicable codes and regulations. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. If a TMGB or TGB is not part of the project installation and one is not present, any new raceway shall be bonded to the Equipment rack. This will allow for future bonding once a BCT is installed. Contractors are to notify ACCC/Telecom Engineers of the deficiency.
3. Items to be bonded to the TMGB or TGB inside an FDF/IDF with a minimum #6 green THHN copper conductor follow NFPA 70 and ANSI/TIA 607-B for sizing and layout:
 - a) All Ladder Racks must be bonded together and tied to the TMGB or TGB
 - b) All Equipment Racks and Cabinets.
 - c) All cable tray entering or leaving the FDF/IDF.
 - d) All conduits terminating inside the FDF/IDF.
 - e) All protectors on copper circuits including primary and secondary type protectors.
 - f) All armored sheaths on OSP cabling both copper and fiber.
 - g) The Grounding Buss of the electrical distribution panel inside the FDF/IDF.
 - h) Power conditioning equipment.
 - i) Any specialty equipment requiring a bonding conductor.
 - j) **Ensure that bonding breaks through paint to bare metallic surface of all painted metallic hardware.**
 - k) **The use of self-drilling screws will not be allowed all connections must be bolted.**
4. The major components of the telecommunications grounding and bonding infrastructure are as follows: ([See diagram 8a](#)).
 - a) **The bonding conductor for telecommunications (BCT).**
 - b) **The Telecommunications Main Grounding Buss Bar (TMGB).**
 - c) **The Telecommunications Grounding Buss Bar (TGB).**
 - d) **The Telecommunications Bonding Backbone (TBB).**
 - e) **The Grounding Equalizer (GE).**
 - (1) Labels:
 - (a) Label TMGB(s) with "TMGB"
 - (b) Label TGB(s) with "TGB".
 - (c) Label TBB(s) and bonding conductors "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"



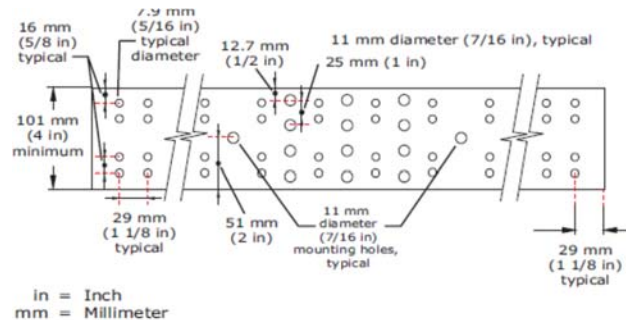
* Optional installation only. Please see section labeled Telecommunications Bonding Backbone in this chapter for alternative design arrangements.

** Optional installation only. Please see section labeled Grounding Equalizer in this chapter for alternative design arrangements.

ACEG = Alternating current equipment ground
BC = Bonding conductor
BCT = Bonding conductor for telecommunications
EF = Entrance facility
ER = Equipment room
GE = Grounding equalizer
GEC = Grounding electrode conductor
TBB = Telecommunications bonding backbone
TGB = Telecommunications grounding busbar
TMGB = Telecommunications main grounding busbar
TR = Telecommunications room

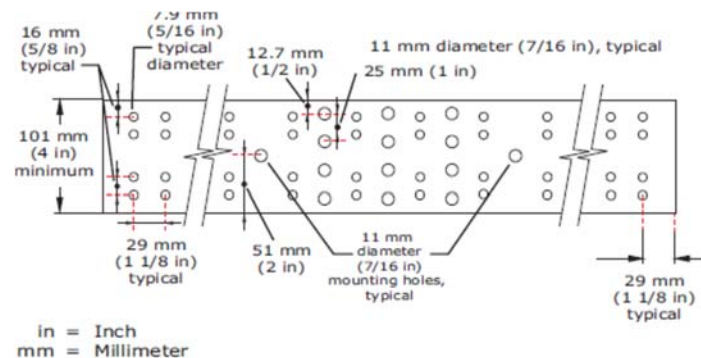
- f) The conductors used to bond the components to the TMGB & the TGBs.
- (1) **The bonding conductor for telecommunications (BCT)**
- (a) The bonding conductor for telecommunications shall bond the TMGB to the service equipment (power) ground.
- (b) This bonding conductor is intended to conduct lightning and ac fault currents from the telecommunication primary protectors.

- (c) A minimum of 300 mm (1 ft.) separation shall be maintained between this insulated conductor and any dc power cables, switchboard cable, or high frequency cables, even when isolated by metallic conduit or EMT.
 - (d) The minimum size for this conductor shall be 3/0 green insulated stranded copper cable. This conductor shall be sized in accordance to the ANSI/TIA 607-B
- (2) **The Telecommunications Main Grounding Buss Bar (TMGB)**



- (a) The Telecommunications Main Grounding Busbar (TMGB) serves as the dedicated extension of the building grounding electrode system for the telecommunications infrastructure. The TMGB also serves as the central attachment point for telecommunications bonding backbones (TBB) and equipment, and is located such that it is accessible to telecommunications personnel.
- (b) The IDF / Node is the desirable location for the TMGB. This TMGB may serve as the TGB for collocated equipment in the IDF / Node as appropriate.
- (c) The TMGB should be located so that the bonding conductor for telecommunications is as short and straight as possible.
- (d) The TMGB should be located to result in the straightest route considering the total length of the bonding conductor from the telecommunications primary protectors to the TMGB.
- (e) The TMGB should be located near the backbone cabling and associated terminations.
- (f) The TMGB shall be as close to the Data Racks as practicable and shall be installed to maintain clearances required by applicable electrical codes.
- (g) Telecommunications primary protectors on the inter-building backbone cables shall be bonded to the TMGB.
- (h) The TMGB is the common point in the IDF/Node to which all grounding connections for that room are made.
- (i) The TMGB is intended to be the location for connecting grounding bars incorporated in telecommunications equipment located in the TEF (e.g., MUX or optical fiber termination equipment).
- (j) The connections of the bonding conductor for telecommunications and the TBB's to the TMGB shall utilize listed 2-hole compression connectors, exothermic type welded connections, or equivalent.
- (k) The TMGB shall be a predrilled copper buss bar provided with standard NEMA bolt hole sizing and spacing for the type of connectors to be used.

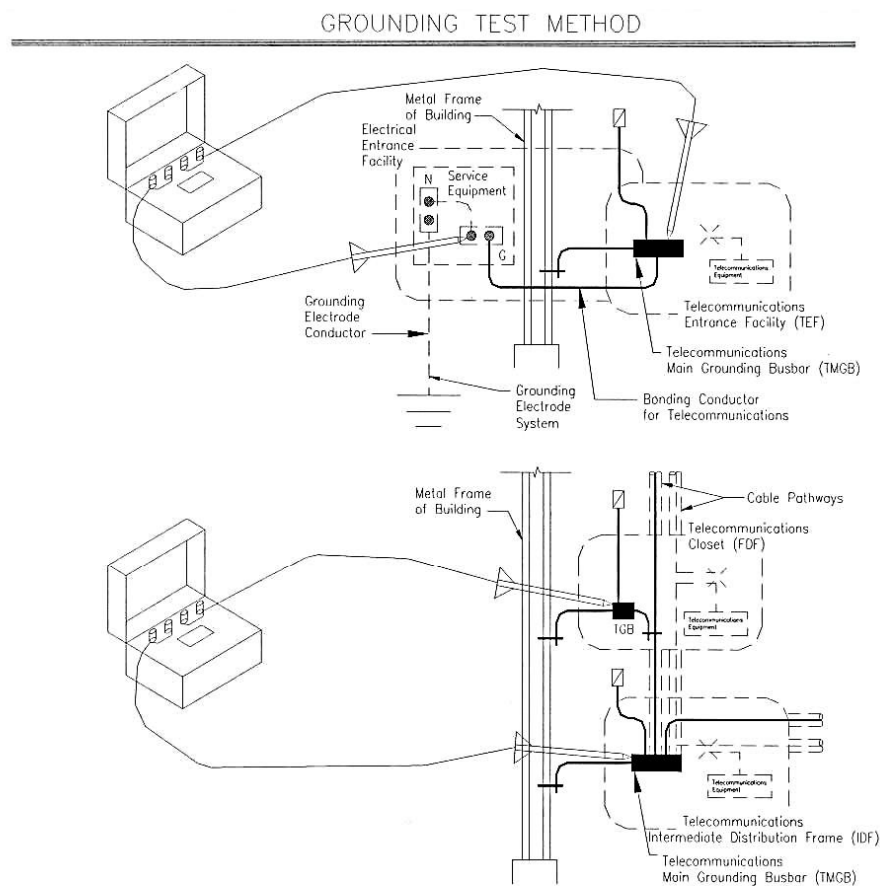
- (l) The TMGB shall have minimum dimensions of 1/4" thick x 4" wide and 12" in length. The length may need to be adjusted longer to meet the application requirements with consideration of future growth.
 - (m) It is required that the buss bar be electro tin plated for reduced contact resistance.
 - (n) The TMGB shall be insulated from its support. A 50 mm (2 in) separation is required.
 - (o) Where an electrical panel board for telecommunications is located in the same room or space as the TMGB, that panel board's Alternating Current Equipment Ground (ACEG) bus (when equipped) or the enclosure shall be bonded to the TMGB.
- (3) The Telecommunications Grounding Buss Bar (TGB)**



- (a) The Telecommunications Grounding Buss Bar (TGB) is the common central point of connection for telecommunications systems and equipment in the location served by that telecommunications closet or equipment room.
- (b) Each telecommunications closet and equipment room shall contain a TGB.
- (c) The TGB should be located near the backbone cabling and associated terminations.
- (d) The TGB should be located so that the grounding conductors are as short and straight as possible.
- (e) The bonding conductor between a TBB and TGB shall be continuous and routed in the shortest possible straight-line path.
- (f) The TGB shall be a predrilled copper bus bar provided with standard NEMA bolt hole sizing and spacing for the type of connectors to be used.
- (g) The TGB shall have minimum dimensions of 1/4" thick x 4" wide and 12" in length.
- (h) It is required that the buss bar be electro tin plated for reduced contact resistance.
- (i) The TGB shall be insulated from its support. A 50 mm (2 in) separation is required.
- (j) Where an electrical panel board for telecommunications is located in the same room or space as the TGB, that panel board's Alternating Current Equipment Ground (ACEG) bus (when equipped) or the enclosure shall be bonded to the TGB.
- (k) Where a panel board for telecommunications is not located within the same room or space as the TGB, consideration should be given to bonding the panel board's ACEG bus (when equipped) or the enclosure to the TGB.
- (l) Bonding to the metal frame of a building:
 - (i) All bonding conductors and connectors for bonding the metal frame of a building shall be listed for the purpose intended and approved by a NRTL.
 - (ii) In buildings where metal frames (structural steel) are effectively grounded, each TGB shall be bonded to the metal frame within the room using a No. 6 AWG conductor.

- (iii) Where the metal frame is external to the room and readily accessible the metal frame should be bonded to the TGB with a No. 6 AWG conductor.
 - (iv) Where the metal frame is external to the room and readily accessible the metal frame should be bonded to the TMGB with a No. 6 AWG conductor.
 - (v) When practicable because of shorter distances and other considerations, and where horizontal steel members are permanently electrically bonded to vertical column members, TGBs may be bonded to these horizontal members in lieu of the vertical column members.
 - (vi) This Standard does not require the steel bars of a reinforced concrete building to be bonded to the TGB or TBB.
- (4) The Telecommunications Bonding Backbone (TBB)**
- (a) A TBB is a conductor that interconnects all TGBs with the TMGB. A TBBs basic function is to reduce or equalize potential differences between telecommunications systems bonded to it. A TBB is not intended to serve as the only conductor providing a ground fault current return path.
 - (b) A TBB should be designed with consideration given to the type of building construction, building size, the telecommunications requirements, and the configuration of the telecommunications pathways and spaces. Specifically, the design of a TBB shall:
 - (i) Be consistent with the design of the telecommunications backbone cabling system.
 - (ii) Permit multiple TBB as dictated by the building size.
 - (iii) Address routing to minimize the lengths of the TBB.
 - (c) A TBB shall be an insulated copper conductor. The minimum TBB conductor size shall be a No. 3/0 AWG.
 - (d) TBB conductors should be installed without splices, where practicable. Where splices are necessary they should be minimum and shall be accessible and located in telecommunications spaces. Joined segments of a TBB shall be connected using irreversible compression-type connectors, exothermic welding, or equivalent. All joints shall be adequately supported and protected from damage.
- (5) The Grounding Equalizer (GE)**
- (a) Whenever two or more vertical TBB are used within a multistory building, the TBB shall be bonded together with a Grounding Equalizer (GE) at the top floor and at a minimum of every third floor in between.
 - (b) The Grounding Equalizer (GE) shall be sized as 3/0 green insulated stranded copper cable.
- (6) All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).
 - (7) All bonding conductors shall have green insulation and be copper. The minimum bonding conductor size shall be a No. 6 AWG.
 - (8) Route ground conductors to provide the shortest, most direct path from point to point.
 - (9) Bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place bonding conductors in ferrous metallic conduit that exceeds 1 m (3 ft.) in length, the conductors shall be bonded to each end of the conduit with a conductor sized as a No. 6 AWG, minimum (this makes the conduit a parallel path with the cable).
 - (10) Splices in bonding or grounding conductors are not allowed.
 - (11) A continuous ground path shall be provided in all telecommunications raceways.

- (12) The IDF protector frames shall be grounded to the TMGB.
- (13) At each FDF all equipment and raceways must be bonded to the TGB.
- (14) Any grounding or bonding conductor which is run through a metallic conduit shall be bonded to the conduit at both ends.
- (15) Gas pipes must not be utilized as a grounding electrode.
- (16) Water pipes must not be used as a grounding electrode except for the service equipment power ground.
- (17) The Telecommunications Ground & Bonding System shall be tested with an Earth Ground Resistance Tester used in the Two Point Test Method. (Diagram 8b)



The metering test, known as the Two-Point Test Method, can verify the bonding between grounding planes and is illustrated above in diagram 8b. The test is accomplished by connecting a two-point terminal earth ground resistance tester in a two-point setup. The meter is then connected between the two points under test. A measurement is then made with the tester, and after subtracting the resistance of the leads, record the value. If the ohmic value is less than 0.1 Ohm, this means that there is adequate bonding between the two test points.

diagram 8b

| | | | |
|-------------------------------|------------------|--------------------------------------|------------|
| FILE: GNDTEST.DWG | DRAWN BY: T.E.D. | UNIVERSITY OF ILLINOIS AT CHICAGO | UIC |
| DWG: GROUNDING TEST METHOD | DATE: 07.22.97 | TELECOMMUNICATIONS DEPARTMENT | |
| | SHEET: 1 OF 1 | | |
| | SCALE: NO SCALE | | |

- (18) Tests to be conducted:
- (a) Test between the TMGB and the service equipment (power) ground.
 - (b) Test between the TMGB and each TGB in the system.
 - (c) Test between the TGB and:
 - (i) Data racks.
 - (ii) Cable tray.
 - (iii) Telecommunication conduit.
 - (iv) Caging.
 - (v) Electronic equipment.
 - (d) These tests shall be conducted with the systems in operation.

Q. TRANSMISSION MEDIA

1. General

- a) Section Layout
 - (1) **General**
 - (2) **Copper**
 - (a) Backbone
 - (b) Horizontal
 - (3) **Fiber**
 - (a) General
 - (b) Inter-building
 - (c) Intra-building
- b) Follow NFPA 70 and ANSI/TIA 569/607/568 on Grounding and cable placement requirements.
- c) All cable must be in an approved metallic raceway outside the FDFs / IDFs or sleeved when passing between FDFs / IDFs See [RACEWAY](#) Section
- d) All Media must be tested. See [TESTING](#) Section
- e) All Media must be labeled. See Section on [LABELING / ADMINISTRATION](#)
- f) For approved Products See [PRODUCT](#) Section
- g) Raceways and associated cabling for Network infrastructure are to be used solely for the delivery of the campus Enterprise Network. Under no circumstances other system cabling, connectivity or hardware is to be installed in or on network infrastructure. If found it will be removed/demoed.
- h) For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu

2. Copper

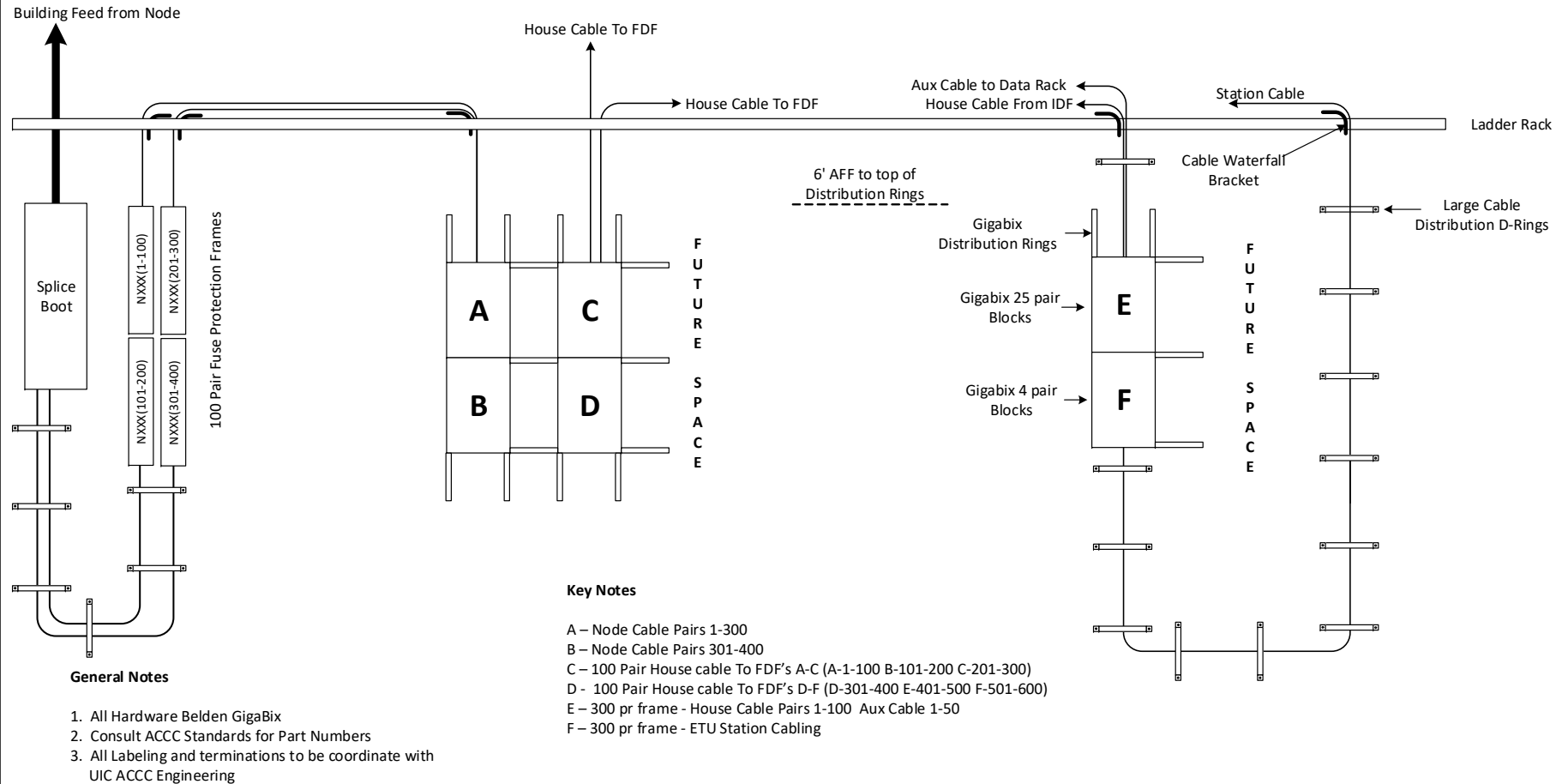
- a) **Backbone**
 - (1) Infrastructure-node cable shall be standard exchange type telephone cable, which is defined as paired, multi-conductor, thermoplastic insulated, copper cable characterized by a mutual capacitance at 1000 Hz of 0.083 microfarads per mile. All cable provided shall be solid annealed copper
 - (2) Minimal 24 AWG cable may be used in the distribution network and must be based on standard resistance design procedures, taking into account the signaling limits of the Northern Telecom DMS-100 Switching Equipment. Loop resistance calculations shall be based on cable temperature of 68 degrees F. Cable selection MUST be equivalent or better than AT&T products coded PIC, ASP, AFMW, and ARMM as specified.
 - (3) Cable selection must be in accordance with the following:

| APPLICATION | CONDUCTOR INSULATION | CORE | SHEATH |
|---|----------------------|--------|-----------------|
| Intra-building (risers and terminating stubs) | Solid | Air | PVC Riser Rated |
| Inter-building (in conduit) | Foam/Skin | Filled | ASP* |

| | | | |
|-----------------------------------|-----------|--------|--------------|
| Inter-building (in steam tunnels) | Foam/Skin | Filled | APPLICATION* |
|-----------------------------------|-----------|--------|--------------|

- (a) **The National Electric Codes (NEC) prohibits the use of outside plant copper cables within the building, since they are not fire-resistant and do not pass any of the fire tests. If these cables are utilized within a building beyond a fifty foot radius from the building entrance, they must be enclosed in heavy-duty metal conduit.**
- (4) Cables must be sized to accommodate the voice, data, and miscellaneous requirements specified by the end user and UIC Telecommunications. UIC ACCC/Telecom Engineering Department will specify the counts.
- (5) There MUST NOT be multiple appearances of cable counts.
- (6) The cables shall be identified with appropriate cable tags at both ends of the cable. See Section on Labeling / Administration
- (7) Install cables in compliance with ANSI/TIA requirements, BICSI practices, and manufacturers recommendations. Adhere to the requirements relating to bending radius, pulling tension, other mechanical stresses, and pulling speed. Use a Kellum grip when pulling and supporting vertically
- (8) Standard Bend Radius:
 - (a) 10 x OD for non-armored cable when pulling
 - (b) 8 x OD for non-armored cable when installed
 - (c) 15 x OD for armored cable when pulling
 - (d) 10 x OD for armored cable when installed
- (9) Vertical support in risers shall be 3' from point of entry to the closet above and below and at every 5'.
 - (a) Methods for support shall be the use of vertical cable tray with Velcro attachment
- (10) Must be equipped with protector modules at both ends. See Section on [GROUNDING/BONDING](#)
- (11) For Termination Hardware layout please reference [PRODUCTS](#) Section

Gigabix Typical IDF/FDF Layout



Typical Backbone and Station Cable Labeling FDF

**Typical ETU GIGA-Bix Field (FDF -A)
No Voice Cabling (New Layout)**

[illegible]

**Typical Voice GIGA-Bix Field (FDF -A)
Where Voice Cabling is installed**

| | | | | | |
|-------|-------|-------|-------|-------|-------|
| A-001 | A-002 | A-003 | A-004 | A-005 | A-006 |
| A-007 | A-008 | A-009 | A-010 | A-011 | A-012 |
| | | | | | |
| | | | | | |
| A-013 | A-014 | A-015 | A-016 | A-017 | A-018 |
| A-019 | A-020 | A-021 | A-022 | A-023 | A-024 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| A-301 | A-302 | A-303 | A-304 | A-305 | A-306 |
| A-307 | A-308 | A-309 | A-310 | A-311 | A-312 |

Place ETU Cables
at the end of the
voice count

Typical Backbone (F-3) (909 Building FDF -A)

[illegible]

100 Pair Feed
from IDF To FDF
(909 represents
Building #)

50 Pair Feed from
Bix to Data Rack -
Aux Cable Cat5e
50 pair

Typical Backbone (F-2) (909 Building Feed)

| | | | | | |
|-----|-----|-----|----------------|-----|-----|
| 1 | 5 | 10 | 15 | 20 | 25 |
| 26 | 30 | 35 | 2909 (1-50) | 45 | 50 |
| 51 | 55 | 60 | 65 | 70 | 75 |
| 76 | 80 | 85 | 2909 (51-100) | 95 | 100 |
| 101 | 105 | 110 | 115 | 120 | 125 |
| 126 | 130 | 135 | 2909 (101-150) | 145 | 150 |
| 151 | 155 | 160 | 165 | 170 | 175 |
| 176 | 180 | 185 | 2909 (151-200) | 195 | 200 |

200 Pair Building
Feed

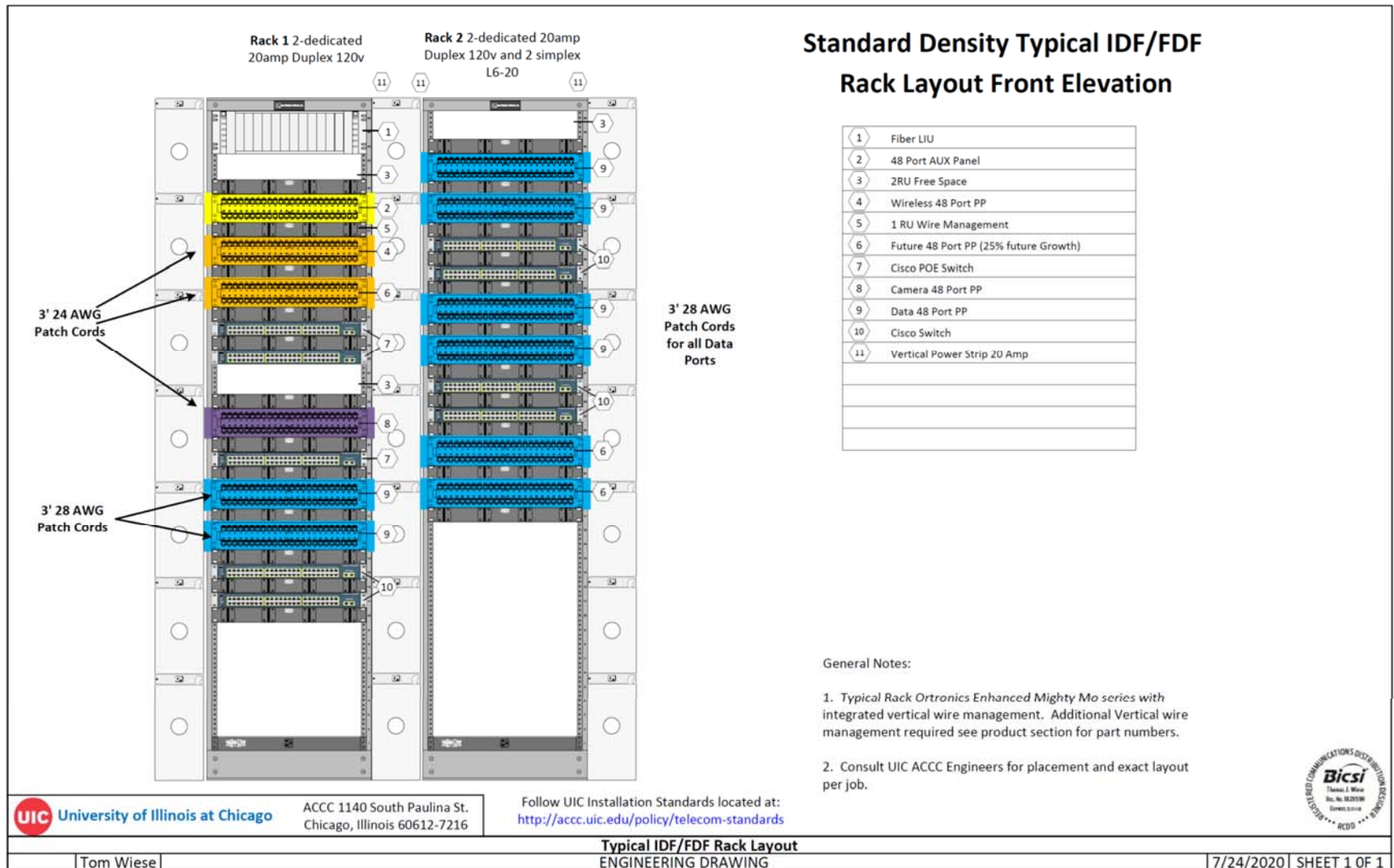
This building example is a 200 pair Backbone cable from Node 2 to the 909 building.

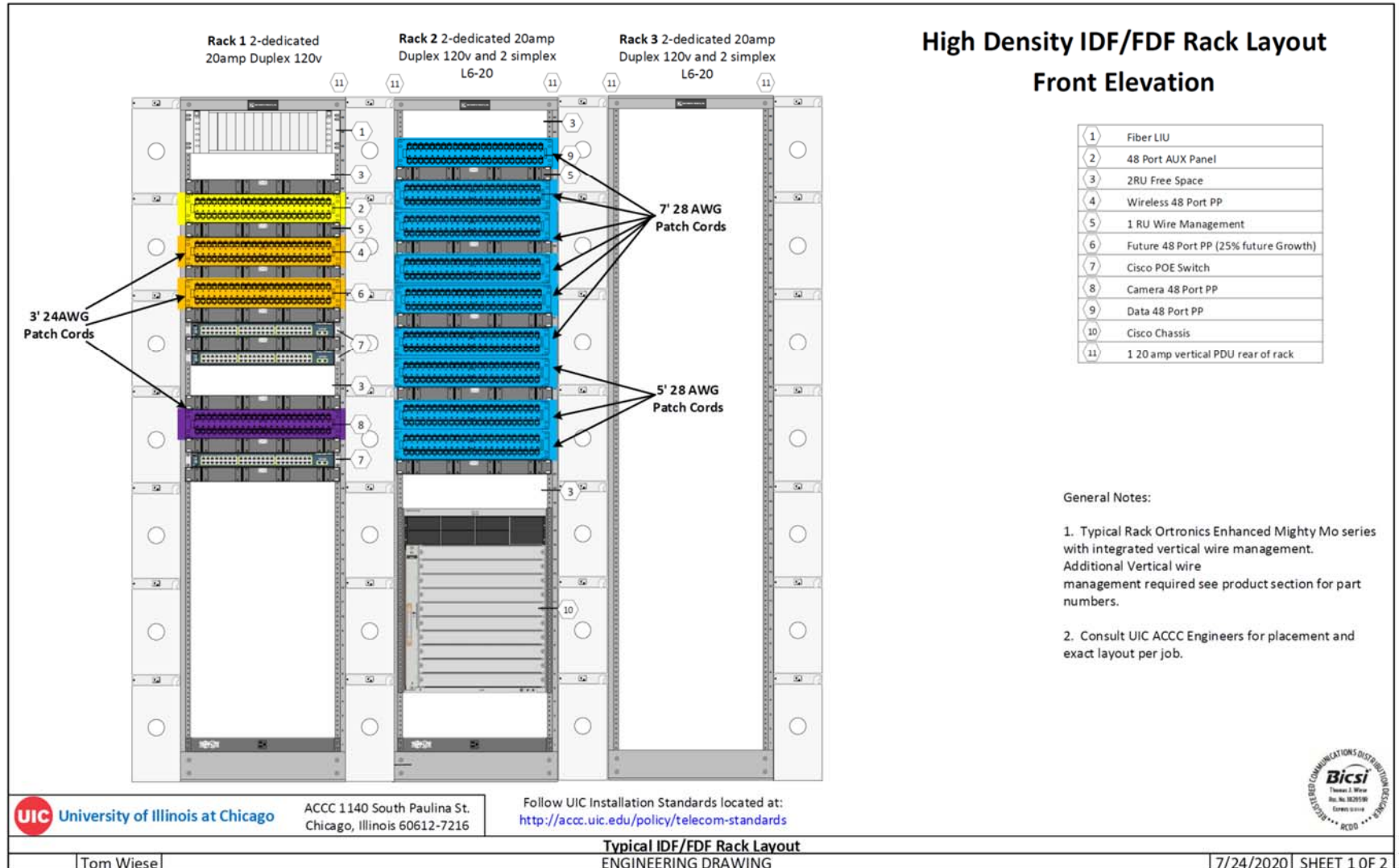
2909 (2) represents Node 2 and (909) the building #

b) Horizontal

- (1) All cabling shall be placed in an approved raceway. Free-aired cable is not permitted
See Raceway Section
- (2) Each cable shall be a 100 ohm four pair, solid copper UTP, CMR, rip cord, category 6 cable. See Products Section
- (3) Jacket Color Code
 - (a) Data – Blue (including VoIP)
 - (b) Wireless – Orange
 - (c) Voice – Grey (analog only)
 - (d) Data Backbone – Yellow
 - (e) IP Cameras – Purple
 - (f) ETS/Duress – Green
 - (g) Fire alarm - Red
- (4) Color Coding Terminations (8 position Registered Jacks)
 - (a) Black – Data (including VoIP)
 - (b) Orange – Wireless
 - (c) Office White – Voice (analog only)
 - (d) Green – Startel, Duress (ETS circuits)
 - (e) Purple – IP Cameras
- (5) 3' Red Copper patch cords are to be furnished by the contractor and installed by ACCC .
 - (a) 1 patch cord for each port cabled. Patch cords are to be left in the FDF for activation by ACCC network engineers. See [PRODUCTS](#) Section for specific part numbers.
- (6) The minimum standard for a work area includes 2 category 6 or 6a cables see specific project requirements. Any changes to the standard work area outlet must be approved by UIC ACCC/Telecom Engineering Department.
 - (a) In areas where Analog service is needed the addition of a Voice cable will be needed for a total of three cables (1-V / 2-D) Contact UIC ACCC/Telecom Engineering Department when needed for clarifications.
- (7) The accepted general fill rate for **horizontal pathways** is:
 - (a) 1" conduit – 6 category 6 cables
- (8) Separation from EMI sources
 - (a) Power conductors (6 in)
 - (b) Electrical motors and transformers. (47 in)
- (9) Terminations will be T568A wiring standard
- (10) All cables shall be identified with a cable tag marked at both ends of the cable. All Work areas shall be labeled. See Section on [LABELING / ADMINISTRATION](#)
- (11) In the FDFs the cables are to be separated by type and neatly (but loosely) lashed together with Velcro cable wraps and routed to the separate termination locations indicated on the communications drawings.
- (12) Cables are to be routed directly to the patch panels. No excessive loops are to be placed at the equipment racks.
- (13) All station cables must be continuous with no splices to the FDF.

- (14) Station cables shall not exceed 295' in length from the assigned FDF. Once a station is assigned to a FDF it cannot be changed without permission of UIC Telecommunications Engineering & Design.
- (15) Cable Placement
 - (a) Voice & ETU cables will be terminated on Gigabix wall fields
 - (b) Data cables will be terminated on Patch panels
 - (c) Wireless cables will be terminated on separate Patch panels See [WIRELESS](#) Section
 - (d) IP Camera cables will be terminated on separate Patch panels See [IP CCTV](#) Section
- (16) Plastic wire ties shall not be used. Velcro wire ties shall be used.
- (17) Install cables in compliance with ANSI/TIA requirements, BICSI practices, and manufacturers recommendations. Adhere to the requirements relating to bending radius, pulling tension, other mechanical stresses.
 - (a) 25' lbs. force max for pulling
 - (b) 4 x OD of cable for bend radius
- (18) Refer to the diagram below for placement:

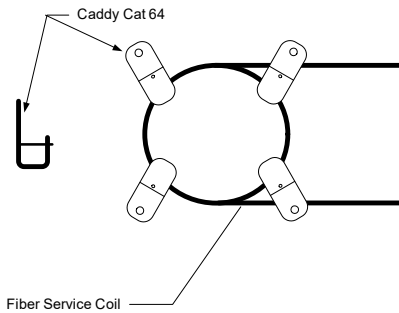




3. Fiber

a) General:

- (1) The University will specify the pathways that shall be used and the size of the fiber cables that will be required for each installation.
- (2) All armored fiber is to be bonded on both sides to the local TGB or TMGB. See [GROUNDING and BONDING](#) Section
- (3) Splicing will only be allowed when approved by ACCC/Telecom Engineers. All splices are to be Fusion Splices at a loss less than .3dB
- (4) Fiber optic cables shall only share paths with other fiber optic cables. **Copper cables are not to be pulled in the same raceway as Fiber.**
- (5) All cables shall use the standard color coding system based on the 12 fiber colors:
 - (a) blue
 - (b) orange
 - (c) green
 - (d) brown
 - (e) slate
 - (f) white
 - (g) red
 - (h) black
 - (i) yellow
 - (j) violet
 - (k) rose
 - (l) aqua
- (6) See the [PRODUCTS](#) Section for approved hardware
- (7) Pulling:
 - (a) All Fiber shall be pulled by strength members accompanied by a swivel eye or an optical fiber pulling grip accompanied by a swivel eye. Pulling force shall not exceed manufactures recommendations.
 - (b) Figure-eighting Cable: If the cable must be unreel during installation, use the "figure - eight" configuration to prevent kinking or twisting. Fiber optic cable should not be coiled in a continuous direction except for lengths of (100 ft.) or less. The preferred size of the "figure - eight" is about 15 feet in length, with each loop about 5 feet to 8 feet in diameter.
 - (c) MaxCell innerduct shall be pulled with a swivel to minimize twists and pull ropes are to be tied off at each maintenance hole. Unused cell pull ropes shall be tied off for future use.
 - (d) Bend Radius
 - (i) Loaded (Pulling) no less than 20 x OD
 - (ii) Unloaded (Resting) no less than 15 x OD
- (8) Service coils:
 - (a) Each termination point (IDF/FDF) shall have a minimum 50' service coil supported on the wall with 4 - 4" J-hooks at a diameter not to exceed the manufacturers limit Other Service coils may be required by TED.



(9) Terminations:

- (a) SC connectors pre-polished shall be used for all connectivity
- (b) For all OSP installs, fusion spliced pre-polished terminations are the only approved method
- (c) Unicam High Performance 0.5dB SC connectors will be allowed as a suitable substitution for **riser systems only**.
- (d) Field polished terminations are not accepted.

b) **Inter-building**

- (1) Single Mode Optical Fiber OS2 shall be used for Outside Plant Inter-building installations.
 - (a) Fiber type shall be Indoor / Outdoor rated Dual Jacketed Loose Tube, Armored, and Dry Blocked. See [PRODUCT](#) Section
 - (i) Maximum attenuation 0.5 dB/km at 1310 nm and 1550 nm
 - (ii) Fusion Splices .3dB
- (2) Paths: Outside Plant Optical fiber shall be routed via tunnel tray, conduits, and innerducts.
 - (a) Where paths in tunnels are in vertical mounted trays, attachment methods to existing routes include the use of tie wraps at intervals of no more than 3' for armored cable. Tie wraps shall be rated for the environment. Horizontal tray layouts need not be tie wrapped. Care should be taken when installing paths to maintain as much distance as possible from steam piping.
 - (b) Where paths are in conduits, Maxcell Innerduct shall be installed. Only optical fiber can be placed in the same path as optical fiber. The conduit shall be sized by the Telecommunication Engineering Department.
 - (c) Where paths are in Innerduct, a 3/8" nylon mildew resistant pull rope shall accompany the fiber. The innerduct shall be sized by the Telecommunication Engineering Department.
 - (d) When cable is routed through a riser in a multi-story building the cable shall be tied to vertical ladder rack at each floor 3' from each floor and ceiling penetration along with every 5' vertically with Velcro. The use tie wraps for armored cable is allowed.
 - (e) All applicable codes and standard shall apply
 - (f) Bonding is required at both ends of the armored optical fiber.

c) **Intra-building**

- (1) Both Single Mode OS2 and 50/125µm OM4 Multi Mode Fiber Optics are used in Intra-building applications. These fibers should be riser-rated, armored/non-armored, tight buffered cables.
 - (a) Single Mode – Yellow Jacket

- (b) Multi-Mode – Aqua Jacket
- (2) All fiber must be in a Raceway the following are acceptable raceways and fiber types
 - (a) Tray
 - (i) Install non-armored fiber in an approved innerduct 1 ½" plenum rated
 - (ii) Install only an inner locking armored fiber loose in the tray
 - (b) Conduit
 - (i) Non-armored fiber allowed
 - (ii) Minimum 1" conduit
 - (iii) Consult TED for sizing
 - (c) Innerduct
 - (i) 1 ½" Riser rated Orange with pull rope
 - (ii) Non-armored fiber allowed
 - (d) When cable is routed through a riser in a multi-story building the cable shall be tied to vertical ladder rack at each floor 3' from each floor and ceiling penetration along with every 5' vertically with Velcro.
 - (e) See [RACEWAY](#) Section for more information. All applicable codes and standard shall apply
- (3) Maximum attenuation
 - (a) Single Mode 1.0 dB/km at 1310 nm and 1550 nm
 - (b) Multi-Mode 3.5dB/kM at 850 nm
 - (c) Multi-Mode 1.5dB/kM at 1300 nm
 - (d) Fusion Splices .3 dB
 - (e) Mated Pair .75 dB
- (4) Cable ties are not to be used on Intra-Building Fiber. Only use Velcro
- (5) Fiber Cabinets
 - (a) Size and type by ACCC/Telecom
 - (b) Tie off all strength members inside the cabinets
 - (c) Cable entering Fiber Distribution Cabinets should be securely fastened to the cabinet.
- (6) Bonding is required at both ends of the armored optical fiber.

R. INFORMATION OUTLET INSTALLATION

1. General:

- a) Outline
 - (1) **General**
 - (2) **Labeling**
 - (3) **Configuration**
 - (4) **Outlet Termination**
 - (5) **FDF Termination**
 - (6) **Outlet Box**
 - (7) **Location**
 - (8) **Heights**
- b) General planning assumptions call for an information outlet every 100 square feet. In general any room should have a minimum of two information outlets, one each on opposing walls. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
- c) Information outlets (work areas) shall be connected to their assigned FDF through an approved raceway system as described by Section on [RACEWAYS](#)
 - (1) All cable above suspended ceiling shall be in an approved **continuous metallic** raceway system. In no circumstances will the cables be laid on suspended ceilings or “free aired”.
- d) Outlet boxes in finished walls shall be fitted with appropriate covers, set vertically and flush with the finished surface.
- e) Elevator ETUs and other security locations are the exceptions. These locations will not require the conventional jacks but will require the correct horizontal cables. These cables shall be tagged with the jack numbers and terminated on D-mark blocks specified by the UIC ACCC/Telecom Engineering Department. See Emergency Telephone Units Section L
- f) Follow ANSI/TIA 568 industry guidelines for terminations, maintaining twists up to termination points within ½” and jackets as close as possible to termination points.
- g) Maintain a cable bend radius of no less than 4 x O.D.
- h) (1) patch cord shall be provided by the contractor and left in the FDF for each new network jack / wireless jack installed. Length and type to be determined by the project. See Product section for part numbers.
- i) All cabling shall be certified in accordance to the Section on [TESTING](#)
- j) For all approved parts and colors See Section on [PRODUCTS](#) and Section on [LABELING](#)
- k) For Wireless installs see Section on [WIRELESS](#)
- l) For IPCCTV installs see Section on [IPCCTV](#)

2. Labeling:

- a) All cabling and locations are to be labeled in accordance to the UIC standard on labeling. Labels are to be machine generated. See Section on Labeling for more detail.

3. Configuration:

- a) The minimum standard for a work area includes 2 category 6 or 6a cables see specific project requirements. Any changes to the standard work area outlet must be approved by UIC ACCC/Telecom Engineering Department.

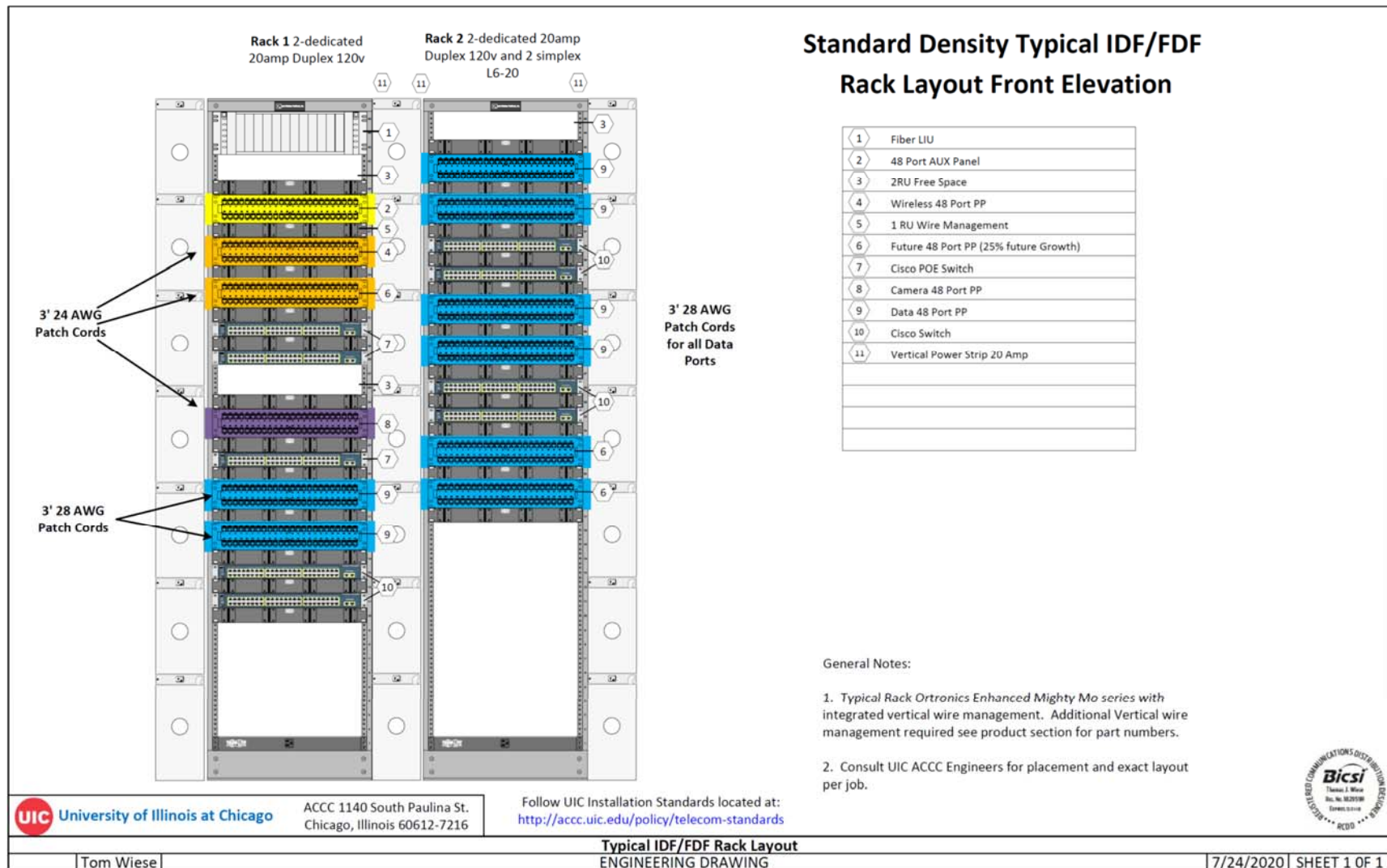
- (1) In areas where Analog service is needed the addition of a Voice cable will be needed for a total of three cables (1-V / 2-D) Contact UIC ACCC/Telecom Engineering Department when needed for clarifications.

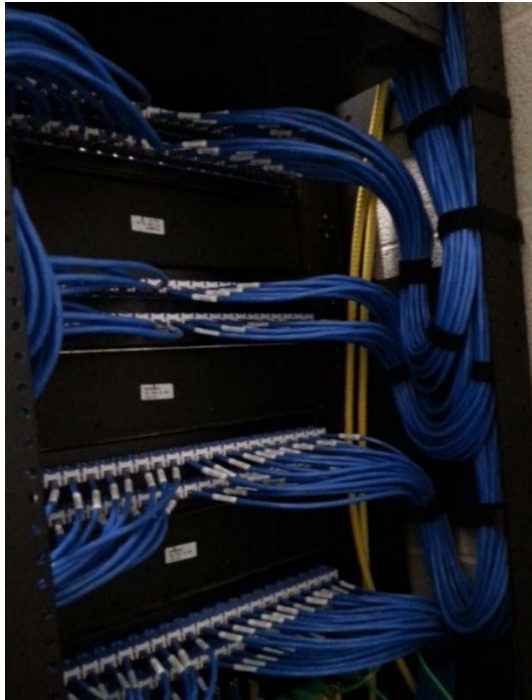
4. Outlet Terminations:

- a) **T568A** Wiring Configuration.
- b) Terminations at the outlet include an office white jack on the voice and black jacks on the data.
- c) Faceplates are to be a standard single gang 2-3 port office white. For outlets containing more than 4 cables a double gang faceplate is required with a larger outlet box.
- d) Wall mount phone locations will utilize a face plate to accommodate 1- voice and 1-data.

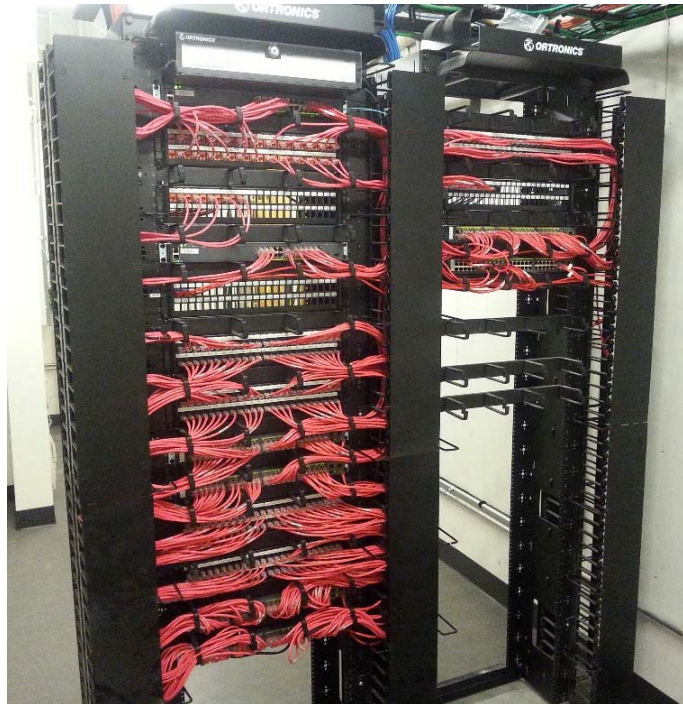
5. FDF Terminations:

- a) All terminations shall be in sequential order. No separate panels for Data 1 and Data 2.
- b) All cabling shall be routed to termination points via ladder rack inside the FDFs.
- c) Cabling is to be divided into separate bundles based on cable type and secured to the ladder rack with Velcro.
- d) Cabling is to be routed in a neat and workmanlike manner to the termination points.
- e) (1) patch cord shall be provided by the contractor and left in the FDF for each new network jack / wireless jack installed. Length and type to be determined by the project. See Product section for part numbers.
- f) Data:
 - (1) Cabling is to be terminated on modular patch panels with black 8 position register jacks.
 - (2) Cabling is to be routed directly to the patch panels without excessive service loops.
 - (3) Every 2 rack units of patch panel shall employ one rack unit of wire management.
 - (4) Follow labeling requirements in the Section on [Labeling](#)





Rear Waterfall of Cabling



Standard Density



High Density

- g) Voice:
- (1) Cabling is to be terminated on Gigabix frames. Follow all manufacturer installation instructions.
 - (2) Cabling shall be routed from the Ladder Rack via D-Rings to the point of termination. Velcro is to be used to bundle the voice cabling
 - (3) Follow labeling requirements in the Section on [LABELING](#)
 - (4) For layout [see below](#):

Typical Voice GIGA-Bix Field (FDF -A)

| | | | | | |
|-------|-------|-------|-------|-------|-------|
| | | | | | |
| A-001 | A-002 | A-003 | A-004 | A-005 | A-006 |
| A-007 | A-008 | A-009 | A-010 | A-011 | A-012 |
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| | | | | | |
| A-013 | A-014 | A-015 | A-016 | A-017 | A-018 |
| A-019 | A-020 | A-021 | A-022 | A-023 | A-024 |
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| A-301 | A-302 | A-303 | A-304 | A-305 | A-306 |
| A-307 | A-308 | A-309 | A-310 | A-311 | A-312 |

Place ETU Cables
at the end of the
voice count

6. **Outlet Box Size:**
 - a) Minimum conduit size feeding boxes is a 1" EMT.
 - b) Recessed GEM Boxes shall be at least 2 ¾" deep (For fishable walls)
 - c) Outlet boxes shall be 4 11/16" x 4 11/16" x 2 1/8" deep. *AKA 11B box minimum*
 - d) See Surface mounted raceway in Section on Raceway for sizing of surface mounted boxes.
7. **Location:**
 - a) The exact location of information outlets and equipment shall be determined by the user, UIC ACCC/Telecom Engineering Department, the project architect / engineer, and governed by structural conditions and obstructions.
 - b) Information outlets may be moved no more than six feet prior to installation, as directed by the UIC project engineer, with no additional cost to UIC.
 - c) Outlets are to be serviced individually by a given conduit drop. Looping or "daisy chaining" of outlets is not acceptable.
 - d) Back to back outlets in the same wall or "thru-wall" type boxes are not permitted. Offset all outlets shown on opposite sides of a common wall.

8. Heights:

- a) Install boxes at the following heights to the center of the box, except where noted otherwise:
 - (1) Workstation telecommunications outlets shall be mounted at the same height as the electrical power receptacles.
 - (2) **Wall mounted telephones: 48 inches above finished floor.**
 - (3) **Workstation outlets: 16 inches above finished floor.**
 - (4) Place boxes for outlets on cabinets, countertops, shelves, and similar boxes located above countertops two inches above the finished surface or two inches above the back splash. Verify size, style, and location with the supplier or installer of these items prior to outlet box installation.
- b) ADA height requirements from the 2010 ADA Revision:

308 Reach Ranges

308.1 General. Reach ranges shall comply with 308.

| <p>Advisory 308.1 General. The following table provides guidance on reach ranges for children according to age where building elements such as coat hooks, lockers, or operable parts are designed for use primarily by children. These dimensions apply to either forward or side reaches. Accessible elements and operable parts designed for adult use or children over age 12 can be located outside these ranges but must be within the adult reach ranges required by 308.</p> | | | |
|---|----------------|------------------|-------------------|
| Children's Reach Ranges | | | |
| Forward or Side Reach | Ages 3 and 4 | Ages 5 through 8 | Ages 9 through 12 |
| High (maximum) | 36 in (915 mm) | 40 in (1015 mm) | 44 in (1120 mm) |
| Low (minimum) | 20 in (510 mm) | 18 in (455 mm) | 16 in (405 mm) |

308.2 Forward Reach.

308.2.1 Unobstructed. Where a forward reach is unobstructed, the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

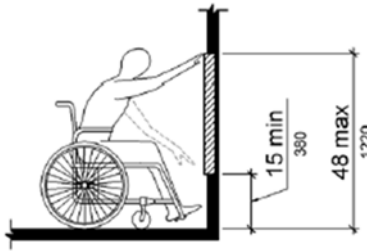


Figure 308.2.1 Unobstructed Forward Reach

308.2.2 Obstructed High Reach. Where a high forward reach is over an obstruction, the clear floor space shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches (1220 mm) maximum where the reach depth is 20 inches (510 mm) maximum. Where the reach depth exceeds 20 inches (510 mm), the high forward reach shall be 44 inches (1120 mm) maximum and the reach depth shall be 25 inches (635 mm) maximum.

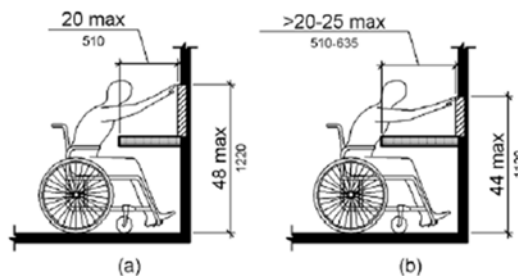


Figure 308.2.2 Obstructed High Forward Reach

308.3 Side Reach.

308.3.1 Unobstructed. Where a clear floor or ground space allows a parallel approach to an element and the side reach is unobstructed, the high side reach shall be 48 inches (1220 mm) maximum and the low side reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

EXCEPTIONS:

1. An obstruction shall be permitted between the clear floor or ground space and the element where the depth of the obstruction is 10 inches (255 mm) maximum.
2. Operable parts of fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum measured from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

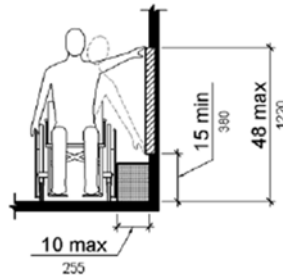


Figure 308.3.1 Unobstructed Side Reach

308.3.2 Obstructed High Reach. Where a clear floor or ground space allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches (865 mm) maximum and the depth of the obstruction shall be 24 inches (610 mm) maximum. The high side reach shall be 48 inches (1220 mm) maximum for a reach depth of 10 inches (255 mm) maximum. Where the reach depth exceeds 10 inches (255 mm), the high side reach shall be 46 inches (1170 mm) maximum for a reach depth of 24 inches (610 mm) maximum.

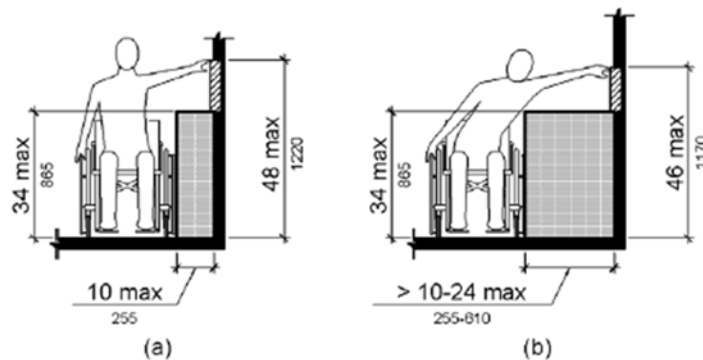


Figure 308.3.2 Obstructed High Side Reach

S. LABELING / Administration

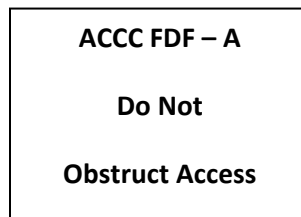
1. General:

- a) Outline of this section
 - (1) **General**
 - (2) **Color Codes**
 - (a) Cross Connects
 - (b) Terminations
 - (c) Cable
 - (3) **FDF / IDF (Telecommunications Rooms)**
 - (4) **Grounding/Bonding Conductors**
 - (5) **Cable Labels**
 - (a) Location
 - (b) Station Cables
 - (c) Copper Backbone
 - (d) Fiber Backbone
 - (6) **Station Jacks (Faceplates)**
 - (7) **Data Patch Panels**
 - (8) **GigaBIX Voice Termination Blocks**
 - (9) **Fiber Optic Enclosures**
 - (10) **Wireless**
 - (11) **IP Video Surveillance**
 - (12) **Conduits**
 - (13) **10 GIG Copper**
- b) All labeling shall be pre-approved or coordinated through UIC Telecom. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
- c) Labeling and administration shall comply with ANSI/TIA/EIA 606 and following UIC ACC/Telecom Engineering Standards.
- d) Permanent (i.e. not subject to fading or erasure), permanently affixed, and created by a hand-carried label maker or a computer/software-based label making system. **Handwritten labels are not acceptable. All labels shall be self-adhesive type machine generated using black on white lettering.** For harsh elements use labels approved for those conditions.
- e) Please contact ACC/Telecom Engineering for any questions regarding labeling.

2. Color Codes:

- a) Color Coding Cross Connects: Cross-connections are generally made between termination fields of different colors. Use the following color code:
 - (1) Blue / white for voice circuits.
 - (2) Orange / white for data circuits.
 - (3) Green / white for emergency telephone circuits (ETS). Including Duress systems
 - (4) Brown / white for security, entry phone and card reader circuits for the electric shop.
 - (5) Red / white for fire alarm circuits.
- b) Color Coding Terminations (8 position Registered Jacks)
 - (1) Black – Data / (VoIP)
 - (2) Orange – Wireless
 - (3) Office White – Voice (Analog)

- (4) Black – 10GIG
- (5) Green – Startel, Duress (ETS circuits)
- (6) Purple - IPCCTV
- c) Color Coding for Cable:
 - (1) Copper
 - (a) Data – Blue
 - (b) Wireless – Orange
 - (c) Voice – Grey
 - (d) Data 10GIG – Blue
 - (e) IPCCTV – Purple
 - (f) Startel/ETU Duress - Green
 - (2) Fiber
 - (a) Single mode – Yellow
 - (b) 50 µm Multimode – Aqua
- 3. **FDF / IDF (Telecommunications Rooms):** Affix a permanent label to the door of each telecommunications room with the approved FDF letter. Consult UIC Signage for latest revision. For example:



- 4. **Grounding/Bonding Conductors**
 - a) Label bonding conductors; “**WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!**”
- 5. **Cables Labels:**
 - a) **Label Location:** Affix at each end of the cable.
 - b) **Station Cables:** Each station cable is assigned to a Telecommunications Outlet or Work Area. Each work area will be assigned a unique location number associated with a FDF. This work area location number will be associated to all cables (voice and data) that terminate at that location. For example: Work area location 052 wired back to FDF C will have 3 cables wired to it: C-052-V for voice, C-052-D1 and C-052-D2 for data 1 and 2. Label station cables with the same label as the station connector that terminates the cable at the station location. Include a clear vinyl adhesive wrapping applied over the label in order to permanently affix the label to the cable. Using transparent tape to affix labels to cables is not acceptable for station cables. See Station Jacks below for information on how to assign labels for Station Cables.
 - c) **Copper Backbone Cables:**
 - (1) Label intra-building copper backbone cables in the form “(### IDF to FDF - X), ###-PR” where “###” is the Building Number, “(IDF to FDF - X)” is the origination and destination telecommunications rooms between which the cable routes, “###-PR” is the pair count.
 - (a) Example: If a 200 pair cable is run from the IDF to the FDF A in the 607 building the cable would read:

607 IDF – FDF A 200 PR

- (2) Label inter-building copper backbone cables in the form “(Node X – IDF-Building number), ###-PR” where “(Node - IDF)” is the origination and destination telecommunications rooms / Buildings between which the cable routes, “###-PR” is the pair count.

(a) Example: If a 1800 pair cable is run from Node 2 to Building 675 IDF the cable would read:

Node 2 - IDF 675 1800 PR

d) **Fiber Backbone Cables:**

- (1) Label intra-building fiber backbone cables in the form “###-ST, type, (IDF to FDF - X)”, “###-ST” is the strand count, “type” is the fiber type (i.e. SM, 50 μ MM, etc.), and “(FDF - X to FDF - X)” is the origination and destination telecommunications rooms between which the cable routes.

(a) Example: If a 12-strand, multimode 50/125 μ m fiber backbone cable running between telecommunications rooms “IDF” and “FDF B” would read:

12-ST 50 μ MM IDF to FDF B

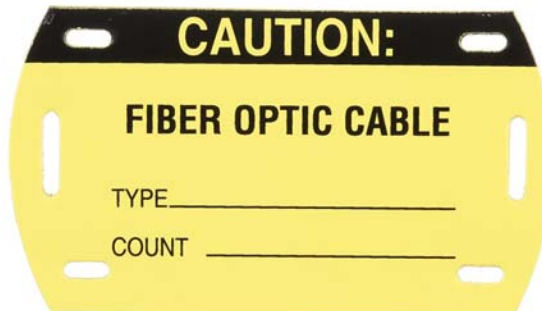
- (2) Label inter-building fiber backbone cables in the form “###-ST, type, (IDF - X to IDF - X)”, “###-ST” is the strand count, “type” is the fiber type (i.e. SM, 62.5MM, etc.), and “(IDF - X to IDF - X)” is the origination and destination telecommunications rooms / buildings between which the cable routes.

(a) Example: If a 144-strand, single-mode fiber backbone cable running between the IDF of building 607 and the IDF of building 648, the would read:

144-ST SM IDF 607 – IDF 648

- (3) Fiber optic and copper cable shall be labeled at each end of each cable within 24” of FDF/IDF entrance and again within 24” of termination point. Inter-building fiber optic and copper cable shall be labeled at all tunnel / building entry points along with termination points and transition points.

- (4) Transition Labeling type:

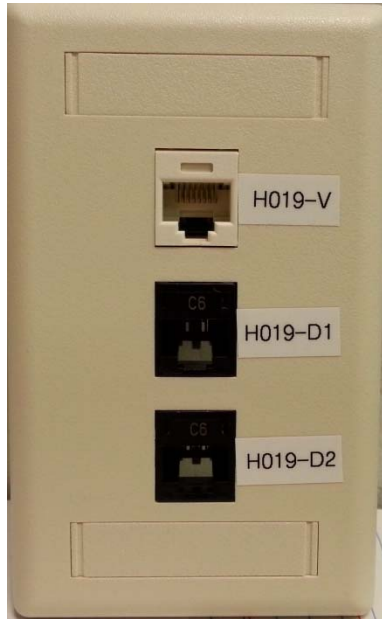


6. **Station Jacks (Faceplates):**

a) Connected to patch panels and Gigabix blocks in the FDF:

(1) Label Jacks in the form “X - ### - Type” where X is the FDF Letter, ### is the work area number and Type is Data or Voice.

(a) Example: If two data cables and one voice cable are being pulled from FDF H to work area location 019 then the station label would read:



(b) Example: 4 data cables to from FDF H to work area 020:



7. Data Patch Panels:

a) For Horizontal Distribution:

- (1) Ports: Ports will be labeled in the same form as part 8 above.
- (2) All data ports are to be placed in the order of the work area with Data 1 and Data 2 on the same panels

(a) For Example: FDF K patch panel label

- (i) K-001-D1 K-001-D2 K-002-D1 K-002-D2...



8. GIGA BIX Voice Termination Blocks:

a) General:

- (1) Label termination block ports/pairs sequentially beginning on the first row of each termination block column. Begin with "001" for the first port/pair or the first jack location containing a voice cable.

- A - 020

- Typical Voice GIGA-Bix Field (FDF -A)

Place ETU Cables
at the end of the
voice count

- ### Typical Backbone (F-2) (909 Building Feed)

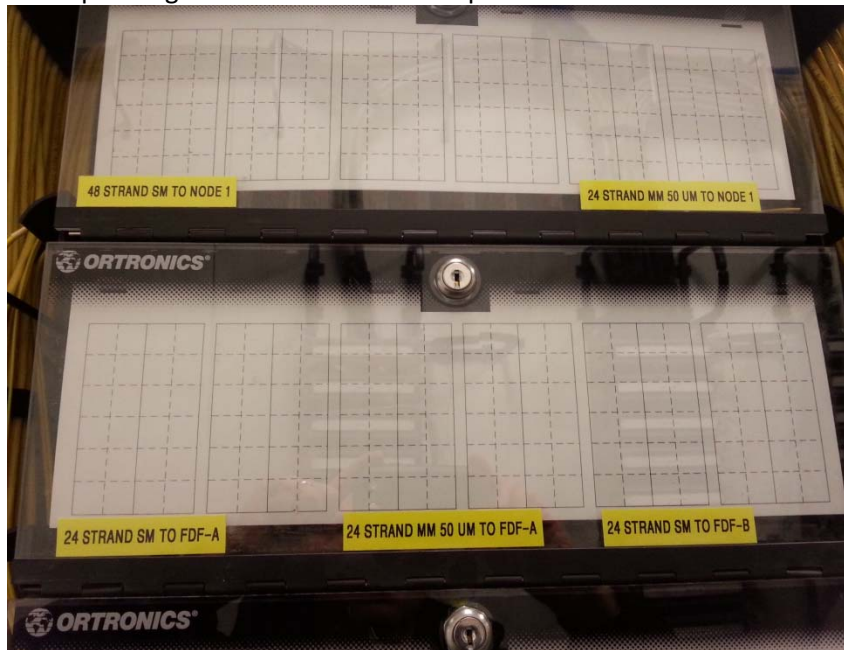
200 Pair Building
Feed (2909 (2)
represents node 2
and (909) the
building #)

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[illegible]

9. Fiber Optic Enclosures:

- a) Each Door of the enclosure shall be labeled with the same labels as indicated in Part 5 d above. Furthermore, each fiber insert shall be labeled with each strand number corresponding to each fiber. For example: "Strands 1-6...Strands 7-12...Strands 13-18..."



10. Wireless:

- a) Locations shall comply with the following labeling schematic:
 - (1) Patch panels shall be labeled as “Wireless” using machine generated labels with self-adhesive permanent black on white labels.
 - (2) Patch panels and Wireless Locations shall both have the same labels.
 - (3) The label format should be two lines consisting of (WAP #####) line one and (X-90#-D1/2) line two. Where WAP ##### represents the room number the Wireless Access Point is placed. X represents the FDF the cable terminates in. 90# represents the wireless

number. This starts and 900 and continues 901,902,903...for each FDF. For example: Four wireless locations are to be installed in room 352 cabled to FDF "C" where there are already two wireless locations 900 and 901 in FDF "C" The new labels shall read:

| | | | |
|-----------|-----------|-----------|-----------|
| WAP - 352 | WAP - 352 | WAP - 352 | WAP - 352 |
| C-902-D1 | C-902-D2 | C-903-D1 | C-903-D2 |



- (4) These labels shall be placed on the side of the 8-position jacks in the field and at the patch panel.



11. IP Video Surveillance

- a) Camera locations shall comply with the following labeling schematic:
- (1) Patch panels shall be labeled as "Cameras" using machine generated labels with self-adhesive permanent black on white labels.
 - (2) Patch panels and Camera Locations shall both have the same labels.
 - (3) The label format should be in the form of (X – 80# -YYYY) where "X" represents the FDF that the cable comes from and 80# represents the cable number and YYYY represents the room number the camera is placed in. For example, a camera is to be installed from FDF – "C" to rooms 2304, 2305 and two in 2306 the labels shall look like the following:

| | | | |
|---------------|---------------|---------------|---------------|
| C – 801 -2304 | C – 802 -2305 | C – 803 -2306 | C – 804 -2306 |
|---------------|---------------|---------------|---------------|

- (4) These labels shall be placed on the side of the 8-position jack in the field and at the patch panel.

12. Conduits:

- a) Label each conduit end (existing or new) in a clear manner by designating the location of the other end of the conduit (i.e. room name, telecommunications room identifier, pull box identifier, outlet identifier, etc.)

T. TESTING

1. GENERAL

- a) Cable certification may be required to be done under the supervision of a UIC ACCC/Telecom Engineering Department representative. The request for a representative must be received a minimum of 48 hours in advance.
- b) Contractors who certify cabling must use installers that are certified to do the tests.
- c) The test results must be given to UIC ACCC/Telecom Engineering Department as recorded by the test device. Test results of each cable/strand shall be saved in both software and PDF format and emailed to the Telecommunications Engineering & Design project manager. Tests in the “report format” will not be accepted.
- d) Test results should be saved in a format indicating the Building Number followed by an FDF Letter and the appropriate label for voice/data/wireless/fiber. Results shall be in numerical order and can be emailed to tcomengr@uic.edu
- e) Quick reference labeling for saving results:

(1) Camera

Building #–CAM-Room # – FDF letter – Jack #

605-CAM-1215-A800-1

(2) Wireless

Building #–WAP-Room # – FDF letter – Jack #

605-WAP-211-A901-1

(3) Voice/Data

Building # – FDF letter – Jack #

605-A093-D1

(4) Fiber or OTDR

Building # To/From or FDF To/From– Fiber type- Strand #

605 to 609 SM Strand 01

605 IDF to 605 RM 311 MM Strand 01

605 IDF to 605 FDF C SM Strand 01

2. COPPER BACKBONE CABLE TESTING - LEVEL THREE INTER-BUILDING AND RISER

- a) All pairs shall be tested for continuity.
- b) All pairs shall be tested for polarity.
- c) All pairs shall be tested for shorts.
- d) All Contractors that test level 3 copper cables for UIC must have the proper type of test equipment and be certified by UIC ACCC/Telecom Engineering Department to perform these tests. UIC Telecommunications & Design must approve the test equipment used to test the cables prior to its use. If not approved prior to use, the tests must be performed again with approved test equipment.

3. **COPPER CABLE CERTIFICATION – CATEGORY 6**

- a) The UIC Telecommunications Engineering Department requires that a minimum of two category 6 or 6a cables for data. Changes to this configuration must be approved by UIC ACCC/Telecom Engineering Department. Contractors who install these cables must use installers that are BICSI Technician certified to do the installation.
- b) These cables must be certified with a Level III field test instrument for measurements up to category 6 at 250 MHz in compliance with the latest ANSI/TIA 568 C standards. Without these tests, installations **will** NOT be accepted. For 6a at 500MHz.
- c) All Contractors that certify category 6/6a copper cables for UIC must have the proper type of test equipment. UIC ACCC/Telecom Engineering Department must approve the test equipment used to test the cables prior to its use. If not approved prior to use, the tests must be performed again with approved test equipment.
- d) Field testing of balanced twisted-pair cabling with compliant instruments is used in this example.
 - (1) Follow these steps to perform field testing.
 - (a) Setting a reference (Perform prior to each job)
 - (b) Selecting cable type (Use cable type out of tester library or manually set the NVP)
 - (c) Selecting test configuration (Permanent Link unless otherwise noted)
 - (d) Testing (Perform the Certification test in accordance to the Category rating of the link)
 - (e) Saving and printing data (Save in accordance to the labeling scheme used)
 - (f) Failures (Address all failures or Marginal Passes then re-certify)
 - (g) Field test instrument maintenance and upgrades (Make sure the instrument is maintained in accordance to the manufacturer's recommendations.)
- e) A marginal PASS* will not be accepted as a passing result
- f) Test labels should be saved in the following format:
 - (1) Building## - FDF XX – Location # - D1/D2/V/wireless
 - (a) Building number
 - (b) FDF Letter
 - (c) Location number
 - (d) Data or voice or wireless
 - (e) (607 – FDF – A – 012 – D1) for example

4. **FIBER OPTIC CABLE CERTIFICATION**

- a) Contractors shall provide the results of attenuation tests performed at the place of manufacture to UIC ACCC/Telecom Engineering Department. These results **MUST** be on the original form provided by the manufacturer.
- b) Because of the stress and bending that cables undergo during installation, UIC ACCC/Telecom Engineering Department requires attenuation and OTDR tests of every terminated fiber after installation is completed. No tests are presently required for non-terminated fibers.
- c) UIC ACCC/Telecom Engineering Department must approve the test equipment used to test the fiber prior to its use. If not approved prior to use, the tests must be performed again with the approved equipment

- d) No fiber optic cable installation will be accepted without the following tests being performed:
- (1) **Multimode:** For every multimode fiber installed end-to-end attenuation loss testing shall be performed at both 850 nm and 1300 nm wavelengths bi-directionally using Method B single jumper reference in accordance to the ANSI/TIA 568 C and ANSIA TIA 527 standards. The use of a mandrel is required for multimode testing.
 - (a) The results must be recorded and emailed to ACCC/Telecom engineers
 - (b) OTDR tests need to be taken both directions at both wavelengths. OTDR Testing in accordance to the ANSI/TIA 568 C and ANSIA TIA 527 standards.
 - (2) **Single Mode:** For every single-mode fiber installed end-to-end attenuation loss testing shall be performed at both 1310 and 1550 nm wavelengths bi-directionally using Method B single jumper reference in accordance to the ANSI/TIA 568 C and ANSIA TIA 527 standards.
 - (a) OTDR tests need to be taken both directions at both wavelengths and are to be saved to a CD, DVD, or flash drive. OTDR Testing in accordance to the ANSI/TIA 568 C and ANSIA TIA 527 standards.
- e) **Test labels:** should be saved in the following format:
- (1) Building## FDF XX /IDF – Building ## FDF XX /IDF– Strand #
 - (a) Building number end A
 - (b) FDF Letter /IDF for building end A
 - (c) Building number end B
 - (d) FDF Letter /IDF for building end B
 - (e) Strand number
 - (f) (648-FDF C – 648 – FDF A - Strand 14) for example
- f) While performing certification tests and OTDR tests the manufacturer's cable type must be entered into the tester to maintain accurate lengths and loss results. Failure to enter this information prior to testing will result in the contractor having to re-certify the entire cable plant.
- g) **Optical link loss testing:**
- (1) Multimode and Single mode links
 - (a) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.
 - (i) $\text{Link Attenuation (dB)} = \text{Cable_Attn (dB)} + \text{Connector_Attn (dB)} + \text{Splice_Attn (dB)}$
 - (ii) $\text{Cable_Attn (dB)} = \text{Attenuation_Coefficient (dB/km)} * \text{Length (Km)}$
 - (iii) $\text{Connector_Attn (dB)} = \text{number_of_connector_pairs} * \text{connector_loss (dB)}$
 - (iv) Maximum allowable connector_loss = 0.75 dB**
 - (v) $\text{Splice_Attn (dB)} = \text{number_of_splices} * \text{splice_loss (dB)}$
 - (vi) Maximum allowable splice_loss = 0.3 dB**
 - (vii) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

| Type of Optical Fiber | Wavelength (nm) | Attenuation coefficient (dB/km) | Wavelength (nm) | Attenuation coefficient (dB/km) |
|----------------------------------|-----------------|---------------------------------|-----------------|---------------------------------|
| Multimode 62.5/125 μm | 850 | 3.5 | 1300 | 1.5 |
| Multimode 50/125 μm | 850 | 3.5 | 1300 | 1.5 |

| | | | | |
|-----------------------------|------|-----|------|-----|
| Single-mode (Inside plant) | 1310 | 1.0 | 1550 | 1.0 |
| Single-mode (Outside plant) | 1310 | 0.5 | 1550 | 0.5 |

- (b) OTDR testing
 - (i) Reflective events (connections) shall not exceed 0.75 dB.
 - (ii) Non-reflective events (splices) shall not exceed 0.3 dB.
- (c) Magnified end face inspection
 - (i) Fiber connections shall be visually inspected for end face quality.
 - (ii) Scratched, pitted or dirty connectors shall be diagnosed and corrected.
- h) The cable attenuation shown by the OTDR shall be checked against the manufacturer's stated maximum attenuation.
 - (1) A minimum 200 foot fiber test lead shall be used between the OTDR and the fiber under test.
 - (2) A minimum 200 foot fiber test lead shall be connected to the far end of the fiber under test with the OTDR.
 - (3) The test procedures must comply with ANSI/TIA 568 C and ANSI/TIA 527 standards. Along with the UIC Telecommunications limits listed in this standard.

U. PRODUCTS

1. General

- a) All products stated in this standard are to be used for installations and bids unless substitutions are permitted by the UIC ACCC/Telecom Engineering Department
 - (1) Product substitutions must be submitted to UIC ACCC/Telecom Engineering Department prior to bid submission and or the commencement of the job.
 - (2) Product substitutions may only be of equal quality, standard and performance. **A lesser grade material or installation method may not by any means be allowed.**
 - (3) Part numbers listed are to be verified by the contractor. UIC ACCC/Telecom is **not** to be held liable for confirming correct ordered material.
 - (4) UIC accepts the following connectivity solutions which are warrantied by the manufacturer: Panduit/Hitachi solution Panduit/General cable solution and Hubble solution with Panduit being the preferred solution.

b) Section Layout

- (1) **General**
- (2) **Cable**
 - (a) Copper
 - (b) Fiber
- (3) **Connectivity**
 - (a) Copper
 - (b) Fiber
- (4) **Raceways**
 - (a) Conduit
 - (b) Surface Mounted
 - (c) Inner Duct
 - (d) Ladder Rack
 - (e) Tray
 - (f) Poke Through Floor Boxes
- (5) **Enclosures / Racks**
 - (a) Open Racks
 - (b) Closed Racks
 - (c) Wire Management

2. Cable

- a) Copper
 - (1) Intra-Building Riser rated per application
 - (a) Hitachi CMR Riser Plus Cat 6
 - (b) General GenSPEED 6000 Enhanced
 - (c) Mohawk Advancenet
 - (d) Belden3612 Multi-Conductor - Enhanced Category 6+.
 - (e) Berk-Tek LANmark-1000 *Enhanced*
 - (2) **Minimum compliant Category 6 will not be accepted resulting in a re-pull if used.**

| | |
|----------------|--------|
| Data | Blue |
| Voice | Grey |
| Wireless | Orange |
| IP Cameras | Purple |
| Startel/Duress | Green |
| | |

- (a) For 10 GIG Category 6A will be utilized.
- (i) Hitachi: Supra 10G-XE
 - (ii) General Cable: General Cable GS10 GenSPEED® 10 MTP™ - Small Diameter
 - (iii) Panduit : Panduit TX6A

- (b) Riser Rated Multi-Hitachi CMR or Approved Equivalent for analog backbone

| | | | | |
|-------|------|-----------------------------|----------|-----------|
| Voice | Grey | Category 3 Multi-Pair Riser | 100 Pair | 39228-200 |
| Voice | Grey | Category 3 Multi-Pair Riser | 200 Pair | 39228-400 |
| Voice | Grey | Category 3 Multi-Pair Riser | 300 Pair | 39228-600 |
| Voice | Grey | Category 3 Multi-Pair Riser | 400 Pair | 39228-800 |

(3) Inter-Building

- (a) Outdoor ETU (Emergency Telephone Units) 4-pair

| | | | |
|-------|-------|-------------------------------------|--------------|
| Voice | Black | Category 6 4 pair Outdoor Hitachi | 30180-8-BL-2 |
| | Black | Category 6 4 pair Outdoor General | 7136100 |
| Data | Black | Category 6e Indoor /Outdoor Hitachi | 30315-8-BK3 |
| | Black | Category 6A Indoor /Outdoor General | 7141007 |

- (b) Multi Pair Outdoor

- (i) General Cable Filled Foam Skin ASP Cable Spec. 2100 BELL SYSTEM TYPE ANMW (24 AWG) ANAW (22 AWG) or Approved Equivalent

b) Fiber

- (1) ETU Bollard Camera Fiber:

- (a) General/Prysmian Cable **BL0061ANR.BK** TIGHT BUFFERED I/O 6ST OM4

- (2) Single Mode Yellow OS2:

- (a) Intra-Building

- (i) When Pulled in an inner-duct or conduit

- 1. Tight Buffered OFNR

- a. General/Prysmian Cable **AP0121PNR** or Hitachi **60014-12** (12 Strand Single Mode) or Approved Equivalent.

- (ii) When Pulled in a tray without protection use Interlocking Armor Premise Fiber

- 1. Tight Buffered OFCR

- a. General/Prysmian Cable **AP0121PNR-ILRA** or Hitachi **61540-12** (12 Strand Single Mode) or Approved Equivalent

- (b) Inter-Building

- (i) All outside plant fiber is to be Single Mode Indoor / Outdoor Loose Tube, Armored with Dry Blocking. Consult UIC ACCC/ Telecom Engineering for approval.
 - 1. For installations in tunnels/harsh environments use:
 - a. Corning **LSZH – XXXEWV-T4101D2N** (XXX indicates # of strands)
 - b. Prysmian F-IRZHD-12-HB-XXX-E3 (XXX indicates # of strands) or Approved Equivalent
 - 2. For installations in a duct system/non-harsh environment use General/Prysmian Cable Dual Jacketed Armored Loose tube.
 - a. **F-EDH1A2J-12-HB-096-E3** (96 strand example) or Approved Equivalent
- (3) Multi-Mode 50µm Aqua OM4:
 - (a) Intra-Building
 - (i) When Pulled in an inner-duct or conduit
 - 1. Tight Buffered OFNR
 - a. General Cable **BL0121PNR** or Hitachi **61865-12** (12 Strand Multi-Mode) or Approved Equivalent
 - (ii) When Pulled in a tray **without** protection use Interlocking Armor Premise Fiber
 - 1. Hitachi Tight Buffered OFCR
 - a. General Cable **BL0121PNR-ILRA** or Hitachi **61896-12** (12 Strand Multi-Mode) or Approved Equivalent
 - (b) Inter-Building
 - (i) For installations in a duct system/non-harsh environment use General Cable Dual Jacketed Armored Loose tube.
 - 1. BL1924H1F-DWB (192 strand example) or Approved Equivalent
- 3. **Connectivity**
 - a) Copper:
 - (1) Patch Panels and wire management shall be **unloaded**.

| | | |
|-----------|----------------------|-----------------|
| Panduit | 24 Port Patch Panel | NK FP24Y |
| Panduit | 48 Port Patch Panel | NK FP48Y |
| Hubbell | 24 Port Patch Panel | NSPJ24 |
| Hubbell | 48 Port Patch Panel | NSPJ48 |
| Ortronics | 1 RU Wire Management | OR – FCM-19-1XL |

**** please note that for every 2 RU of patch panels install the contractor is to install 1 RU of wire management**

- (2) Gigabit Ethernet:
 - (a) Registered Jacks Category 6
 - (i) Panduit NetKey Series (Preferred)
 - (ii) Hubble Xcelerator series

| | | | |
|-------|-----------|-----------------|----------|
| Data | Black | Panduit Net Key | NK688MBL |
| Voice | Off White | Panduit Net Key | NK688MIW |

| | | | |
|----------|--------|-----------------|----------|
| Wireless | Orange | Panduit Net Key | NK688MOR |
| ETU | Green | Panduit Net Key | NK688MGR |
| CCTV | Purple | Panduit Net Key | NK688MVL |

(3) 10 GIG Ethernet:

(a) Registered Jacks Category 6a

- (i) Net Key Panduit NK6X88MBL (Black example)
- (ii) Hubbell Nextspeed 6a

(4) Face Plates:

(a) Panduit NetKey FIWY series

| | | | |
|-------------------|--------------|-----------------|---------|
| (1 Hole-recessed) | Office White | Panduit Net Key | NK1FIWY |
| (2 Hole-recessed) | Office White | Panduit Net Key | NK2FIWY |
| (4 Hole-recessed) | Office White | Panduit Net Key | NK4FIWY |

(b) Hubble Quick Port Series Office White Face Plate

| | | | |
|--------------------------|--------------|-------------------|---------|
| (1 Hole-recessed) | Office White | Hubble Quick Port | IFP11OW |
| (2 Hole-recessed) | Office White | Hubble Quick Port | IFP12OW |
| (3 Hole-recessed) | Office White | Hubble Quick Port | IFP13OW |
| (4 Hole-recessed) | Office White | Hubble Quick Port | IFP14OW |
| 2 GANG (4 Hole-recessed) | Office White | Hubble Quick Port | NSP24OW |
| 2 GANG (6 Hole-recessed) | Office White | Hubble Quick Port | NSP26OW |

(5) Wall Mount Phone Plates:

| | | | |
|-------------------------|---------|-----------|------|
| Face Plate - Wall Mount | Panduit | Stainless | KWPY |
|-------------------------|---------|-----------|------|

(6) **GigaBix** Voice Blocks:

| | | |
|---------|-------------------|----------|
| GigaBix | 300 Pair Frames | AX101471 |
| GigaBix | 4 – Pair Blocks | AX101447 |
| GigaBix | 25 – Pair Blocks | AX101448 |
| GigaBix | Plastic D-Rings | AX101478 |
| GigaBix | Designation Strip | AX101483 |

(7) **Patch Cords** Contractor to provide 1 patch cord per network jack installed in the FDF. Consult job requirements for length and type.

(a) Wireless patch panel:

- (i) Red – FDF Category 6 Rated 24 awg
 - 1. Panduit NetKey NK6PC3RDY (3' Red)

(b) Data patch panel Category 6:

- (i) Red – FDF Category 6 Rated 28 awg

1. Panduit NetKey UTP28SP3RD (3' Red)
2. Panduit NetKey UTP28SP5RD (5' Red)
3. Panduit NetKey UTP28SP7RD (7' Red)

(ii) Blue – Work Area Category 6 Rated

1. Panduit NetKey NK6PC7BLY (7' example)

(c) Cat 6A Data patch panel:

(i) White– FDF Category 6a Rated

1. Panduit NetKey NK6APC3 (3' example)

(ii) White – Work Area Category 6a Rated

1. Panduit NetKey NK6PAPC7 (7' example)

b) Fiber:

- (1) Enclosures: Ortronics OptiMo FC Series or Panduit Opticom Quick Net Enclosures with locks. Ortronics is the institutional standard.

| | | |
|-----------|---|-----------------|
| Ortronics | OptiMo FC 2 RU for Splices and Connectivity | OR-FC02U-P |
| Ortronics | OptiMo FC 4 RU for Splices and Connectivity | OR-FC04U-P |
| Ortronics | OptiMo FC 2 RU for Connectivity only | OR-FC02U-C |
| Ortronics | OptiMo FC 4 RU for Connectivity only | OR-FC04U-C |
| Ortronics | 615 Series Surface Mount Enclosures | OR-615SMFC-24P |
| Ortronics | Blank Fiber Enclosure Inserts | OROFB Blank |
| Ortronics | SM LIU 12 pack Inserts SC | OR-OFP-SCD12AC |
| Ortronics | MM LIU 12 pack Inserts SC | OR-OFP- SCD12LC |
| Ortronics | SM LIU 6 pack Inserts SC | OR-OFP-SCD06AC |
| Ortronics | MM LIU 6 pack Inserts SC | OR-OFP-SCD06LC |
| | | |

(2) Connectivity:

- (a) SC connectors shall be used for connectivity
- (b) For all OSP installs, fusion spliced pre-polished terminations are the only approved method Sumitomo LYNX2 design basis. Alternates to be approved by UIC/ACCC Telecom Engineering Department
- (c) Unicam High Performance 0.5dB SC connectors will be allowed as a suitable substitution for **riser systems**.
- (d) Field polished terminations are not accepted.

| | | |
|----------|---|-------------------------|
| Sumitomo | Single Mode SC Fusion Splice Connector 900 Micron | LYNX2-SCUPCSM-250900 |
| Sumitomo | Multi-Mode SC Fusion Splice Connector 900 Micron | LYNX2-SCUPCM510G-250900 |
| Sumitomo | Single Mode SC Fusion Splice Connector Loose Tube | LYNX2-SCUPCSM-900LT |

| | | |
|-----------|--|------------------------|
| Sumitomo | Multi-Mode SC Fusion Splice Connector Loose Tube | LYNX2-SCUPCM510G-900LT |
| Corning | Break out Kit for Loose Tube 12 Strand | FAN-BT47-12 |
| Ortronics | 12" Splice Tray, Fusion, 12 Fibers | OR-FSTS-F012 |

4. Raceways

- a) Conduit
 - (1) EMT
 - (a) Allied Tube or equivalent
 - (2) Work Area Boxes
 - (a) Recessed GEM Boxes 2 ¾" deep. Raco or equivalent
 - (b) Outlet boxes shall be 4 11/16" x 4 11/16" x 2 1/8" deep. Raco or equivalent
 - (i) When permitted outlet boxes may be 4" x 4" x 2 1/8" deep. Raco or equivalent
 - (3) Fittings
 - (a) All connections must be compression type, no set screws. Raco or equivalent
- b) Surface Mounted
 - (1) Wiremold 2400 for work areas.
 - ***All fittings are to be radius type***

| | |
|----------|-----------------------------------|
| V2400B10 | Base |
| V2400C | Cover |
| V2401 | Coupling |
| V2410C | Entrance Fitting 1" |
| V24-FO | Flat 90 Radius Fitting |
| V2415-FO | T - Fitting Radius Type |
| V2417-FO | Internal 90 Radius Fitting |
| V2418-FO | External 90 Radius Fitting |
| V2457D | Bridge |
| V2444 | Single Gang Extra Deep Outlet Box |
| V2448-2 | Double Gang Extra Deep Outlet Box |

- (2) Wiremold series 3000, 4000 and 6000 for distribution surface mount raceway.
 - ***All fittings are to be radius type***
- c) Inner-duct:
 - (1) Orange Riser Rated with Pull Rope for indoor applications
 - (a) Size per job
 - (2) Max Cell Fabric Inner duct with Pull Rope
 - (a) MXC for outdoor applications
 - (b) MXR for indoor applications
- d) Ladder Rack:
 - (1) CPI Chatsworth Products Black or Approved Equivalent. 12" for one rack applications and **18" for two rack locations. 90 degree radius type fittings only.**

| | | |
|---------------|-----------------------------------|------------------|
| CPI | 12" Chatsworth Black Runway | 10250-712 |
| CPI | Waterfall Brackets | 12100-710 |
| CPI | Chatsworth Couplings and Brackets | See Manufacturer |
| Cooper B-Line | Wall Angle Brackets | SB21312KFB |

- e) Tray:
- (1) Solid Bottom
 - (a) B-Line or Approved Equivalent Submit and size per job.
 - (i) Only use Manufacturer's transitions & fittings
 - (ii) *****All fittings are to be radius type*****
 - (iii) 6" deep minimum
 - (2) Welded Wire Mesh when approved as a substitute:
 - (a) B-line or Approved Equivalent Submit and size per job
 - (i) Only use Manufacturer's transitions & fittings
 - (ii) *****All fittings are to be radius type*****
 - (iii) 2" deep minimum
 - f) Poke Through Floor Locations:
 - (1) Must be divided for power and signal
 - (2) Submit cut sheets for approval.

5. Enclosures/Racks

a) Open Floor Mount Racks

- (1) Ortronics Mighty Mo Series

| | | |
|-----------|---|---------------|
| Ortronics | Enhanced Mighty Mo 7' x 19" Rack x 10.5" Deep | ORT-MM6E710 |
| Ortronics | Cable Management Rings | OR-MM20CMR6-B |
| Ortronics | Mighty Mo Bend Limiter | OR-MM6CBL10 |
| Ortronics | Mighty Mo Runway Bracket | OR-MM6CRB10 |
| Ortronics | Cable Support Bar | OR-60400046 |
| Ortronics | 20-Amp Vertical Power Strip | OR-60400681 |
| Ortronics | Standard Vertical Cable | OR-MM6VMD710 |

b) Enclosed Racks

(1) Floor Mount

- (a) Ortronics DataCab Server Series (Size per application see Engineering department for exact recommendations.)

(2) Wall Mount

- (a) Hoffman AccessPlus II Double Hinge with Locking Doors W/ Wire Management

| | | |
|---------|--|------------|
| Hoffman | 12RU Wall Mount Cabinet W/Cable management | EWMW242825 |
| Hoffman | 19RU Wall Mount Cabinet W/Cable management | EWMW362825 |
| Hoffman | 26RU Wall Mount Cabinet W/Cable management | EWMW482825 |

| | | |
|---------|----------------------------|--------|
| Hoffman | Vertical Cable Manager 24" | EWMC24 |
| Hoffman | Vertical Cable Manager 36" | EWMC36 |
| Hoffman | Vertical Cable Manager 48" | EWMC48 |

(b) Hoffman DataCom Wall Mount with Gland Plate for with Locking Doors
(For Retrofit Applications)

| | | |
|---------|---|-------------|
| Hoffman | 12RU Wall Mount Cabinet W/Cable management | EWMWG242425 |
| Hoffman | 19RU Wall Mount Cabinet W/Cable management | EWMWG362425 |
| Hoffman | 26RU Wall Mount Cabinet W/Cable management | EWMWG482425 |

c) **Open Wall Mount Racks**

(1) Ortronics Wall Mount Rack (Open)

| | | |
|-----------|---------------------|--------------|
| Ortronics | Wall Mount Rack 26" | OR-604045400 |
| Ortronics | Wall Mount Rack 38" | OR-604045450 |
| Ortronics | Wall Mount Rack 50" | OR-604045451 |

d) **Wire Management Horizontal**

| | | |
|-----------|----------------------|-----------------|
| Ortronics | 1 RU Wire Management | OR – FCM-19-1XL |
|-----------|----------------------|-----------------|

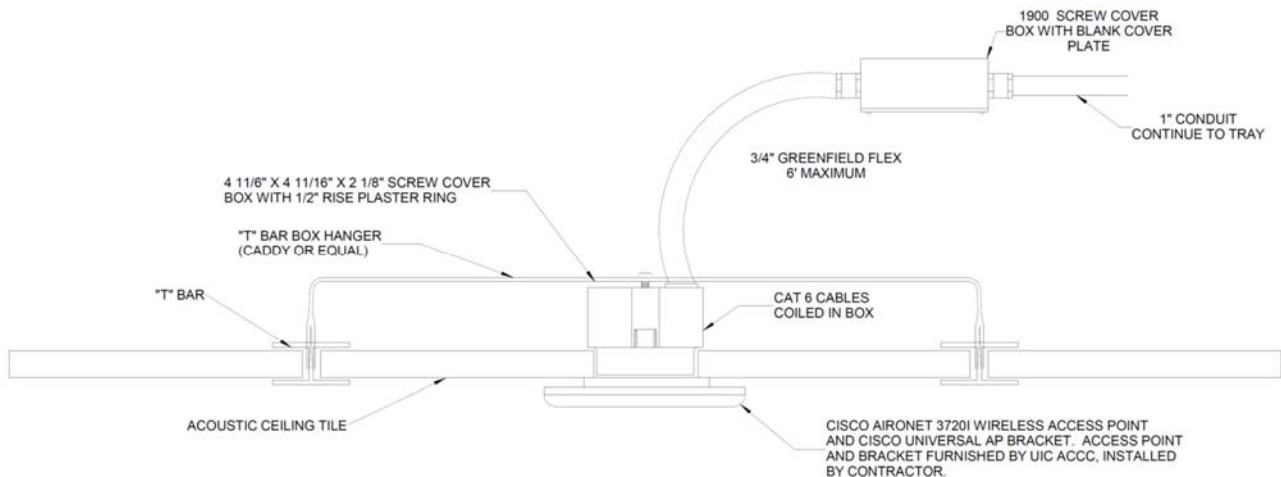
e) **Wire Management Vertical**

| | | |
|-----------|-------------------------|----------------|
| Ortronics | Standard Vertical Cable | OR – MM6VMS706 |
|-----------|-------------------------|----------------|

V. WIRELESS ACCESS POINTS

1. Installation
 - a) All wireless access point installations shall be coordinated with the ACCC Wireless department, Telecom and UIC ACCC/Telecom Engineering Department. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
 - b) UIC ACCC Wireless engineers will make all decisions on wireless locations and Part Numbers.
 - c) Wireless locations shall be placed on the ceiling where applicable. When questioning exact placement consult ACCC Wireless department or UIC ACCC/Telecom Engineering Department. Locations shall be placed in the following order of acceptable locations:
 - (1) Ceiling mount: (IDEAL) Unless obstructed by mechanical equipment or building structure. The use of a T-Bar mounted to a 4 11/16" x 4 11/16" x 2 1/8" deep Raco or equivalent box is the preferred method of installation in drop ceilings.
 - (2) Wall mount at least 10' aff. (Suitable) Unless restricted by ceiling height.
 - (a) Oberon Wireless AP Horizontal Bracket to be used. UIC Specified PN
 - (3) Wall mount 12" below ceiling. (Last resort)
 - (a) Wall mount applications are to be approved only by ACCC Telecom Engineering department.
 - (b) Oberon Wireless AP Horizontal Bracket to be used. UIC Specified PN
 - d) There shall be TWO Category 6 cables installed from the assigned wireless outlet location to the corresponding assigned FDF using the following format: (For new building construction Category 6a will be employed throughout for wireless)
 - (1) TWO – orange, 4-pair 100-ohm balanced, 23 gauge, category 6 or 6a, solid copper, 250 / 500 MHz, NEC rated for riser or plenum installations. Category 6 cable complies with the requirements contained in the Telecommunication Industry Association TIA-568 C Standard . See the [PRODUCTS](#) Section for acceptable cable.
 - (2) Each cable must be terminated in an Orange eight-position connector: one on the FDF side and one at the Wireless Location. All connectors that provide electrical connections between 100 ohm balanced twisted-pair cables must meet the appropriate requirements of local and national codes, standards, and regulations. See the [PRODUCTS](#) Section for acceptable termination hardware.
 - (3) Termination standards shall use the **T568A** wiring scheme.
 - (4) All cables shall be identified with a cable tag marked at both ends of the cable.
 - (5) In the FDF the cables are to be separated from other data circuits and neatly (but loosely) lashed together with Velcro cable wraps and routed to a separate termination location from the data cabling. Wireless locations shall be on their own patch panel.
 - (6) All wireless cables must be continuous with no splices to the FDF.
 - (7) Wireless cables shall not exceed 295' in length from the assigned FDF. Once a location is assigned to a FDF it cannot be changed without permission of UIC ACCC/Telecom Engineering Department.
 - (8) Wireless locations will not be terminated in a face plate but will be coiled in the wireless back box after termination, testing and labeling to await installation of the Wireless Access Points.
 - (9) No more than 6-8" of slack shall be stored in the back box.
 - (a) Contractors are to mount UIC supplied Access Points.

- (10) If no wireless access points are to be installed proceed with terminating the wireless jacks in a two port face plate. See the [PRODUCTS](#) Section for acceptable termination hardware.
- e) All cabling shall be tested to the latest TIA 568C standard as indicated in UIC Standards Section [TESTING](#). Test results shall be delivered with close out documentation.
- f) All cable will be placed in a raceway from the FDF to the wireless outlet. The following guidelines shall be used for placing the station cables into these runways:
 - (1) A conduit shall be run from the Wireless outlet to the cable tray of the assigned FDF on the same floor. The conduit run shall not have more than two ninety degree bends without a pull box. Size the conduit in accordance to Standards Section [RACEWAYS](#). The minimum size per location is a 1" EMT.
 - (2) All cable above suspended ceiling shall be in an approved raceway system see Standards Section RACEWAYS. In no circumstances will the cables be laid on suspended ceiling or "Free Aired".
 - (3) Wireless termination boxes:
 - (a) 4 11/16" x 4 11/16" x 2 1/8" deep with a 1/2" rise plaster ring mounted to the box in unfinished areas or ceiling mount. The use of a T-Bar mounted to a 4 11/16" x 4 11/16" x 2 1/8" deep box is acceptable for ceiling installations with a drop ceiling.



- (b) Wiremold 2400 series with radius fittings and deep boxes for surface mounting in finished areas. 700 series wiremold is not to be used.
 - (c) Double gang deep gem box for recessed mounting.
- g) Labeling
 - (1) Wireless locations shall comply with the following labeling schematic:
 - (a) Patch panels shall be labeled as "Wireless" using machine generated labels with self-adhesive permanent black on white labels.
 - (b) Patch panels and Wireless Locations shall both have the same labels.
 - (c) The label format should be two lines consisting of (WAP ####) line one and (X-90#-D1/2) line two. Where WAP #### represents the room number the Wireless Access Point is placed. X represents the FDF the cable terminates in. 90# represents the

wireless number. This starts and 900 and continues 901,902,903...for each FDF. For example: Four wireless locations are to be installed in room 352 cabled to FDF "C" where there are already two wireless locations 900 and 901 in FDF "C" The new labels shall read:

| | | | |
|-----------|-----------|-----------|-----------|
| WAP - 352 | WAP - 352 | WAP - 352 | WAP - 352 |
| C-902-D1 | C-902-D2 | C-903-D1 | C-903-D2 |



- (d) These labels shall be placed on the side of the 8-position jacks in the field and at the patch panel.



- h) Equipment Installation
- (1) ACCC Wireless shall supply all access points. Contact the wireless team for pickup of programmed hardware.
 - (2) Hardware shall consist of four items for each Wireless location:
 - (a) Wireless Access Point pre-labeled.
 - (b) Mounting Bracket
 - (c) 10" White Patch Cord

- (d) Master Lock
- (3) Hanging the access point:
 - (a) Install the mounting bracket with contractor supplied 6-32 screws.
 - (b) Wireless location shall be patched to the access point with the 10" White patch cord.
 - (c) Mount the access point to the bracket.
 - (d) Lock the access point with the supplied lock.
 - (e) Verify that the face of the access point is clean and level.
- (4) Notify the ACCC/Telecom department that the installation is complete for inspection.
- i) Documentation
 - (1) Provide Telecom with the new jack locations and certification results as indicated in Standards Section [RECORDS](#).

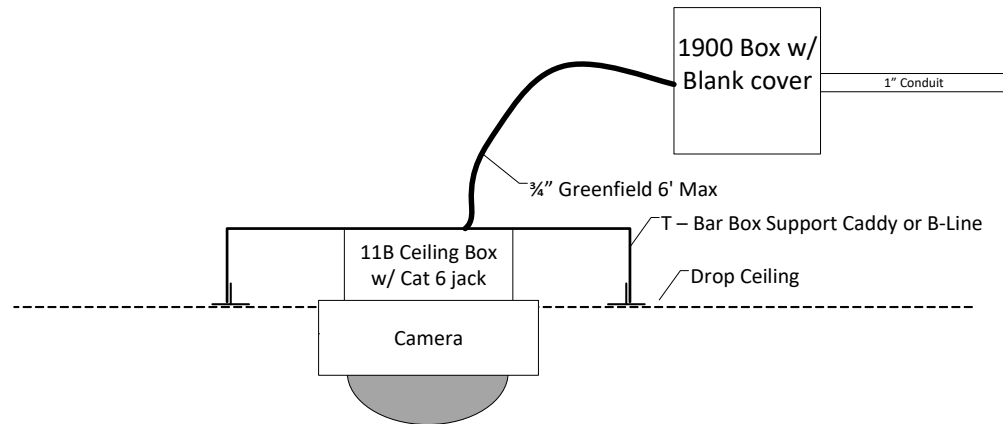
W. IP Video Surveillance

1. This section addresses the cabling and network infrastructure part of the installation of IP Video Surveillance systems. All Camera hardware and equipment are not addressed in this standard. For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu
2. For Camera specific questions please coordinate with vcas@uic.edu
3. General
 - a) All IP Camera installations shall be coordinated with the on-site contact, ACCC department, UIC ACCC/Telecom Engineering Department, UIC VCAS and UIC Police.
 - (1) Camera placement, type and specification shall be coordinated via the respective UIC department, A/E and UIC Police representative / VCAS.
 - b) Cameras and associated equipment, programming, focusing, training and installation instructions shall be in accordance to the project documents which are not part of this standard.
 - c) All hardware components are to be specified in the project documentation.
 - d) Interior Cameras are to be powered with POE switches as specified by the project documentation.
4. Rack/Equipment Placement within UIC ACCC spaces (FDF):
 - a) ACCC has included in this cabling standard rack spacing for Camera cabling in new FDF build outs and floor renovations to be placed within ACCC racks.
 - (1) 2 rack units for patch panels and 2 rack units for POE switch and wire management.
 - b) Placement in existing racks will be done on a case by case with ACCC to confirm spacing availability.
 - c) Any server equipment which is associated with IP Video Surveillance systems is to be located external to the ACCC FDF.
 - d) Backbone Infrastructure
 - (1) Any copper/fiber inner-switch connectivity and server connectivity will need to be addressed on a case by case scenario.
 - (2) Determinations will be based on the following:
 - (a) Availability of the type of media needed Multimode / Single Mode / Copper Category 6 cabling
 - (b) Quantity of each media needed
 - (3) In the event that ACCC does not have “spare” infrastructure we will suggest alternative solutions.
 - e) Accessibility for Non-ACCC Staff
 - (1) ACCC requires the installation of card access to any FDF which Departments and or UIC VCAS wish to house cabling and equipment.
 - (a) ACCC will have access to any records/reports for those who use credentials to gain access to our space.
 - f) ACCC will grant access to the UIC Police and Department Administration
 - (1) Any additional access rights must be granted by ACCC.

5. Installation

- a) All Camera installations shall be coordinated with the on-site contact, ACCC department, Telecom, UIC ACCC/Telecom Engineering Department, UIC VCAS and UIC Police.
- b) Cameras and associated equipment, programming, focusing, training and installation instructions shall be in accordance to the project documents which are not part of this standard.
 - (1) Consult UIC VCAS/Police for equipment and placement recommendations.
 - (2) Additional information is located at <https://cppm.uic.edu/construction/construction-codes-building-standards/building-standards/>
- c) For ACCC Managed Spaces:
 - (1) Camera locations shall be placed on the ceiling where applicable with recessed boxes when available.
 - (2) Ceiling mount. (IDEAL) Unless obstructed by mechanical equipment or building structure. The use of a T-Bar mounted to a 4" x 4" x 2 1/8" box is acceptable for ceiling installations with a drop ceiling. Verify back boxes with equipment manufacturers prior to installation.
 - (3) Wall mount at least 10' aff. (Suitable) Unless restricted by ceiling height.
 - (4) All hardware shall be vandal resistant
 - (5) All exterior cameras shall be weather tight using outdoor rated boxes and raceways.
- d) All hardware components are to be specified in the project documentation.
- e) Cameras are to be powered with POE switches as specified by the project documentation.
- f) There shall be one network jack run from the assigned Camera outlet location to the corresponding assigned FDF using the following format:
 - (1) One – Purple, 4-pair 100-ohm balanced, 23 gauge, category 6, solid copper, 250 MHz, NEC rated for riser or plenum installations. Category 6 cable complies with the requirements contained in the Telecommunication Industry Association TIA-568 C Standard. See the Standards Section **PRODUCTS** for acceptable cable.
 - (2) Each 4-pair 100 ohm balanced twisted-pair cable must be terminated on a Purple eight-position connector: one on the FDF side and one at the Wireless Location. All connectors that provide electrical connections between 100 ohm balanced twisted-pair cables must meet the appropriate requirements of local and national codes, standards, and regulations. Termination hardware shall be purple in color to signify IP Cameras. See the Standards Section **PRODUCTS** for acceptable termination hardware.
 - (3) Termination standards shall use the **T568A** wiring scheme.
 - (4) All cables shall be identified with a cable tag marked at both ends of the cable.
 - (5) In the FDF the cables are to be separated from other data circuits and neatly (but loosely) lashed together with Velcro cable wraps and routed to a separate termination location from the data cabling. Camera locations shall be on their own patch panel Marked **CAMERAS**.
 - (6) All Camera cables must be continuous with no splices to the FDF.
 - (7) Network cables shall not exceed 295' in length from the assigned FDF. Once a location is assigned to a FDF it cannot be changed without permission of UIC Telecommunications Engineering & Design.
 - (a) For locations which reach beyond the standard 295' please consult VCAS vcas@uic.edu for permissible solutions (fiber or Ethernet extenders) to be coordinated also with Telecom Engineering for any equipment placed in ACCC spaces.

- (8) Camera locations will not be terminated in a face plate but will be coiled in the back box after termination, testing and labeling to await installation of the IP Camera. If no cameras are to be installed proceed with terminating the jacks in a single port face plate. See Standards Section [PRODUCTS](#) for acceptable termination hardware.
- (9) See below for approved drop ceiling cabling/conduit layout:



- g) All cabling shall be tested to the latest TIA 568C standard as indicated in UIC Standards Section [TESTING](#). Test results shall be delivered with close out documentation.
- h) All cable will be placed in a raceway from the FDF to the outlet. The following guidelines shall be used for placing the station cables into these runways:
- (1) A conduit shall be run from the Camera outlet to the cable tray of the assigned FDF on the same floor. The conduit run shall not have more than two ninety degree bends without a pull box. Size the conduit in accordance to Standards Section [RACEWAYS](#).
 - (2) All cable above suspended ceiling shall be in an approved raceway system see to Standards Section [RACEWAYS](#).
 - (3) Under no circumstances will the cables be laid on suspended ceiling.
 - (4) Camera termination boxes:
 - (a) Consult Camera specs for specific outlet box configurations along with mounting brackets if needed.
 - (b) 4" x 4" x 2 1/8" steel box with a 1/2" rise plaster ring mounted to the box in unfinished areas or ceiling mount. The use of a T-Bar mounted to a 4" x 4" x 2 1/8" box is acceptable for ceiling installations with a drop ceiling.
 - (c) **Surface mounted raceway is not recommended however if needed the use of radius fittings is mandatory.**
 - (d) Single gang gem box for recessed mounting.
- i) Labeling
- (1) Camera locations shall comply with the following labeling schematic:
 - (a) Patch panels shall be labeled as "Cameras" using machine generated labels with self-adhesive permanent black on white labels.
 - (b) Patch panels and Camera Locations shall both have the same labels.
 - (c) The label format should be in the form of (X – 80# -YYYY) where "X" represents the FDF that the cable comes from and 80# represents the cable number and YYYY

represents the room number the camera is placed in. For example, a camera is to be installed from FDF – “C” to rooms 2304, 2305 and two in 2306 the labels shall look like the following:

C– 801 -2304

C – 802 -2305

C – 803 -2306

C – 804 -2306

- (d) These labels shall be placed on the side of the 8-position jack at the location see below and at the patch panel.



- j) Notify the Telecom department that the installation is complete for inspection.
- k) Documentation
 - (1) Provide Telecom with the new jack locations and certification results as indicated in Standards Section [RECORDS](#).

X. HIGH BANDWIDTH TRANSMISSION MEDIA INSTALLATIONS 10/40/100 GIG

1. General

- a) Installations of Category 6A (Augmented Cat 6) are to be utilized for network applications requiring 10 GIG up to 500Mhz up to 100m.
- b) Newly constructed buildings will employ category 6A throughout for wired and wireless technology
- c) For installations requiring 100 GIG Single Mode OS2 is to be installed.
- d) Consult with ACCC/Telecom Engineering for project specifications
- e) All Cabling is to be certified per project scope
- f) For questions contact the UIC ACCC/Telecom Engineering Department at tcomengr@uic.edu

2. 10GBASET

a) Raceways

- (1) Follow installation instructions in the Standards Section [RACEWAYS](#) with the following exceptions:
 - (a) Minimum size outlet boxes shall be 4 11/16" x 4 11/16" x 2 1/8" deep. AKA 11B box
 - (b) Minimum size conduits shall be 1" EMT
 - (c) **1900 Boxes will not be allowed.**

b) Installation

- (1) Cabling is to be installed per manufacturer's recommendations
- (2) No excessive bends or kinks are to be installed in the cable plant
- (3) Cables are to be loosely dressed in bundles of no more than 12 inside the FDF.
- (4) For copper based 10GIG Ethernet a Cat 6A solution will be deployed
 - (a) See Standards Section [PRODUCTS](#) for acceptable part numbers
- (5) Where shielded cabling is specified patch panels are to be bonded to a local TGB. If one is not available consult with ACCC/Telecom Engineering.
- (6) Labeling: Follow Standards Section [LABELING](#)

c) Testing

- (1) All cabling is to be certified in accordance to the Standards Section [TESTING](#)
- (2) Follow test procedures for IEEE 10GBASE T and ANSI/TIA 568C.2
 - (a) For Non-shielded cabling the Certification must include AXT (Alien Cross Talk) Test.
 - (b) All test results are to be checked for validity and any issues must be rectified.
 - (c) For Shielded cabling AXT is not required.
 - (d) The University will follow up with spot checks to verify 10 GIG links.

3. 100 GIG Single Mode Optical Fiber

- a) Consult with ACCC/Telecom Engineering for design considerations

b) Raceways

- (1) Follow installation instructions in the Standards Section [RACEWAYS](#).
 - (a) The minimum size conduit for Optical fiber shall be 1" EMT
 - (i) Verify bend radius based on manufacturer recommendations.

c) Installation

- (1) OS2 Single Mode Fiber Optics is to be installed unless otherwise noted.
- (2) Follow Fiber installation as described in Standards Section [TRANSMISSION MEDIA](#) part 3 Fiber.
- (3) See Standards Section [PRODUCTS](#) for acceptable parts

d) **Testing**

- (1) All cabling is to be certified in accordance to the Standards Section [TESTING](#)
- (2) UIC will instruct the contractor on the Link Loss allowable for the 100 Gig Link