



**Boise State University**

**Master Specification for  
Structured Cabling Systems  
For New Buildings and Remodels**

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# 1 Structured Cabling General Requirements

Boise State University has selected the Ortronics/Superior Essex nCompass Structured Cabling Solution for all campus copper cabling. For fiber cabling Boise State University has selected Corning Cabling Solution as its standard. BSU desires to protect its investment in training, certifications, and inventory, therefore, all new construction projects shall include the Ortronics/Superior Essex nCompass Cabling and/or Corning Solution(s) products as specified.

## 1.1 Scope

- A. This document is general in nature and not specific to a particular project. It is, however, the minimum standard by which all new and remodel construction documents, particular to any telecommunications project, should be based. Any modifications to this document to fit a particular project must be approved by Boise State University OIT Network Department prior to being put in a construction document.

Backbone and horizontal cabling comprised of Copper and Fiber Optic, and support systems, are covered under this document. All installations are warranted and shall be pre-registered with Ortronics/Superior-Essex before work begins as does Corning Fiber Systems when fiber optics are involved.

- B. The Horizontal (workstation) Cabling System shall consist of Category 6 (77-272-2B or 77-272-2A), 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor (unless otherwise specified), and routed to the appropriate rack serving that area and terminated as specified in this document.

**NOTE:** All remodels, moves, adds and changes will be cabled to match existing cabling in the building unless otherwise identified by the BSU OIT Network Team.

- C. All cables and related pathways, supports, terminations, and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.
- D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, telecommunication room details, equipment racks, cable routing and outlet types will be provided as project specific information by bid specification and/or bid drawings. The contractor shall meet or exceed all requirements for any infrastructure system as detailed within this document. This document shall be referenced within a project's specific scope of work.

**NOTE:** This specification may impact other trades. When there is a conflict in the construction document between trades, this specification prevails. For example, the construction document may instruct the electrical contractor to provide telecommunications grounding/bonding and conduit runs in the electrical section of the construction document. If there is a conflict between the electrical specification and the telecommunications specification, the telecommunications specification prevails.

## 1.2 Contractor Qualifications and Responsibilities

- A. Certifications: The telecommunications contractor submitting a response regarding a Boise State University Voice/Data Infrastructure RFP/RFQ must be an approved Ortronics Certified Installer Plus (CIP) for copper installations and Corning Network of Preferred Installers (NPI) for optical fiber installations. Contractors must possess these certifications within the state of Idaho to qualify for RFP/RFQ responses.

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A copy of certification documents must be submitted with the bid in order for such bid to be valid. The telecommunications contractor is responsible for workmanship and installation practices in accordance with the Ortronics CIP Program. Ortronics/Superior Essex will extend a nCompass Limited Lifetime Warranty to BSU Network team. Contractor fulfills all requirements under the Ortronics CIP Program. At least 30 percent of the copper installation and termination crew must be certified by BICSI and Ortronics, with a BICSI Technician Certification.

- B. Experience: Contractor must meet the requirement of having continuously performed telecommunications installation work for a period of at least five (5) years. Contractor must be skilled and proficient in both inside cable plant (copper and fiber optics) installation, as well as outside cable plant (copper and fiber optics) installation, termination, splicing, and testing.
- C. The Contractor shall be responsible for:
  - 1. Providing material and labor for a complete turnkey infrastructure system. Including but not limited to: All permits, racks, pathway, cabling, grounding, patch panels, testing, labeling, warranty and close out documentation.
  - 2. The field coordination of communications work with the other trades prior to beginning work. NOTE: Communications plan drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc. All dimensioned locations and elevations are approximate.
  - 3. The proper placement and routing of equipment, cable, raceways, cable tray, and related components; according to the Contract Documents and subject to prior review by contractor.
  - 4. Refer all conflicts between Contract Documents to the owner for resolution.

### 1.3 Submittals

- A. Submit appropriate cut sheets and samples for all products, hardware and cabling as detailed in project specifications and drawings.
- B. Work shall not proceed without BSU OIT Network Team written approval of the submitted items.

### 1.4 References

- A. All work shall be performed in accordance with the following Codes and industry Standards, unless noted otherwise:
  - 1. NFPA 70 – National Electrical Code, current version adopted by local or State AHJ.
  - 2. ANSI/TIA 568-C – Commercial Building Telecommunications Cabling Standard, current version.
  - 3. ANSI/TIA 569-C – Commercial Building Standard for Telecommunications Pathways and Spaces, current version.
  - 4. ANSI/TIA 606-C – Administration Standard for Commercial Telecommunications Infrastructure, current version.
  - 5. ANSI/TIA 607-B – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, current version.
  - 6. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, pertaining to communication systems.

### 1.5 Warranty

- A. Ortronics/Superior Essex nCompass Limited Lifetime warranty for horizontal subsystem.

1. nCompass Category 6+ Cabling, Connectivity Hardware and Patch Cables shall be covered by a, nCompass Limited Lifetime warranty labor and application assurance warranty. The application assurance portion shall provide coverage for the cabling system to support the applications that are designed for the specifications outlined in ANSI/TIA 568-C.0-2. These applications include, but are not limited to 10BASE-T, 100BASE-T, 1000BASE-T and 155 Mb/s ATM.
2. Corning 25-year NPI Warranty for fiber optic riser and outside plant backbone subsystems.

## 1.6 System Description

- A. The owner will implement a comprehensive integrated communications distribution system, as described in paragraph B below, to provide wiring infrastructure which may be used to support one or more of the following services and systems:
  1. Telephony and Data telecommunications.
  2. Wireless systems.
  3. Facilities management systems.
  4. Camera security systems.
  5. Audio/Video telecommunications.
- B. The communications distribution system consists of the following major subsystems, as specified elsewhere:
  1. Inter-building Backbone: The interbuilding subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Building Entrance Facility room (EF) to each building Main Distribution Frame room (MDF) in all buildings on the campus. Note: typically, outside plant cables.
  2. Intra-building Backbone: The intrabuilding subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Main Distribution Frame room (MDF) to each Intermediate Distribution Frame Room (IDF) in the buildings.
  3. Telecommunication Rooms (TR): Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF).
  4. Horizontal Distribution: The horizontal distribution subsystem refers to all intra-building twisted-pair and fiber optic communications cabling connecting telecommunication rooms (IDF's) to telecommunication outlets (TOs) located at individual work areas.
  5. Work Area Distribution Subsystem: Patch cords, adapters, and devices located between the TO and station equipment.

## 1.7 Design/Engineer Requirements

- A. BICSI RCDD Certification is required for anyone performing infrastructure design, specifications and/or drawings for solicitation and construction. All drawings issued for construction shall have valid RCDD stamps.
- B. Wireless RF Design:
  1. Wireless Access Point (WAP) design, access point (AP) manufacturer, quantities and locations will be provided exclusively by Boise State University OIT Network Department utilizing manufacturer RF design software with project drawings.
- C. Compliance by the contractor with the provisions of this specification does not relieve the contractor of the responsibilities of furnishing materials and equipment of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.
- D. Communication room design:

1. Minimum communication room size for EF room shall be no less than 12'x16'.
2. Minimum communication room size for MDF room shall be no less than 12' x 16' up to 624 horizontal data ports. Exceeding 624 data ports requires a larger room and additional equipment racks.
3. Minimum communication room size for an IDF room shall be no less than 12' x 14' up to 624 horizontal data ports. Exceeding 624 data ports requires a larger room and additional equipment racks.
4. All pathways, conduits, cable trays, slots and sleeves shall have no less than 50% future fill capacity when the project is completed. This shall include all changes/adds to the project.
5. All pathways, conduits, cable trays, slots and sleeves shall not have other cabling (fire alarm, Audio/Visual, security etc.) routed within them.
6. Each equipment rack dedicated to network equipment shall have (2) 120V L5-20 electrical outlets installed on the rear of the rack.

## 1.8 Project Record Documents

- A. Contractor will provide detailed project record documentation within 30 days of substantial completion of the work.
  1. Maintain separate sets of red-lined record drawings for the communications work which show the exact placement and identification of as-built system components.
  2. Provide communication pathway record drawings which indicate exact placement and routing for all components; e.g., maintenance holes, handholes, conduit, wireway, cable tray, pull boxes, enclosures, telecommunications outlet boxes, etc.
  3. Provide communication room record drawings which indicate exact placement for all components; e.g., conduit, wireway, cable tray, backboards, equipment cabinets, equipment racks, cross-connect equipment, etc.
  4. Provide communication wiring and cabling record "As-Built" drawings and schedules which indicate exact placement, routing, and connection details for all components; e.g., twisted-pair and fiber optic cables, splices, cable cross-connect termination locations, enclosures, telecommunications outlets, cross-connect jumpers, patch cords, etc.
  5. Provide GPS coordinates and/or GIS data for the pathways of any outside telecommunications pathways; e.g., buried fiber optic cabling, aerial fiber optic cabling, etc.
  6. Provide network schematics when appropriate.

## 1.9 Approvals and Substitutions

- A. Substitutions are not authorized without written approval from the owner's authorized representative through an addendum.

## 2 Communication Equipment Room Fittings

### 2.1 Summary

- A. Telecommunications spaces will be referred to as Building Entrance Facility (EF), Main Distribution Frame (MDF), Intermediate Distribution Frame (IDF), Data Center (DC).

### 2.2 Telecommunications Backboards

- A. Wall mounted termination block fields shall be mounted on A/C 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with a minimum two coats of white fire-retardant paint on all (6) sides. Mounting hardware shall also be painted white for cosmetic purposes.

### 2.3 Equipment and Wiring Racks

- A. All racks and wire management shall be Ortronics as specified in project specifications and drawings. The equipment/wiring racks shall provide vertical and horizontal cable management on front and rear of each rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Racks and Vertical managers shall be black in color.
  - 1. Approved manufacturers are Ortronics Mighty MM20 Channel Rack, 16.25"D channel, 7'H, 45 RU, tapped #12-24. Ortronics P/N: OR-MM20716-B
- B. Racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes. Earthquake restrictions, requirements, and zoning codes shall be strictly followed.
- C. A minimum of 36-inch clearance shall be maintained from the walls to the front/rear of each rack's vertical managers. When mounting equipment/cabling on vertical walls the equipment mounting depth will need consideration for maintaining 36" clearances for all front/rear of racks.
- D. All racks shall be bound to the telecommunications ground bus bar and shall meet the requirements and practices of application authorities or codes; and shall conform to ANSI/TIA-607 requirements.

### 2.4 Vertical Wire Managers for Equipment and Wiring Racks

- A. Each equipment rack shall have (4) vertical wire managers installed. Two located on the front of the rack (one on each side), two located on the rear. Ortronics P/N: OR-MM20VMS710-B.

### 2.5 Wire Basket Cable Tray Within Communications Rooms (EF/MDF/IDF)

- A. 12 or 24 inches wide depending on specific project details and the amount of horizontal data ports served by the communication room, 4 inches deep, black and of steel construction.
  - 1. Cablofil P/N 105/300BL OR P/N 105/600BL
- B. Black basket cable tray shall be required in all communication rooms and shall not have a liner. Cable trays installed outside communication rooms will have a color determined by A/E to match building paint schemes and tray liners will be required.

- C. All trays will be grounded per local Electric Code requirements and ANSI/TIA-607.
- D. All trays shall be cut using the Cablofil tray cutter: COUPFIL or CUTYFIL. All cut cable trays will be filed to remove burrs and painted to match color. All cutting, filing, and painting will be done outside of the building.

## 2.6 Grounding and Bonding

- A. The facility shall be equipped with a telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA-607 Telecommunications Bonding and Grounding Standard.
- B. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding busbar (TMGB). Each telecommunications room shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building's electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
- C. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. Entering or residing in the TR or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG green stranded copper bonding conductor and compression connectors.
- D. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and busbars shall be identified and labeled in accordance with the System Documentation Section of this specification.
- E. Busbar shall be solid copper, 12.0 inches long x 4.0 inches wide, wall-mounted, with standoffs.

## 2.7 Firestop

- A. All Penetrations through fire-rated building structures (walls and floors) shall be sealed with an approved fire stop system approved by the local fire code. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire-rated structure). Any penetration item, i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire stopped.

### **3 Communications Backbone Cabling**

#### **3.1 Riser Cable**

- A. Voice riser cable shall be 6 - CAT 6 cables terminated on a separate 24 port patch panel between MDF and IDF.
- B. Data riser cable shall be Corning single mode fiber, Interlocking Armor, plenum or riser rated (NEC CODE), and terminated utilizing manufacturer pre-polished duplex LC pigtail assembly. BSU OIT Network shall approve strand count to be installed.

#### **3.2 Campus Backbone Cable**

- A. Analog backbone UTP cable shall be category 3, Pic-Filled, Black jacketed cable with overall sheath. PE-89.
  - 1. All copper backbone cable shall be terminated and grounded on a wall board as per the grounding section of this document.
  - 2. In addition, all copper backbone cabling shall be extended from the wall board to the equipment rack and terminated on a separate patch panel with a single pair per port.
- B. Fiber Cable shall be Corning Altos. 24 strands, OS2 rated, single mode fiber, non-conductive and be of loose tube construction.
- C. Fusion splice all cables requiring splicing as detailed in project specifications and drawings. Mechanical splices are not acceptable anywhere within the physical system.
- D. Cable Jacket shall have a permanently attached label that identifies Boise State University cable number, strand count and destination at every termination and/or splice as the cabling enters and/or leaves a splice enclosure, vault, hand hole, building, building floor, and patch panels. The tag shall be engraved with black lettering on yellow background with information provided by Boise State University Network Services.

#### **3.3 Copper Cable Protection Units**

- A. All copper circuits shall be provided with protection between each building with an entrance cable protector panel. All building-to-building circuits shall be routed through this protector. The protector shall be connected with a #6 AWG green copper bonding conductor to the TMGB.

#### **3.4 Termination Blocks**

- A. 110-Style Blocks: Ortronics OR-30200007

#### **3.5 Fiber Optic Termination Hardware**

- A. Fiber Optic Termination Hardware
  - 1. Corning Fiber Optic Housing Assembly Corning P/N: CCH-04U.
  - 2. Corning Cassette 24 port, shuttered duplex LC. Corning P/N: CCHCS24A9P00RE.

#### **3.6 Underground Fiber Cabling Tracing**

- A. All underground fiber optic cabling will be buried with tracing wire according to industry specification.

## 4 Communications Horizontal Cabling

### 4.1 Horizontal Cabling

- A. Category 6: Superior Essex, colored Blue, plenum or riser rated per NEC and local fire codes.
  - 1. 77-272-2B for Plenum fire rating.
  - 2. 77-272-2A for Riser fire rating.
- B. Security Cameras or 802.3bt/PoE++ Devices: Superior Essex PowerWise 1G 4PPoE, colored Blue, plenum or riser rated per NEC and local fire codes.
  - 1. PW52-HXX-x8 for Plenum fire rating.
  - 2. PW52-HXX-x5 for Riser fire rating.
- C. For remodels, moves, adds and changes the contractor will match existing cabling. Questions will be addressed by the BSU OIT Network Team.

**NOTE:** CAT 5, 5E, 6, and 6A cabling shall be terminated using the ANSI/TIA T568B standard.

### 4.2 Modular Jacks

- A. Work area outlet jack.
  - 1. Ortronics category 6, data, Fog White, T568B. Ortronics P/N OR-TJ600.
- B. For remodels, moves, adds and changes the contractor will match existing jack. Questions will be addressed by the BSU OIT Network Team.

**NOTE:** The intent is that every cable will be terminated on a jack or a 110-patch panel. No cable shall be terminated on an RJ45 termination. Questions will be addressed by the BSU OIT Network Team.

### 4.3 Work Area Outlets

- A. Flush mounted high-density faceplates with recessed label fields, mounted within a single gang wall box.
  - 1. Ortronics OR-403HDJ12, fog white 2-port
  - 2. Ortronics OR-403HDJ14, fog white 4-port
  - 3. Ortronics OR403HDJ16, fog white 6-port
- B. Dust covers (blanks)
  - 1. Single port dust cover for modular openings, color to match faceplate.
- C. Labeling:
  - 1. Work area faceplates shall be labeled with the telecom room number/patch panel letter/port number.  
Ex. B/15 (See Figure 1: Example Labeling)

- D. Work area outlets shall have a minimum of two data ports per single-gang outlet.

#### 4.4 Data Patch Panels and Patch Cords

- A. Category 6 Patch Panel: (PHD66U48) For remodels, moves, adds and changes the contractor will match existing jack. Questions will be addressed by the BSU OIT Network Team.
- B. Patch Cords
  1. For all new builds, Patch cords shall be included and installed by the contractor for 100% of the horizontal data ports including wireless access points. This includes work area outlet and patch panel to switch connectivity.
  2. Patch cord length for EF/MDF/IDF patch panels/network hardware are specific to proper routing as defined by BSU OIT Network Team. Drawing showing proper routing of patch cords is available upon request. Typically, a white 1 Ft patch cord will be used. (OR-MC601-09)
  3. Patch cord lengths for work area outlet location: 10'. (OR-MC610-06)

#### 4.5 Execution: Horizontal Distribution Cable Installation

- A. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- B. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48-inch intervals.

#### 4.6 Testing and Acceptance

- A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA-568-C.1, C.2. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% usable conductors in all cables installed.
- B. All cables shall be tested in accordance with this document, the ANSI-TIA standards, the Ortronics, Superior Essex and Corning Certification Program Information Manuals and best Industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the owner's authorized representative for clarification and resolution.
- C. Horizontal and riser fiber optic cabling attenuation shall be measured bi-directionally at both 1310 nanometer (nm) and 1550 nm operating windows using a light source and power meter.
- D. Campus Backbone single mode fiber cabling shall be tested with OTDR at both 1310 nm and 1550 nm bi-directionally.

#### 4.7 System Documentation

- A. Per project contract documents.

#### 4.8 Test Results

- A. Submit completed test results with close out documentation on thumb/flash drive. This applies to all copper and all fiber optic test results.

## 4.9 Identification and Labeling

- A. All Copper patch panels will be labeled in alphabetical order leftmost rack top to bottom then the next rack top to bottom. Starting with the letter A through Z. If additional panels exist then AA to ZZ will be used.
- B. All work outlet faceplates will be labeled by the communication room they go back to with the patch panel letter followed by the port number. Example (see Figure 1: Example Labeling): B/15 (Room 201, patch panel B port number 15). Any question should be directed to the BSU OIT Network Team.



Figure 1: Example Labeling

- C. All labeling information shall be noted on the as-built drawings.

## 4.10 Final Acceptance and System Certification

- A. Completion of the installation, in-progress inspections, receipt of the test and as-built documentation, and successful performance of the cabling system will constitute completion of the system. Upon successful completion of the installation and subsequent inspection, Boise State University shall be provided with a numbered certificate, from Ortronics or Superior Essex and/or Corning if applicable, registering the installation.