9. Telecommunications

Overview
This report covers telecommunications infrastructure. The report describes existing conditions and then lists recommendations to bring the telecommunications infrastructure up to current codes, standards, and industry practices or improve operations.

Concerns and Deficiencies
Much of the existing telecommunications/IT infrastructure meets today’s codes, standards, and typical practices. The following items are a few conditions that do require attention (explained in greater detail later in this Report):

1. Firestopping at Pathways and Cables Penetrations: TEECOM observed a few instances of cable and pathway penetrations through construction assemblies that do not have code-compliant firestopping systems. Based on this information, TEECOM recommends a comprehensive study of each floor to record each instance of a penetration through a rated construction assembly that lacks a proper firestopping system. From the data collected during the study, DGS (or a specialist firestopping consultant) can plan the most appropriate actions to correct deficiencies. The codes “NFPA 101” and “NFPA 70” would apply to firestopping of telecommunications cables and pathways.

2. Non-Plenum-Rated Horizontal Cables: TEECOM observed (observation made in the IDF) cables stamped with a “CMR” (not plenum) rating that exit the IDF into the ceiling space. The ceiling space is a plenum; therefore; cables within the plenum space must be plenum rated. Based on this information, TEECOM recommends a comprehensive study of each IDF to record all instances of non-plenum rated cables that route into plenum rated spaces. From the data collected during the study, DGS can plan the most appropriate actions to correct deficiencies. The codes “NFPA 70” and “NFPA 101” would apply to telecommunications cables ratings and uses.

3. Supports for Horizontal Cables: TEECOM observed many instances where cables were not properly supported. TEECOM does not recommend retrofit actions but does recommend new cables (additions, replacements, or other) get installed according to current codes and industry practices. The code “NFPA 70” would apply to telecommunications cables installation practices – specifically cable support requirements.

4. Network Patching in Main Telecom Room / BDF: Though not a code violation, TEECOM observed patch cords at the network core installed in a condition that presents significant risk to network operations (should a critical patch cord come detached). TEECOM recommends replacing the patching at the network core and, in doing so, properly utilize cord management apparatus.

5. Network Patching in Per-Floor Telecom Rooms / IDFs: Though not a code violation, TEECOM observed patch cords installed in a condition that presents risk to network
communications. TEECOM recommends adding cord management apparatus and replacing the patching, properly utilizing the cord management apparatus.

6. Computer Room’s Halon-Based Gaseous Total Flooding Fire Extinguishing System: The existing gaseous total flooding fire suppression system is Halon-based. TEECOM recommends replacing this system at the earliest opportunity, sequencing and budget permitting. Also see section “5. Fire Protection”.

**Basis of Report**

**Observations:** TEECOM Design Group performed a visual, non-intrusive (did not open any walls or outlets) building walk-through on February 10, 2009, for observations and assessment of existing conditions. TEECOM observed the “Telephone Equipment” Room, the Computer Room, and the IDFs and samplings of office and conference areas on floors 5, 17, 19 and 24. Also, TEECOM made some observations to a much smaller degree on January 22, after a project kick-off meeting, and we observed work spaces on floor 24 and the mechanical penthouse.

**Drawings:** TEECOM received telecommunications cabling infrastructure drawings (the “ET” sheets, dated “29 Feb 92”) for study.

**Testing Report:** TEECOM obtained a copy of the backbone cabling testing report.

**B. Telecommunications Distribution Existing Conditions**

Overall, the configuration of the existing distribution is relatively straightforward and the infrastructure’s design mostly complies with industry practices and standards (explained in more detail later in this report). Many applicable codes appear to be met but some issues exist (again, explained in more detail later in this report).

**Structured Cabling Subsystem:** The existing telecommunications distribution system consists of the following aspects (appearing in a logical, not physical, order):

1. **Telecommunications Distribution Spaces**
   - Minimum Point of Entry (MPOE)
   - Main Telecommunications Room / Building Distribution Facility (BDF)
   - Computer Room
   - Intermediate Distribution Facilities (IDFs), per floor

2. **Telecommunications Building Pathways**
   - Service Entrance
   - Backbone Pathways between MPOE and BDF
   - Backbone Pathways between BDF and IDFs
   - Pathways for Horizontal Cabling and Devices

3. **Telecommunications Structured Cabling System**
   - Backbone Cabling
   - Horizontal Cabling
• Computer Room Cabling

**Telecommunications Distribution Spaces**

**MPOE (Room #18)**

The MPOE (minimum point of entry) room typically functions as the service entrance point for telecommunications services (TEECOM did not observe this room). However, this room effectively acts as a pass-through since the Telco has extended the demarcation to the BDF.

**BDF (Room #517)**

This room functions as the main telecommunications systems service point, and this room houses: the Telco utility’s (AT&T, possibly others) demarcation, the backbone cabling – both twisted pair and fiber optic – origination/termination field, telephone services (either route-through or originates from this room), and the network core.

The room has finishes typical to telecommunications equipment rooms, including vinyl composite tile (VCT) flooring, plywood backboards on all walls, and no ceiling (open overhead). The room also has power, cooling, and fire suppression services (see electrical, mechanical, and fire protection sections for additional information) typical for a telecommunications equipment room.

The room is near capacity. Little can be added without sacrificing clearances and/or removal or rearrangement of existing equipment.

**Computer Room (Room #515)**

Most of the data center operations and equipment have relocated from this building. Remaining data center operations and equipment within the computer room serves the building (local services and applications, with limited storage).

The room has finishes typical to computer rooms, including a raised access floor (RAF), painted framed walls, and a lay-in acoustical ceiling tile (ACT) overhead. The room also has power and cooling services and has a gaseous total flooding fire suppression system (see electrical, mechanical, and fire protection sections for additional information) – all typical for a computer room.

The room has spare capacity for data center operations and equipment.

The room also houses furniture systems and stored items.

**IDFs**

Floors 11 and below (herein lower floors) have two IDFs per floor, which are closets (shallow relative to industry-standard telecommunications distribution spaces) flanking the ends of the core area on the north and south sides.
Floors 14 and above (herein upper floors) have one IDF within a combined telecom-electrical room located within the core area.

Each IDF, on lower and upper floors, contains 1 equipment rack, which house the network access switches. The equipment racks are wall-mounted; the racks on the lower floors are hinged (for a swing out feature to access the back of the rack). No equipment racks we observed were bonded to ground.

![Figure #01: Typical IDF (Example on Upper Floors)](image)

Telecommunications Building Pathways

Service Entrance

The service entrance pathways connect the building to the Telco utility, which is AT&T, extending just beyond the property line (TEECOM did not observe the pathways).

Backbone Pathways

Backbone pathway systems support the backbone cabling from the BDF to and up the IDF stacks. These pathways consist of cable trays and slots.

Cable trays exist on floor 5 from the BDF to both the west and east riser stacks. Cable trays also exist on floor 14 from the east riser stack on the lower floors to the central riser.
stack on the upper floors to support backbone cables continuing up the building. The cable trays are steel, solid bottom with solid cover, and sized 24” wide x 6” high. Slots exist in the IDFs, allowing the backbone cables to pass floor-to-floor, rising up and down the building. The following figure depicts a typical slot in an IDF for backbone cables.

![Figure #02: Typical Riser Slot and Backbone Cabling](image)

**Horizontal Pathways**

Horizontal pathway systems support the horizontal cabling from the IDFs to work areas. These systems consist of overhead distribution and in-floor trench.

The overhead distribution consists of sleeves and conduits for cable exit from the IDFs, and also contains hangers, straps, and other accessories to support cables routing through the ceiling.
Figure #03: Typical Sleeve/Conduit Exit Pathway

The in-floor trench consists of headers that open within the IDF's and trenches with ‘cells’ routing throughout the office areas. This provides pathways to modular furniture systems without the use of power poles.

Figure #04: Typical In-Floor Trench
Telecommunications Structured Cabling System

Telco Utility Extended Demarcation

The BDF contains an extended demarcation from the Telco utility – AT&T (extended from the MPOE room to the building owner’s main telecom room). The extended demarcation consists of two 1,800-pair cables (indoor ARMM type) from the MPOE room to the BDF, splicing to eighteen 100-pair cables (indoor ARMM type) to termination apparatus. The termination apparatus is building entrance protection (BEP) terminals with 110-type output. This is considered the demarcation wall field.

This wall field appears well laid out though lacks physical space for growth. The demarcation’s pair utilization is low, so physical growth capacity isn’t an issue. The installation is clean and tidy for the Telco’s cabling, splicing, and termination apparatus (as well as adjacent the building’s backbone cabling and termination apparatus).

Figure #05: BDF Wall Field
Backbone Twisted Pair Cabling

The backbone twisted pair cabling originates in the BDF and routes to the IDF through backbone pathways. The cables are CMR rated, ARMM-type, and most often a 900-pair to each IDF. Within the BDF, the cables terminate to 110-type blocks, which are wall-mounted and installed directly above the Telco demarcation wall field. The wall field includes appropriately applied wire management apparatus associated with the termination apparatus. The telecom group installs crossconnect wire between the Telco demarcation wall field and the backbone wall field, as shown in the following Figure.

Figure #06: BDF Wall Field and Backbone-to-Demarc Crossconnection
This Crossconnection provides the electrical connectivity from the Telco’s telephone circuits to the backbone cabling, which extends to the IDFs (crossconnecting to the horizontal cabling ultimately out to the user’s telephone). The crossconnect wiring appears cleanly installed.

Within the IDF, the backbone twisted pair cables terminate to wall-mounted 110 blocks, adjacent to the horizontal termination apparatus. Refer to Figure #01 for additional information on backbone termination.

Backbone Fiber Optic Cabling

The backbone fiber optic cabling originates in the BDF and routes to the IDFs through backbone pathways. The cables are OFNP rated, LGBC-type, and most are two 12-strand multimode 62.5/125µm cables to each IDF. Within the BDF, the cables terminate to “LST”-type termination/patch panels mounted in an “LGX Frame” (a rack specialized for fiber). The network group installs fiber patch cords between the backbone field and the network equipment (core or distribution switch), as shown in the following Figure.

Figure #07: BDF Backbone Fiber Optic Cabling Termination/Patching Field
Within the IDFs, the backbone fiber cables terminate to “LIU”-type termination/patch panels mounted on the wall. The network group installs fiber patch cords between the LIU and the network equipment (optical transceiver and access switch) [refer to the following Figure].

Figure #08: IDF Backbone Fiber Optic Cabling Termination

Firestopping for Backbone Cabling

The cable exits, which are cable trays from the BDF to the riser stacks (backbone pathways), at the BDF perimeter contain firestopping [refer to following Figure]. This firestopping appears proper and compliant to current codes.

Figure #09: Firestopping at Backbone Cable Exits from BDF

Within the IDFs observed by TEECOM observed, all riser slots contain stopping material of some type [refer to Figure #02].
Horizontal Cabling

The horizontal cabling extends from the IDFs to the work areas (furniture systems, fixed offices, conference rooms, copy rooms, etc.) supporting telephone and computer network services.

Cables: The cables are virtually exclusively unshielded twisted pair (UTP) CATEGORY type 4-pair cables. Cables are both CMR rated and CMP rated (the CMP cables appear to have been added since the original construction).

Cable Routing: The cables route through in-floor pathways (trench) and overhead pathways (also refer to previous ‘Horizontal Pathways’ description).

Once outside the IDFs and within the trench system, the cables route to their destination where they exit the trench system and enter the furniture system’s ‘spline’. From the exit box on the floor to the furniture entry point, the cables are shroud with corrugated plated tubing for protection.

Once outside the IDFs and within the ceiling space, the cables route to their destination where they drop into a device pathway (device box & stub).

Figure #10: Typical Cable Routing at Work Areas
IDF Termination: The horizontal cabling – both voice and network cables – terminates to wall-mounted 110-type ‘punch down’ blocks.

Work Area Termination: The horizontal cabling – both voice and network cables – terminates to modular jacks in either a standard wall outlet in fixed offices and other wall instances or a furniture system configuration.

Figure #11: Typical IDF Termination Configuration

Figure #12: Typical Work Area Termination Configurations
Voice Services Crossconnections: To support voice services, the telecom group provided crossconnect wire from the backbone termination field to the horizontal termination field, completing the circuit that comes into the building (see BDF description).

Network Patching: To support network services, the network group provided patch cords from the network switch to the horizontal termination field (and the network switches with optical transceivers).

Labeling: The horizontal termination field includes an identifier per termination field that corresponds to the identifier at the work area (on the outlet’s label). Each work area outlet (at least all outlets observed by TEECOM) includes a label for both the device (on the outlet’s faceplate) and per port.

Firestopping: Firestopping exists inconsistently throughout the building, based on our observations. Sometimes firestopping exists within exit pathways around the horizontal cables and sometimes firestopping does not exist. Within in-floor trench, no firestopping exists.

C. Compliance to Codes and Standards
This section remarks specific or general instances of existing conditions relative to current codes. Though the building was designed to past codes, this report (as directed) compares existing conditions to current codes.

1. BDF and Computer Room – Overall
Based on our observations, existing conditions within the BDF and Computer Room appear to comply with applicable codes. Our observations were limited to telecommunications infrastructure and did not include electrical, mechanical, and/or other systems. Refer to those respective sections for more information.

2. Telecommunications Building Pathways
The building pathways (the pathways themselves – less the firestopping), inclusive of backbone pathways and horizontal pathways, appear to comply with codes.

3. Telecommunications Structured Cabling System
   Backbone Twisted Pair Cabling: TEECOM observed CMR rated backbone twisted pair cabling, which meets code (NFPA 70). No modifications necessary.
   Backbone Fiber Optic Cabling: TEECOM observed OFNP rated backbone fiber optic cabling, which meets (in fact, exceeds) code (NFPA 70). No modifications necessary.
   Backbone Firestopping: The riser slots TEECOM observed contain stopping [refer to Figure #02]. We presume this stopping as firestopping and compliant with building codes, though the actual system and material is not conspicuously evident.
4. Horizontal Cabling – Plenum Rating
According to NFPA 70 (“National Electrical Code”), 800.154(A) and CCR Title 24 (“California Electrical Code”), cables “installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP.” The ceiling space above the ACT below the deck above is classified as a space for environmental air, and thus requires plenum rated – or “CMP” (for voice and data twisted pair ‘CATEGORY’ type cables) – cables. TEECOM observed no condition(s) within the building that would provide any exception to this regulation.

TEECOM observed cables that route through the ceiling space to work areas that are “CMR” rated – not plenum rated. Refer to following Figure.

![Figure #13: Horizontal Cables Routing Through Ceiling Space](image)

**Action:** TEECOM recommends a study to log instances where non-plenum cables route through plenum spaces. From the information acquired from this study, DGS could analyze the impact (work, cost, downtime, etc.) and formulate a plan to replace non-compliant cables.

**Cost:** depends upon the extent of non-plenum cables; could range $5,000 - $50,000

5. Horizontal Cabling – Firestopping Exit Sleeves
At the IDFs, some exist sleeves contain firestopping while others do not – *refer to the following Figure.*

**Action:** TEECOM recommends DGS provide firestopping at each cable exit in each IDF where the cables exist into a plenum space (e.g., over the ceiling).

**Cost:** depends upon the extent of lacking firestopping; could range $3,000 - $10,000
6. Horizontal Cabling – Supporting Methods
TEECOM observed cables within the ceiling space attached to ceiling grid wires for support – refer to the following Figure.

This violates NFPA 70, 300.11(A), last sentence – “Cables and raceways shall not be supported by ceiling grids”.

**Action:** Future recabling projects shall install cables according to a cable support strategy (e.g., cable hangers with dedicated support wires) to comply with codes and applicable standards (e.g., ANSI/TIA/EIA-568-B.1).

**Cost:** no immediate cost impact.
D. Required and/or Recommended Upgrades or Improvements

The following recommendations are based on industry standards and best practices, and do not constitute improvements necessary relative to code compliance. These recommendations are elective.

1. BDF – Improve Network Patching

TEECOM observed network patching within the BDF at the network core that is significantly below industry practices, including cords resting on the floor – *refer to the following Figure*.

![Patch Cords on Floor]

**Figure #16: Network Patching in BDF**

Further, some cable/cord management does exist within the rack bay, but the cords do not utilize the existing cord management apparatus.

**Action:** TEECOM recommends an additional vertical manager to the network core equipment rack. Further, TEECOM recommends more stringent policies and practices, and enforcement of such, to utilize the cord management apparatus so that, over time, cord management improves to a level of at least industry practices.

To re-dress the patch cords and add cord management apparatus, IT Staff could plan and schedule a patch cord re-dressing effort (note: service may be disrupted; therefore,
planning and coordination is a must). IT Staff (and IT installer to assist) could re-dress the cords, and then bring network communications back up.

**Cost:** approximately $3,000 - $5,000, plus DGS employee time.

2. BDF – Demolish Unused Telco Demarcation

**Action:** TEECOM recommends the unused Telco demarcation on the west wall be demolished. The following Figure indicates the scope of what should be demolished.

**Cost:** approximately $4,000 - $6,000

![Figure #17: Demolish Unused Telco Demarcation](image)

3. Computer Room – Eliminate Combustible Materials Build Up

TEECOM observed a ‘build-up’ of corrugated paper boxes and wood pallets in the Computer Room.

**Action:** TEECOM recommends this combustible packing material – and fuel for a fire – be removed or, at the very least, significantly reduced.

**Cost:** DGS employee time.
4. IDF – Bond Racks to Ground
Though not strictly a code violation (because the rack does not serve as a ground continuity component), the existing conditions – no bond from the rack to ground – does violate a number of standards, guidelines, and industry practices, such as IEEE 1100, ANSI-J-STD-607-A-2002, and BICSI TDMM.

**Action:** TEECOM recommends DGS provide a bond from the equipment racks to the ground busbar within the IDF.

**Cost:** approximately $4,000 - $6,000

5. Backbone Twisted Pair Cabling – Bond Cable Shields to Ground

**Action:** TEECOM recommends DGS provide a bond from the backbone twisted pair cables, specifically the shield, to ground – in the BDF and in each IDF.

**Cost:** approximately $4,000 - $6,000

6. Horizontal Cabling – Improve Network Patching within IDF

TEECOM observed network patching within the IDF that is significantly below industry practices – *refer to the following Figure.*
Figure #18: Examples of Network Patching in IDF
Little to no support exists for the cords spanning from the walls to the rack. Clearly, risk exists for a cord to ‘break away’ from a network switch due to collective weight of cords pulling on cords towards the bottom of the bundle.

**Action:** TEECOM recommends an additional vertical cabling section/manager be attached to the side of the rack along with a short section of cable runway from the wall to over the vertical manager to manage cords. The patch cords should be re-dressed to within the cord management apparatus (note: service may be disrupted; therefore, planning and coordination is a must).

**Cost:** approximately $10,000 - $15,000, plus DGS employee time.