1. General requirements

1.1 On premise connectivity

All building closets (IDF) aside from the main closet (MDF) shall be provided with two or more separate links via fiber optic cabling (Multi Links on Multi Strands) to the main closet of the site. All closets within one physical building shall be provided with two or more separate links via fiber optic cabling (Multi Links on Multi Strands) to the main closet of the site (known as the MDF). Any building to building cabling must be in underground conduit unless a retrofit has been ordered where aerial (Under/Above Breezeways roofing, etc.) conduit installation is the only method possible.

1.2 Data outlet type and distribution

All building spaces shall be provided with data outlets, with stainless steel faceplates, with quantity and positions in accordance with the needs of the location or the requirements of the blue print documents. Data outlet layouts designed by a project architect or project manager shall be approved by the Forsyth County Schools Technology Department before preliminary acceptance. Preliminary and final acceptances are conditional on receipt of documentation.

1.3 Wireless infrastructure

All building spaces shall be provisioned with dual outlet Category 6A based data outlets for wireless access points (WiFi, wireless APs, WAPs) unless the blueprint documents, or project plans, deviate from this guideline. Owing to this rapidly-changing technology, design shall be performed only by the Forsyth County Schools Technology Department.

1.4 Cabling etc. requirements

Any work involving installation, re-installation, modification, or movement of data outlets requires that the outlets be (re)test and (re)certified. All data outlets shall be RJ45 outlets to Category 6 Plus standard. All horizontal cabling (i.e. cabling connecting RJ45 data outlets and/or fiber optics connecting closets and electronics) shall be made with approved products and terminated in data racks or cabinets in accordance with Section 5. No cable run shall be longer than 328ft or 100m to include the length of patching cables. Where necessary, a building shall be provided with more than one wiring center or IDF. All cabinet layouts shall be designed by the Forsyth County Schools Technology Department ONLY. There should be an adequate service loop above each closet for every run.

2. External services

2.1 External cabling and micro ducts

Data connections between buildings shall be made using fiber optic cables. Copper cables are not permitted between buildings. The default standard for fiber optic cables is 12 strand single mode, with indoor and outdoor-rated cabling being installed as appropriate. Fiber optic interconnections between wiring closets and buildings shall be designed as shown in schematics by the Forsyth County Schools.
Technology Department. Wherever possible, interconnections between buildings shall be made using fiber in approved inner-ducts; between buildings these shall be installed within the normal 4-inch ducts. Fiber optic cables for external connections shall be terminated in rack mounted metal termination boxes fitted with duplex LC connectors ONLY. The patch panel boxes shall be appropriately sized to accommodate the needs of the closet plus future expansion. The rear cable entries shall be slotted to allow removal of the cable without the need to cut and re-terminate it. Single-mode shall not be mixed in the same fiber termination box as multi-mode, unless prior approval is acquired. Each pair in a fiber optic installation shall be fitted as a crossover.

3. Wiring Closets

3.1 Access

Data closets shall be secure (lockable) rooms or accessible using the FCS badge access system. Key issue shall be restricted to Forsyth County Schools Technology Department staff members only. Access must be available to authorized Forsyth County Schools Technology Department staff members, including out-of-hours access. Closets shall be located so that access is from indoor public areas rather than departmental areas, which may be closed off, if possible. Access to staff other than the Forsyth County Schools Technology Department and their contractors is prohibited. Access for contractors will be by arrangement with the Forsyth County Schools Technology Department.

3.2 General design and layout

Data Closets shall consist of a dedicated room provisioned with appropriate services for lighting, power, and cooling. The room shall not be used for storage or any other purpose not directly related to the delivery of Forsyth County Schools data services. Data closets shall not be used for site power distribution equipment other than that dedicated to the operation of the data equipment unless not possible through retrofit. Certain other building services shall be excluded from data closets. These include but are not limited to water supplies, drains (including drain pipes), and heating pipes. There must be no water or liquid pathway, sources or outlets in the ceiling above the cabinet(s). This includes waste water pipes, chilled water pipes, hot water pipes, sewer pipes, and rainwater downpipes unless not possible through retrofit. New data closets shall be capable of accommodating an appropriate number of data cabinets or racks to meet total outlet count necessary with room for expansion. After construction and decoration, and before any active equipment can be fitted, the data closet shall be thoroughly cleaned to eliminate all dust and debris, including racks and the interiors of data cabinets.

3.3 Power and environment

Adequate ventilation and/or cooling shall be provided to maintain the room temperature between 72- and 75-degrees Fahrenheit and maintain a relative humidity level of no more than 50 percent. Each data closet shall be provided with a dedicated 240-volt outlet (locking, 30-amp service, via NEMA L6-30 outlets) fed from a generator-backed main supply. Outlets should be placed aft of the equipment rack. Two circuits per cabinet in Data Center settings. If the IDF closet will have multiple data switching stacks, then it should also have multiple circuits so each data switching stack can have its own. Closets should also have a quad outlet (with two plugs connected to generator, and the other two connected to main power) providing 120-volt, 15-amp service, in a location specified by the Forsyth County Schools Technology Department.
4. Data outlet distribution

4.1 Design and planning

Data outlet quantities and locations shall be designed by or in consultation with the Forsyth County Schools Technology Department before construction. Subject to the foregoing and the rest of this section, data outlet layout may be designed by a project architect or project manager but shall be approved by the Forsyth County Schools Technology Department. Such approval shall be conditional on receiving lists of quantities and drawings indicating proposed layout. High-level data outlet quantities and locations for wireless AP’s shall be designed by the Forsyth County Schools Technology Department. All data outlets shall be fitted in pairs, as “twin” or “dual” RJ45 outlets. All components of the installation shall be to Category 6A standard for wireless access point installations, and Category 6 Plus standard for all other data installations, unless previously agreed with IT Services. Materials shall be chosen from a single range of the products listed in Section 5 and shall only be installed by an installer approved by the manufacturer for that product range. Wiring runs shall be in wire trays or approved J-hooks within equipment rooms, risers, ceiling voids, and loft spaces. In under-floor spaces, where outlets are to be in floor boxes, rigid conduit must be utilized. Where wiring runs are not in such spaces, they shall be enclosed in plastic latch duct on the surface of a wall. Designers should note that Category 6A cable is significantly thicker than older types and should use one of the readily available cable containment calculators to ensure adequate containment provision. Prior to commencement of cabling work, DWG or VISIO (prefer VISIO) files shall be provided to the Forsyth County Schools Technology Department so that modeling software can be used to determine precise quantities and locations of all data outlets.

4.2 Installation

All data outlets shall be labeled in accordance with the Forsyth County Schools Technology Department. All horizontal cabling (i.e. cabling connecting RJ45 data outlets) shall be installed with approved products contained in Section 5, and certified to comply with the relevant standards. Below ceiling cable bundles shall be secured with Velcro cable ties or an equivalent cable tie designed to prevent any possibility of crushing or deforming the cable. Above ceiling may use standard cable “zip ties”. All data cabling must be one continuous unjointed length from patch panel to outlet and shall not have splices or in-line connectors other than those integral to the patch panel and the room outlet. No “consolidation points” shall be used. For reasons of warranty, cables shall not be installed by one contractor and terminated/tested by another unless by prior approval from the Forsyth County Schools Technology Department. Final acceptance of an installation is conditional on receipt of documentation by the Forsyth County Schools Technology Department as described in Section 8 (WHERE is that section???). Forsyth County Schools Technology Department will not patch or “make live” any outlet until it has been finally accepted as above.

4.3 Wireless

The requirement for design and layout by the Forsyth County Schools Technology Department for data outlets supporting wireless access points shall be included in any requirements for new or refurbished building work. Inclusion of dual data outlets for wireless access points shall be included in designs for corridors, open spaces, office space, classrooms, and other areas that may be advised by Forsyth County
Schools Technology Department. Prior to commencement of cabling work, DWG or VISIO (prefer VISIO) files shall be provided to the Forsyth County Schools Technology Department so that modeling software can be used to determine precise quantities and locations of dual data outlets for wireless access points. Wireless access points shall be provisioned and installed with due regard to wireless and client density, interference, propagation differences at different wavelengths including 2.4GHz and 5GHz and using different modulation techniques including but not limited to 802.11a/b/g/n/ac, interaction with neighboring wireless access points, and any building features or construction which may impede the signals. Dual data outlets for wireless access points shall be either wall mounted or securely fastened with termination boxes at above ceiling level, or such as to allow for ceiling mounted access points, to be decided by the Forsyth County Schools Technology Department according to the type and model of wireless access point planned. High-level outlets and mounting bracket positions for wall mounted access points shall be fitted at a height of approximately 9 feet from the floor. Data outlets intended to serve ceiling-mounted access points shall be located in such a position as to be readily accessible to authorized Forsyth County Schools Technology Department staff without the use of specialist tools or equipment for the purpose of patching to the access point when fitted or serviced. Where external Wireless Access Points (WAPs) are required, weather-proofed WAPs must be used. All cable runs for the WAPs shall be pulled to separate patch panels to allow for diversity in switch connectivity.

5. Structured Cabling Hardware and Enclosures (see 3.3 of RFP document) What is this?

NOTE: Unless otherwise specifically stated, it is acceptable to use the direct Panduit equivalent of any Belden or Chatsworth product specified in Section 5 and its accompanying subsections.

5.1 Two Post Racks and Wall Cabinets – Typically used in MDF and IDF applications Belden 2-Post 45U upright racks – BHRR194 (Black)
Wall Cabinets – Typically used in small IDF applications
Chatsworth 2ft x 30” D wall mounted cabinet – 12419-724 (Black)
Chatsworth 3ft x 30” D wall mounted cabinet – 12419-736 (Black)
Chatsworth 4ft x 30” D wall mounted cabinet – 12419-748 (Black)

5.2 Floor Standing Cabinets – Typically used in Data Center applications

5.3 Overhead Cable-Way (Ladders, etc.) – Typically used in Rack and Cabinet applications MDF and IDF applications – Below Ceiling Grid/Exposed
Chatsworth 18” Cable Runway - 10250-718 (Black)
Chatsworth 12” Cable Runway - 10250-712 (Black)

Data Center applications – Below Ceiling Grid/Exposed
Panduit 18” Wyr-Grid - WG18BL10 (Black)
Panduit 12” Wyr-Grid - WG12BL10 (Black)

Hallway and Common area applications – Above Ceiling/Common Panduit 18” Wyr-Grid – WG18BL10 (Black)
Panduit 24” Wyr-Grid – WG24BL10 (Black)
J-Hooks for Hallway and Common area applications when applicable – Above Ceiling/Common PanduitJP2 Series Hooks
Panduit JP4 Series Hooks

5.4 Fiber Enclosures

MDF Rack Mount Enclosures
Belden 4U Fiber Enclosure – AX105565 (Black)
Appropriate LC termination panels (SC and ST are not allowed) IDF Rack Mount Enclosures
Belden 1U Fiber Enclosure – AX105563 (Black)
Appropriate LC termination panels (SC and ST are not allowed)

5.5 Structured Cable Plant and Jack Specifications
Belden CAT6A UTP Cable matching the color codes in Section 5.9 Plenum Rated cable required for ALL above ceiling applications
Riser rated cable ONLY when specified otherwise
Belden CAT6A Key Connect jacks matching the color codes in section 5.9

5.6 Patch Panels and Face Plates

Belden 1U 24 Port Modular Patch Panel - AX103114
Belden 1U 48 Port Modular Patch Panel - AX103121
Belden 2U 48 Port Modular Patch Panel - AX103115
Belden Key Connect Single Gang 1-6 port Stainless Steel Face Plates with Labeling Pockets
Belden Key Connect Dual Gang 4-12 port Stainless Steel Face Plates with Labeling Pockets

5.7 Cable Management

Horizontal Cable Management
Switch Rack: Panduit WMPF1E (Front/Rear Management) Cabling Rack: Panduit WMP1E (Front Only Management) Vertical Cable Management
WMPVHC45E

5.8 Patch Cables

Copper Patch Cable Specification: Category 6A or Category 6 Plus, as appropriate.
Belden Bonded Pair: 3ft, 7ft, 10ft, 15ft, 20ft, 25ft
MDF and IDF Panel to Switch Cross Connect: 3ft (7ft for extended cross connect) Device side: 7ft, 10, 15ft (20ft and 25ft for extended connection)
Fiber Patch Cable Specification: Single-mode patch, duplex LC connectors
Belden Fiber Patch Cables: 1m, 2m, 3m
MDF and IDF Enclosure to Switch & Switch to Switch Cross Connect: 1m, 2m, 3m

5.9 Color Coding
Structured Cabling Color Coding

Blue: General Data (including cameras and phones)
Yellow: Wireless Access Points

Jack Color Coding

Blue: General Data
Yellow: Wireless Access Points
Blue: IP Phone Equipment
Green: IP Cameras
Purple: Intercom
Orange: HVAC/Electrical
Pink: Digital Signage
Black: Access Control
Gray: Alarm

Copper Patch Cable Color Coding

Blue: General Data
Yellow: Wireless Access Points
Blue: IP Phone Equipment
Green: IP Cameras
Purple: Intercom
Orange: HVAC/Electrical
Pink: Digital Signage
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Fiber Patch Cable Specification: Single-mode patch, duplex LC connectors
Belden Fiber Patch Cables: 1m, 2m, 3m
MDF and IDF Enclosure to Switch & Switch to Switch Cross Connect: 1m, 2m, 3m

6. Variances from Specifications

6.1 Variance

Variance from standards outlined in this document are not allowed, unless approved by Forsyth County School System’s Technology Services Department.

6.2 Variance Approval

Any variance from the standards outlined in this document are subject to the approval from the Forsyth County School System’s Technology Services Department. This approval must be in written form and must come from department’s leadership.