VI. TECHNOLOGY SYSTEMS

INTRODUCTION

Purpose

This Basis of Design (BOD) describes the magnitude, functions and requirements of the low voltage Technology systems in Florida Polytechnic University (FPU) Engineering Building. It presents a description of the individual systems' proposed design and function.

Approach

Identify the Technology systems included in the project.

Coordinate the intrabuilding cabling plan and Technology support spaces with FPU and the Architect.

Coordinate the interbuilding cabling plan with FPU.

Coordinate Technology Systems' Mechanical, Electrical, Structural and Architectural needs with the Engineer and the Architect.

Assist Florida Polytechnic University with selection of equipment for information technology and electronic security systems.

Coordinate development of Technology Design Documents with entire Project team.

Scope of Work

The Technology systems in this Project will include design and implementation information for the building structured cabling system. This system will support voice and data applications using equipment supplied by the Owner.

The building structured cabling system will also be used to support other applications including building automation and controls, access control and video.

The Technology System design will include provisions for using the building and campus data network for head-end networked communication for systems including building automation and controls, access control, video and fire alarm.

The Electronic Security System design will include IP video surveillance system and an electronic access control system for the building. The security system will tie into the existing campus video surveillance and access control systems.

Responsibilities

System Name	Designed By	Installed By
Horizontal Structured Cabling System	Engineer	Contractor
Backbone Structured Cabling	Engineer	Contractor
Video Surveillance System	Engineer	Contractor
Electronic Access Control System	Engineer	Contractor
Audio/Visual Systems	A/V Consultant	Contractor
Wireless Local Area Network	FPU	Contractor

Definitions

Definitions	
Backbone Cabling	Cables connecting BEF to MDF and MDF to IDFs
BEF	Building Entrance Facility - Located on first floor of the building. Voice, data and video services are brought into the building in this room.
Cable	Assembly of one or more conductors or optical fibers within enveloping sheath, constructed to permit the use of conductors singly or in groups.
Cable Link	Includes SIO, station cable and termination hardware in consolidation points and MDF or IDF.
Cable Channel	Same as Cable Link, plus patch cords at SIO and in MDF or IDF.
Consolidation Point	Interconnection point within the horizontal cabling using TIA-568-C compliant connecting hardware rated for at least 200 cycles of reconnection.
Cross-Connect	Group of connection points, wall or rack mounted, used to mechanically terminate and administer building wiring.
Faceplate	Component at SIO that holds the jacks.
Horizontal Cabling	Cables connecting SIOs to MDF, IDFs and consolidation points.
IDF	Intermediate Distribution Frame - Used to distribute station cabling to workstation outlets and to house communications equipment.
Intrabuilding	Within a single building.
Interbuilding	Between two or more buildings.
IT	Information Technology
Jack	Modular connector located in SIO.
LAN	Local Area Network - Network or networks typically covering a small geographic area. Typically includes only Client-owned cabling and equipment.
MDF	Main Distribution Frame - Located on the first floor of the building.

Definitions	
	Building voice, data and video services are distributed to IDFs on all levels from this room.
Outlet	See SIO
STP	Shielded Twisted Pair - Balanced, 4-pair cable used for copper station cabling. Each pair is wrapped with a shielding material and the overall cable is also wrapped with a shielding material.
SIO	Standard Information Outlet - A device assembly located in work area on which station cabling terminates and which can receive modular connectors.
Station Cabling	See Horizontal Cabling.
Telecommunications	Any transmission, emission, or reception of signs, signals, writings, images, sounds, or information of any nature by wire, radio, visual, optical, or other electromagnetic systems.
UTP	Unshielded Twisted Pair - Balanced, 4-pair cable used for copper station cabling and multi-pair copper backbone cables.
WAN	Wide Area Network - Network or networks typically covering a large geographic area. Typically includes Client-owned and service provider-owned cabling and equipment.
WAP	Wireless Access Point - Device that allows wireless devices to connect to a wire network.

STRUCTURED CABLING

Load Calculation Criteria

The following outlet quantities indicate the general outlet densities expected for the project. Specific requirements to satisfy user needs will be implemented as space programming is completed.

The values in this table show the number of faceplates in each room and the number of jacks at each faceplate. For example, a conference room would have a total of 4 faceplates containing a total of 7 voice and 9 data jacks.

Room or Space Function	No. of Faceplates	Voice Jacks per Faceplate	Data Jacks per Faceplate	Fiber Jacks per Faceplate
Typical Office	2	0	2	0
Conference Room	1	0	2	0
	1	0	4	0
Modular Furniture	1	0	2	0
Lab Support Rooms	As needed	0	1	0

Room or Space Function	No. of Faceplates	Voice Jacks per Faceplate	Data Jacks per Faceplate	Fiber Jacks per Faceplate
Research Labs – Room	1	0	2	0
Research Labs – Bench top (per 8 lf of bench)	1	0	1	0

Equipment Sizing Criteria

Pathways

Cable pathways will be sized for a growth factor of three, or spare pathways will be provided to allow for growth. Typical pathway sizing is as follows:

- Station - 1" minimum conduit size.
- Reduce minimum conduit size to 3/4" when appropriate.
- Pathways will be installed to connect BEF, MDF and IDFs in an efficient manner.

Termination and Mounting Space

Equipment racks and wall fields will be sized with a minimum of 30% spare capacity.

Copper Voice Backbones

Interbuilding copper voice backbones will be sized at 50-pairs.

Intrabuilding copper voice backbones will be 25-pair per IDF.

Network Electronics

Network electronics will be sized, furnished and installed by the Owner.

System Descriptions

The structured cabling system will be provided as a certified cabling system. The manufacturer or manufacturers of the cable and termination components will qualify and warranty the performance of the entire system.

Support Rooms

All Technology support rooms have several common requirements. Each room will be provided with card access security control, emergency and/or UPS power and continuous HVAC cooling.

The support rooms should be located central to the areas that they serve and have clear access to cable pathways coming in and out of the rooms. Pedestrian and equipment access should be through a door located off a building corridor and should not require access through any other locked room. Door width will be at least three feet.

Suspended ceilings should not typically be provided; however, some means of maintaining the environmental parameters of the rooms must be implemented. If a suspended ceiling is required to maintain environmental integrity, the ceiling should be installed high enough to allow all pathways and room services to come into the rooms below the ceiling.

Floors, walls and ceilings in the support rooms will be treated to minimize dust and the potential for static electricity. At least two walls will be covered with fire treated plywood (3/4-inch-thick, 8 feet high, A-C grade).

Building Entrance Facility (BEF)

Interbuilding services will be brought into the facility at the BEF and the building demarcation will be located in this room. External service providers will bring services into this room for connection to the building's cabling system.

The BEF will be collocated in the Main Distribution Frame (see below).

Main Distribution Frame (MDF)

The building MDF provides a protected environment for terminating all backbone cables and is located on the first floor of the building. This room is where the building Technology systems connect to the campus Technology systems and distribute to the rest of the building.

The MDF requires a minimum of 120 total square feet of space. The room will house voice PBX, voice cable terminations, data network equipment and data cable terminations.

Intermediate Distribution Frames (IDF)

Each floor will have two (2) IDFs, and each IDF will connect to the building MDF with intrabuilding backbone cabling. The IDFs provide a protected environment for terminating backbone cabling and station cabling on each floor and Technology services to the floor will be provided from the IDFs. Network electronics will also be housed in the IDFs.

Each IDF requires a minimum of 120 square feet (10 feet by 12 feet) of space.

Backbone Cabling

Backbone cable summary table

Backbone Cable Application	Cable Type	Cable Quantity
Interbuilding Data (i.e. computer networking)	SM Fiber Optic	48 Strands Each
Interbuilding Voice	Copper UTP	50 Pairs
Security (i.e. CCTV) Cameras	SM Fiber Optic	12 Strands

The existing campus duct bank and manhole system will extend to the building to provide connection to the Campus Technology infrastructure. All Technology services for the building will enter through the duct bank and manhole system.

Interbuilding Data Backbone Cabling and Connection Hardware

The data system will use fiber optic cabling to bring data service into the building at the MDF from the existing campus fiber network. The data backbone will be sized at 48 single mode fiber optic strands.

All fiber strands will terminate on duplex LC connectors in rack mounted patch panels in the MDF.

Intrabuilding Data Backbone Cabling and Connection Hardware

The data system will use fiber optic cabling to distribute data service from the MDF to the IDFs. The data backbone from the MDF to each IDF will be sized at 24 total single mode strands.

All fiber strands will terminate on duplex LC connectors in rack mounted patch panels in the MDF and IDFs.

Interbuilding Voice Backbone Cabling and Connection Hardware

The voice system will use high pair-count copper cabling to bring voice service into the building at the MDF. The voice backbone will be sized at 50 pairs.

All cable pairs will terminate on wall-mounted protector panels and be cross-connected to wall-mounted system terminal blocks.

Intrabuilding Voice Backbone Cabling and Connection Hardware

The voice system will use high pair-count copper cabling to distribute voice service from the MDF to the IDFs. The voice backbone will typically be sized at 25 pairs per IDF.

All cable pairs will terminate on wall-mounted 110-blocks.

Station Cabling

Station Cable Application	Cable Type	Cable Quality
Data (i.e. computer networking)	Copper UTP	CAT6A
Wireless Data (i.e. WAP connections)	Copper UTP	CAT6A
Security (i.e. CCTV) Cameras	Copper UTP	CAT6A

Data Station Cabling and Connecting Hardware

Each data jack will connect to the nearest IDF with a 4-pair UTP, Category 6A cable. All four pairs will terminate at the outlet and in the IDF.

Category 6A rated 8P8C type jacks will be used at the outlet locations and rack mounted patch panels will be used in the IDFs.

Cables from SIOs will run in conduit, J-hooks and cable trays to the IDFs.

Support Equipment

Innerduct

All backbone fiber optic cabling will be installed in flexible, nonmetallic innerduct. This innerduct will protect the cables and segregate conduits and conduit sleeves.

Equipment Racks

All copper and fiber optic patch panels will be installed in 7-foot-high, standard TIA 19" equipment racks.

Horizontal and vertical cable management will be provided in all equipment racks.

Cable Raceways

The cable raceway system will consist of a combination of cable tray, J-hooks, conduit, surface raceway, cable runway and D-rings. The cable runway and D-rings will only be used in the support rooms.

Cable pathways from the SIOs to the IDFs will use conduit above inaccessible ceilings, cable tray above accessible ceilings and major cable runs and J-hooks for aggregating small quantities of cables in common areas.

Grounding System

The Technology grounding system will provide equipment protection in all support rooms. Ground bars and conductors will be provided to minimize the potential difference between the grounding system and the electrical sources powering the Technology equipment.

MEP Requirements

No piping or ductwork will pass over or through any Technology support room, unless they are used to provide services to the support rooms. Piping and ductwork used to provide services to these rooms will be coordinated with the anticipated Technology equipment layout within the rooms.

Electrical Requirements

Technology support rooms will be connected to the building standby power source. Rack-mounted UPS equipment will be used to maintain system operation while the standby power source comes on-line.

Electrical Circuit Type	Source	Circuit Quantity	Device Type
120V, 20A	UPS	(1) per equipment rack	L5-20R
120V, 30A	UPS	(1) Per equipment rack	L6-30R

Electrical service for the MDF will be sized at 100 watts per square foot.

Electrical Circuit Type	Source	Circuit Quantity	Device Type
120V, 20A	UPS	(1) per equipment rack	L5-20R
120V, 30A	UPS	(1) per equipment rack	L6-30R

Electrical service for the IDFs will be sized at 100 watts per square foot.

Technology support rooms will be lit to a minimum of 50-foot candles horizontal illumination and 20-foot candles vertical illumination between the equipment rack rows (measured at three feet above the floor).

Access to Technology support rooms will be controlled by the building access control system to allow the Owner to track access to the rooms.

Mechanical Requirements

Technology support rooms will be maintained at between 68 and 72 degrees Fahrenheit with 30% to 50% relative humidity at all times. If the building HVAC system cannot provide continuous operation or adequate capacity to meet these criteria, supplemental cooling units will be installed.

Cooling requirements for the MDF will be sized at 75 watts per square foot.

Cooling requirements for the IDFs will be sized at 50 watts per square foot.

Piping Requirements

The MDF and IDFs will be sprinkled and include protective cages around the sprinkler heads.

WIRELESS LOCAL AREA NETWORK

The Wireless LAN will be designed by FPU. The Engineer will provide structured and connectivity at each wireless access point (WAP) location identified by FPU. WAPs will be provided by FPU and installed by the contractor.

AUDIO-VISUAL

The audio-visual system will be designed by and A/V consultant and installed by the contractor. The Engineer will coordinate with the A/V consultant to meet their data drop requirements for any A/V equipment.

ACCESS CONTROL

The electronic access control system will be designed by the Engineer and installed by the contractor. The new system will match or interoperate with the existing campus access control system. The access control system is limited to electronic equipment including proximity readers, keypads, electric strikes, magnetic locks, door position switches and electronic requests-to-exit. All door hardware design and installation will be provided by the door hardware consultant/vendor. The Engineer will coordinate with FPU to determine which doors require controlled access.

CCTV

The Engineer will coordinate with FPU to design a POE IP video surveillance system. The new video surveillance system will match or interoperate with the existing campus video surveillance system. All cameras, licenses, cabling and connectivity will be provided and installed by the contractor.

END OF BOD