City of Lansing
Telephone and Data Wiring Requirements

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1 Vendor / Contractor Requirements and Guidelines

1.1 IT Division: Authority, Responsibility and Objectives

IT Division (Information Technology Division) is responsible for the operation of the City of Lansing's data and voice networks and therefore has the authority and responsibility to specify requirements for any networks that are connected and enforce the policies set forth here and elsewhere. IT has set the standards under which this wiring is installed.

The City of Lansing (IT Division) wishes to insure that sufficient communications capacity is planned when new construction is anticipated. The following requirements are intended to ensure that the design process for any new construction takes into account all communications factors. The intent of the IT Division is to achieve a minimum acceptable standard for the City of Lansing's widespread infrastructure.

These requirements are NOT a complete set of construction specifications. They are intended only to provide an architect/contractor with a view of what the minimum acceptable communications requirements shall be for any given construction project. The City of Lansing IT Division requires that all the codes and standards mentioned below are adhered to. It is the job of the telecommunications contractor to provide all labor, material, and equipment necessary for a complete telephone and data wiring system as called for in these specifications and indicated on drawings.

1.2 Building Codes, Regulations and Specifications

All work and equipment shall conform to the appropriate portions of the following specifications, codes and regulations:

- City of Lansing IT Division Telephone and Data Wiring Specifications
- Building Industry Consulting Services International (BICSI) *BICSI's Telecommunications Distribution Methods Manual (TDMM), 10th Edition*
- ANSI/EIA/TIA Standards

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- National Electrical Code (NEC)
- All other applicable National, State and Local Codes

1.3 Special Notes

1.3.1 All questions about City of Lansing communications requirements should be directed to the City of Lansing IT Division.

1.3.2 All communications facilities to be installed in City of Lansing buildings must be approved by the IT Division prior to installation.

1.3.3 Plenum-rated cable is required in all new permanent voice and data wiring installations.

1.3.4 In all wiring installations wiring must comply with all applicable building code requirements.

1.3.5 For proper support, all cable terminations and networking equipment must be located in space accessible to and serviceable by maintenance staff.

1.4 Exceptions

Any and all requests for exception to this standard shall be made in writing to the IT Division for approval.

1.4.1 Exceptions Procedure

Any requests for deviations from these specifications must follow this procedure:

- Request must be submitted in writing
  - City of Lansing, IT Division
  - 201 N Grand Ave Lansing MI 48933
  - Pictures and/or drawings may accompany the request
- Reason(s) for exception must be included
- Exceptions will not violate any national, state or local building code
- IT Division will make a decision in consultation with an official from the appropriate trade(s) involved
- IT Division is the ruling body and it’s decision will be final.

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1.5 Submittals

Submittals shall include complete catalog and other information shown to describe the cable, wire and equipment proposed to be furnished and to verify compliance with this specification. *If any materials other than the materials mentioned in this specification are used, an exception shall be filed per section 1.3 and product material samples with specifications are to be provided to the City of Lansing ITS Division for approval.*

1.6 Coordination of Work

Certain final connections and tie connections are to be defined by IT Division. Connections shall be made directly by the City of Lansing when noted as such in this specification or on the drawings. The contractor is to coordinate with the City of Lansing's representative in the IT Division so that the tie-in work and final connection can be accomplished in an orderly and timely manner. Many of our city buildings are administration facilities that provide services to the citizens of the City of Lansing. As such, activities in all buildings are critical to the provisioning of services to the City of Lansing and shall not be interrupted by the vendor's work activities whenever possible. If the vendor must disable services during working hours, the vendor must get prior approval from IT Division and the City's user department, were the work is being conducted.
Also, any computer system associated with this work will fall into this category and may not be taken off-line or removed from service during normal working hours without the same approvals. The vendor will be required to work around all of the conditions listed above, as well as working with the City of Lansing staff to minimize disruptions to normal City of Lansing activities.

1.7 Designer and Installer Qualifications

All telephone and data wiring is to be performed by a qualified telecommunications subcontractor regularly employed in this field.
Network installation shall be completed by a factory registered Panduit PSC contractor. The contractor shall have completed standards based product and installation training. A copy of the PSC Contractor Registration shall be submitted in the proposal.

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The contractor shall provide a complete system warranty to guarantee the proper operation of an end-to-end high performance cabling systems that meet application requirements. The guarantee shall include cable and connectivity components and have one point of contact for all cabling system issues. *The system shall be warranted for a period of at least 2 years. Warranty period shall begin upon acceptance as defined in section 10.*

Network Design

The *designing company* must have a BICSI Registered Communications Distribution Designer (RCDD) on staff that shall be ultimately responsible for this project. The RCDD must have at least 2 years experience in this type project as to be able to lend adequate technical support to the field forces during installation, during the warranty period, and during any extended warranty periods or maintenance contracts. A resume of the responsible RCDD must be attached to the Vendor's response for evaluation by the City of Lansing. Should the RCDD assigned to this project change during the installation; the new RCDD assigned must also submit a resume for review by the City of Lansing.
If, in the opinion of the City of Lansing, the RCDD does not possess adequate qualifications to support the project, The City of Lansing reserves the right to require the vendor to assign an RCDD who, in the City of Lansing's opinion, possess the necessary skills and experience required of this project.
The *contractor* must also have BICSI registered Installers and Technicians on staff and assign them to this project. The project shall be staffed at all times by Installers and Technicians who, in the role of lead craftspersons, will be able to provide leadership and technical resources for the remaining craftspersons on the project. *A copy of their registrations must be available upon request.*

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2 Entrance Facilities and Telecommunications Rooms

The commercial building standard for telecommunications pathways and spaces is standardized in the ANSI/TIA/EIA-569-A documents.
The documents lay out purpose, scope and elements of a modern cable plant.
The rooms are divided along their perceived function.
The Entrance Facility is supposed to terminate all outside cables.
The Communications Room is the "main data / phone" room. Equipment such as routers, switches, telephone equipment etc would be placed here.
The Telecommunications Rooms are more like "wire centers" where cables run to and from the desk top and also to and from the main communication room.
In some instances one room may serve all 3 functions. Service entry, Equipment room and telecommunications room would be in one area in the smaller locations.

2.1 Locations and Distances

The Entrance Facility (EF) is a telecommunications room where all outside telecommunications facilities are terminated.
Communications equipment rooms, Entrance facilities (EF's) and Telecommunications rooms (TR's), shall be located such that the length of the cable installed from the equipment room to all station terminations served by that room is less than two-hundred-ninety-five feet (295').
The distance between telecommunication closets shall not exceed two-hundred-fifty feet (250').
Each floor shall contain a communications equipment room.
Communications Equipment rooms shall be stacked vertically wherever possible.
In general, communications equipment rooms should be placed centrally in the building. Central location of equipment rooms reduces the length of cable to each workstation.
If there will be more than one communications equipment room per floor, then they shall be equally distributed away from possible sources of electromagnetic interference such as electric motors or transformers.

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2.2 Entrance Facility Room Size

This room shall be sized according to the number of rooms/workstations and the size of the building that it will serve. In general, the EF shall be a least twelve-feet by fourteen-feet (12'x14') with a minimum ceiling height of eight feet. All other Telecommunications Rooms (TR) shall be sized according to the number of rooms/workstations that they will serve. In general, the TR shall be at minimum, eight feet by ten feet (8'x10'), with a minimum ceiling height of eight feet.

2.3 General Equipment Hazards Not Allowed

Communications equipment rooms shall be free of electrical distribution panels (except the sub-panel for that room and the UPS for that equipment) inverters, air handler, sinks, washbasins, janitorial storage areas and other equipment. Communications equipment rooms shall contain communications equipment only. NO EXCEPTIONS.

2.4 Electrical Service

Communications equipment rooms shall contain one 60 Amp 120 / 240 sub panel. Receptacles shall be specification grade. *Receptacles should be placed around the equipment room as equipment requires and in adequate numbers, in accordance with NEC specifications and/or local fire codes.*

2.5 Grounding System

All communications equipment rooms shall be provided with a common ground system. The communications equipment room ground system shall connect to the main building protective ground at a single point only. The protective ground connection point shall NOT be made to electrical conduits, power distribution box grounds or neutral busses. The intent is to provide all communications equipment rooms with a common ground, which will not be affected by any other electrical work. The communications equipment room ground system shall consist of a number 6 (#6) AWG copper conductor, green insulated ground wire that shall interconnect all equipment rooms. Ground lugs shall be provided in each equipment room. The wire shall be routed through the equipment room such that additional ground lugs may be installed when needed. The contractor will connect racks, cabinets and frames to a single point ground connected to building ground

system via #6 AWG green insulated copper grounding conductor. The ground path shall be tested by the contractor.

2.6 HVAC

Communications equipment rooms will house active electronic components. These rooms must maintain certain environmental conditions. Equip all communications equipment rooms to provide an appropriate atmosphere for these components on a year round basis. Maintain positive pressure within these spaces with a minimum of one air change per hour.
Temp. Range: 18 to 24 C or 64 to 75 F
Humidity: 30 to 55%RH
Caution: Connection to the building HVAC system usually does not provide proper environmental control year round due to the use of this system for heating during the winter. (ASHRAE = 90 Standard)

2.7 Wall and Floor Preparation

All communications equipment room walls must be covered with three-quarter inch (3/4") indoor grade A/C void free fire retardant plywood from 4 inches above finished floor to a height of eight feet (8') or to the ceiling, whichever is lower. All plywood backboards must be painted with two coats on non-conductive, fire retardant paint or be rated as fire retardant plywood. Due to dusting characteristics of concrete, all such interior surfaces should be painted or tiled with an anti-static tile and finished in a light color to increase illumination. Paint should be free from turpentine. Communications Equipment rooms will not be carpeted.

2.8 Lighting

All communications equipment rooms must be 540 lux (50 foot candles) at a distance of three feet (3') above the floor level. Ceiling lights must be fused on a separate breaker and be provided with a switch located immediately inside the access door to each room. The electrical feed shall be from emergency panels when available

2.9 Conduit between communications rooms

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2.9.1 A minimum of two four-inch (2x4) conduits shall connect the main communications equipment room(s) with all other communication equipment rooms.

2.9.2 A minimum of two four-inch conduits shall connect any communications equipment room(s) with the other communications equipment room(s) on the same floor.

2.9.3 All conduits shall contain a suitable pull string or wire.

2.9.4 All conduits shall have a bushing on each end to prevent abrasion of cable.

2.9.5 All conduit penetrations shall be appropriately fire stopped to comply with all fire and life safety codes.

2.9.6 All conduit turns shall be sweeping turns (no “LBs”). Conduit runs shall contain no more than the equivalent of two sweeping 90-degree turns with the installation of a suitably sized pull box.

2.9.7 Pull box size shall be dependent on the particular installation but shall be no less than twelve-inches bye twelve-inches (12”x12”) in the plane of the conduits, and no less than six inches (6”) deep

2.9.8 Location of all pull boxes shall be shown on drawings furnished by the contractor

2.10 Telecommunications Closet Hardware

2.10.1 2 Post Relay Rack

Relay racks are to be brushed aluminum, height, seven (7’) feet, nineteen (19”) inch rack space. Panel mounting holes are to be #12-24 tapped on EIA universal spacing on both front and rear of rack. The rack shall be self-supporting with base suitable to floor mount.

2.10.2 4 Post Equipment Rack

Open frame, 19 in. equipment rack, 7 foot 6 in. overall height with flange base, mounting rails drilled front and back and tapped to EIA standards, and a front-rack mountable 10 outlet multiple outlet electrical strip.

Relay and Equipment Racks:

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Part Number	Dimensions	Description
19-96-T4SDA2126 Mfg = Homaco	96H x 19W x 21-26D	4 post rack
MNFT1978DU Mfg = APW	96 H	2 post rack
19-96-T2SD	96 H	2 post rack

See Section 2 for information on Patch Panels

2.11 Cable and wire management system

Proper cross-connect wire management will be required for all types of termination fields.
Cable management shall be a style appropriate to handle front, rear, vertical and horizontal cross connect wire and patch cords pathways on a communications backboard or on a standard nineteen (19”) inch rack.
Cable management shall be oversized to meet larger-capacity requirements for Category 5e patch cords and fiber patch cords.

Approved cable management system:

-To be Determined-

3 Entrance Cable Type and Size

Cables of sufficient quantity, type and size shall be installed into the "Entrance Facility". Communications service entrance cable types may include telephone cable, fiber optic cable, coaxial video cable, and other types of cables.

3.1 Entrance Cable Size

All outside plant entrance cables shall be sized to provide adequate pairs (or strands) to facilitate current needs and anticipate future growth needs of the building.

3.2 Entrance Cable Termination

Outside plant telephone feeder cables shall be spliced into the stubs of the building protection units using the proper vault closure.
Outside plant fiber cables shall be terminated directly into fiber patch panels.
All cables shall be routed in a clean and organized manner.

3.3 Entrance Cable Termination Point

Upon examination of the communications needs of the building, the City of Lansing IT Division shall designate the point from which communications services will be provided. Communications service entrance cables shall be installed from the designated point to the main equipment room(s).

3.4 Service Cables between Equipment Rooms

Each Telecommunications Room shall be provided with feeder cables from the main Communications Room. As a minimum each Telecommunications Room shall be serviced from the main Communications Room with a telephone feeder cable and a multimode fiber optic cable.

3.4.1 Feeder Cable Types

Feeder cable types may include telephone cable, fiber optic cable, coaxial video cable, and other types of cables.

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3.4.2 Telephone Feeder Cable

Inside telephone feeder cable shall be multi-pair telephone cable designed for inside wiring. The cable shall have the following characteristics:
Conductors shall be solid, 24 gauge, annealed copper. Strands shall be individually insulated; polyethylene insulated cable (PIC), and twisted into pairs.
Number of pairs in cable shall be noted for each job.
Individual conductors shall be color coded per telephone industry practice.
The cable shall have an overall jacket/sheath rated, per NEC code, for the environment in which it will pass through, i.e. “CMP” if the cable passes through any plenum spaces.

3.4.3 Feeder Cable Size

Feeder cable sizes shall depend on the number of stations to be served by the Telecommunications Room and the type of service to be provided at each station. Cable size shall also provide adequate pairs to facilitate future growth needs. Feeder cable for VOIP applications will be a minimum of Category 6 (Cat 6) compliant 100 ohms, four-pair, 24-gauge copper, plenum-rated, unshielded twisted pair cables.

3.4.4 Feeder Cable Sheathing Fire Rating

The sheath of the cables being pulled shall be rated to be installed in all environments in which that particular cable will pass through; i.e. horizontal, plenum, riser, etc.

3.4.5 Feeder Cable Termination

Telephone feeder cables: between telecommunications equipment rooms within a building: shall be terminated on 66-type blocks and labeled with white insert style labels. (See section on labeling)

3.4.6 Feeder Cable Jacket Colors

Feeder cables between communications rooms within a building (ER to TR and TR to IR) utilizing either a white (1st level) or gray (2nd level) label to designate the backbone’s function

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3.4.7 Approved Feeder Cable Products

Use one of the following products or an equivalent as pre-approved by City of Lansing IT Division:

3.5 Approved Data Network Backbone Cable (IW)

Use one of the following products or an equivalent as pre-approved by COL IT Division:

Cable Mfg	Graybar Part #	Data Cable Color
CommScope	99682389	Cat 6 ORANGE
Superior Essex	22108402	Cat 6 ORANGE
Berk-Tek	22113587	Cat 6 ORANGE

3.6 Service Cables between Telecommunications Room and Workstation:

3.6.1 Horizontal Distribution For Legacy Systems

Runs serving legacy voice and data workstations shall consist of ONE plenum rated Category 5 compliant (as listed in the most recent UL Directory) four-paired unshielded twisted pair cable, white in color and TWO plenum rated Category 5e compliant four-paired unshielded twisted pair cables, blue in color.

3.6.2 Horizontal Distribution For VOIP Systems

Runs serving VOIP phone systems and data workstations shall consist of TWO plenum rated Category 5e compliant four-paired unshielded twisted pair cables, blue in color.

3.6.3 Installation as required

Cables are to be installed as required by the specific functional requirements of the inhabiting department.

3.6.4 Exceptions

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Contact the City of Lansing ITS office prior to the preparation of specifications for any exceptions to this distribution standard.

3.7 Cable Splicing Not Allowed

Inside Copper Cable:
There shall be NO splices in station cable (telephone or data). If a cable is damaged or does not pass testing, and acceptance procedures, that cable must be removed and replaced at contractor's expense.

3.8 Work Station Telephone Cable Requirements

3.8.1 Pairs

These requirements are for cables of four unshielded twisted pairs of 24 AWG bare copper, thermoplastic insulated solid conductors enclosed by a thermoplastic jacket.

3.8.2 Requirements

The finished cable shall meet or exceed the following requirements of ANSI/TIA/EIA-568-A-5-2000.
All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code.
All cable shall be listed with an OSHA approved laboratory and carry labeling of either CMP or CMR which ever is appropriate for the installation environment.

3.8.3 Cat 5e

Station telephone cables shall be Category 5e (Cat 5e) compliant 100 ohms, four-pair, 24-gauge copper, plenum- rated, unshielded twisted pair cables.

3.8.4 Voice Cable Color

The outer jacket of the cable shall be WHITE in color.

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3.8.5 VOIP Exception

Note exceptions in sections 3.6.2 for VOIP phone systems.

3.9 Work Station Data Network Cable Requirements:

3.9.1 Network Cable Requirements

These requirements are for cables of four unshielded twisted pairs of 24 AWG bare copper, thermoplastic insulated solid conductors enclosed by a thermoplastic jacket.

The finished cable shall meet or exceed the following requirements of ANSI/TIA/EIA-568-A-5-2000.

All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code.

All cable shall be listed with an OSHA approved laboratory and carry labeling of either CMP or CMR which ever is appropriate for the installation environment.

3.9.2 Data Cable Color

The outer jacket of the cable shall be BLUE in color

3.10 Approved Workstation Cable (IW)

Use one of the following products or an equivalent as pre-approved by COL IT Division:

Cable Mfg	Voice Cable Part #	Data Cable Part #
CommScope	Part 5504M WHITE	Part # 5504M BLUE
Superior Essex		
Berk-Tek	Lan-Mark 350 WHITE	Lan-Mark 350 BLUE

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4 Copper Cable Termination Hardware

4.1 Wall Fields

All telephone wiring shall be terminated on wall mounted 66-Type blocks.
White Cables for telecommunications, blue cables for data communications from communication rooms to stations utilizing blue labels. (See section on labeling)
.

4.2 Copper Cable Terminations (Voice)

Telephone distribution cables: (communications equipment room to station) shall be terminated on category 5e compliant 66-type blocks and labeled with insert style labels.
Proper cross-connect wire management will be required for all types of termination fields.

4.3 Data Patch Panels

Data distribution cables (equipment room to station) shall be terminated on patch panels, attached to the very top or immediately below a fiber patch panel on the equipment rack.

4.4 Cable Management

Cable management shall be a style appropriate to handle front, rear, vertical and horizontal cross connect wire and patch cords pathways on a communications backboard or on a standard nineteen (19”) inch rack.
Cable management shall be oversized to meet larger-capacity requirements for Category 5e patch cords and fiber patch cords.

4.5 Modular Patch Panels Required

- Four-pair Category 5e UTP cabling shall be terminated onto a four-pair Category 5e modular jack.
- All jacks shall be terminated using the T568B wiring scheme.
- The eight position modular jacks shall exceed the connector requirements of the TIA/EIA Category 5e standard.

- The jack termination to 4-pair 24 AWG 100 Ohm solid unshielded twisted pair cable shall be accomplished by use of a forward motion termination cap and shall not require the use of a punch down tool.
- Use the following products or equivalent as pre-approved by City of Lansing IT Division:

4.6 Approved General Patch Panel

Panduit Patch Panels
Modular patch panels shall be of a metal design with snap in four position and six position molded faceplate frames.
The faceplate frames shall be releasable from the front to provide access to the modular jacks and terminated cable.
Modular jacks shall be mounted to the patch panel using *MINI_COM* mounting features for added strength.
Patch panels shall be available with and without labels

Rack Mount General Patch Panels

Part number	Number of Ports	Wiring Configuration	Rack Spaces
CPP24WBLY	24	T568B	1
CPPL24WBLY	24	T568B	1
CPP48WBLY	48	T568B	2
CPPL48WBLY	48	T568B	2

L = With Labels

If mounting cables and patch panels on the wall, use a hinged wall bracket to mount the patch panels to:

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Part Number (Panduit)	Number of Patch Panels	Rack Spaces
WBH1	1	1
WBH2	2	2
WBH3	3	3
WBH4	4	4

4.7 Voice Patch Panel

VOIP system buildings shall use patch panels to terminate the voice feed from SBC.
This is meant to simplify the move and changes for the POTS lines that are not terminated into the VOIP system.
Use the following Panduit voice patch panel:
Consists of single female telco 50 pin/25 pair connector with VELCRO* fasteners wired for common active voice equipment
24 RJ45 ports with pins 4 and 5 active in each port
VELCRO screw connector accommodates 180, 110 or 90 degree patch cord connectors on back of patch panel
Mounts to standard TIA/EIA 19" rack or 23" racks with optional extender bracket
Write-on areas available (See section on labeling)
PN = VP24382TV25

Mfg	Part Number	Notes
Panduit	VP 24382 TV 25Y	Voice Patch Panel

4.8 Modular Jacks Used With Patch Panels and Workstation Faceplates

Modular jacks shall be constructed in such a manner that no special tool is needed to perform the physical connections (no special crimp or punch down tool).

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The jack shall be color coded to install wire to ANSI/TIA/EIA-568-B wiring standard. The jack shall be of the appropriate category compliance to match the wire to be terminated (Cat5e compliant jack on Cat5e wire).
The Cat5e compliant jacks for data shall be ORANGE in color and the Cat5e compliant jacks for telecommunications shall be Tan in color.
Use the following products or equivalent as pre-approved by the IT Division:

Modular Jack P/N	Rating	Color	Notes
CJ588ORY	Cat 5	Orange	Cat 5 Data
CJ5E88TORY	Cat 5e	Orange w red	Cat 5e Data
CJ588BIGY	Cat 5	Light Brown	Voice
CJ66UEIY	Cat 3	Light Brown	Voice Jacks to be used in legacy install.

Electrical Orange colored Mini-Jack –part #CJ588ORY with tool part number CGT
New cat 5e Orange Mini-Jack-Part # CJ5E88TORY with tool part number CGJT
Light Brown Mini-Jack part #CJ588BIGY

Panduit Cat5 Mini-Jacks are designed to meet Cat5e rating.

4.9 Workstation Workboxes

Work Area Outlets shall consist of a standard single gang deep (minimum 2.125” depth) electrical box complete with TWO Cat 5 rated 8P8C/modular 8 jacks (terminated) for telecommunications, and two Category 5e rated 8P8C/modular 8 jacks (terminated) for data communications.
All 8P8C/modular 8 jacks shall be terminated using the EIA/TIA 568B pin out.
All Category 5e voice communications jacks shall be light brown in color and all Category 5e data communications jacks shall be orange in color.
Station jacks shall be terminated with a minimum of 6” of slack in the outlet box.
All pairs of the station cable shall be terminated.

Each room or workstation which is to receive communications services shall be supplied with a minimum of two (2) double-duplex deep receptacle boxes.

The receptacle box shall have a minimum depth of 2-1/8 inches, not including the cover or shroud. Receptacle boxes may be metal or plastic, and consistent with the National Electrical Code.

Each receptacle box shall be furnished with a single-gang cover/plaster ring of appropriate depth for the particular type of wall construction used.

4.9.1 Workbox Conduit

Each double duplex receptacle box shall be provided with a minimum of a single three quarter inch conduit, which shall be home run back to the serving communications equipment room or stubbed up into an accessible ceiling area with a pathway to the serving equipment room.

4.10 Workstation Voice and Data Workbox Faceplate

Station outlet faceplates shall be single gang and manufactured to accept the modular jack specified.
Unless otherwise noted on drawing all faceplates shall be electrical ivory/Almond in color.
Use the following products or equivalent as pre-approved by COL IT Division:

Panduit Face Plates:
MINI-COM Executive Series Faceplates shall be 1,2,4 and 6 port vertical single gang and 10 port vertical double gang faceplates with combination head screws, screw covers, labels, and a curved, designer appearance.

The faceplates shall mount to standard U.S. NEMA boxes and adapters with screw dimensions of 3.28” (83.3mm). The insert labels shall meet UL 969. Each faceplate shall accept individual connector modules that can be individually inserted and removed as required

Part number	Gang	Number of Modules

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CFPE1**	Single	1
CFPE2**	Single	2
CFPE4**	Single	4
CFPE6**	Single	6
CFPE10**-2G	Double	10
KWP5	Cat5 Stainless Steel Plate For Wall Phone Jacks	1
KWP3	Cat 3 Stainless Steel Plate Wall Phone Jack	1

** = Designates color

EI= Electrical Ivory (City of Lansing preferred color)

4.11 Surface Raceway

The surface raceway shall be constructed of plastic (non-metallic). The raceway shall have a single channel construction with a snap-on detachable over and shall be sized to fit the application.
All appropriate fittings (i.e., elbows and tees) with the proper bend radius shall be supplied to create a complete raceway system.
All outlet boxes and faceplates shall accept the modular jack bid on the project and shall allow adherence to the proper bend radius of the cable installed.
Use one of the following manufacturer's product systems or an equivalent as pre-approved by the IT Division:

Panduit Surface Raceway Systems

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See Panduit Catalog

4.12 Surface Mounted Workboxes

The outlets and surface mount boxes shall support the network system by providing high-density in-wall, surface mount or modular office furniture cabling applications.
The outlets consist of faceplates for flush and recessed in-wall mounting as well as mounting to the modular office furniture systems.
The surface mount boxes can be mounted where in-wall applications are not possible or to support applications where surface mount is the best option.
All outlets shall utilize fully the interchangeable and individual *MINI-COM* connector modules that mount side by side to facilitate quick any easy moves, adds and changes.
All outlets shall be flammability rating of 94 HB or better.
All outlets and surface mount boxes shall be available in 5 colors including Off White (IW), Electrical Ivory (EI), White (WH), International Gray (IG) and Black (BL).
MINI-COM Low Profile Surface Mount Boxes shall be 1,2,4,6 and 12 port low profile surface mount boxes with a 28 mm (1.1”) maximum height.
All connections (with exception of the 12 port low profile box) shall exit one side of the box, parallel to the wall.
The boxes shall be capable of mounting with screws, adhesive, and/or magnets.
The 2 port boxes shall include a removable blank for addition of a second port.
The 4,6 and 12 port boxes shall include breakouts for use with *PAN-WAY* surface raceway and cable tie slots at each raceway entry point to provide strain relief on incoming cables.
The 4 (except low profile 4), 6, and 12 port boxes shall include tamper resistant screws that securely fasten the cover to the base and are concealed by screw covers and labels.
Each box shall accept individual connector modules that can be individually inserted and removed as required.

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Part number	Number of Modules	Maximum Height
CBX1**-A	1	23 mm
CBXJ2**-A	2	23 mm
CBX2**-A	2	27 mm
CBXC4**-A	4	23 mm
CBX4**-A	4	28 mm
CBXD6**-A	6	26 mm
CBX12**-A	12	26 mm

A = Adhesive

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4.13 VOIP Telephone System Workstation Outlets

Work Area Outlets shall consist of a standard single gang deep (minimum 2.125" depth) electrical box complete with two Category 5e rated 8P8C/modular 8 jacks (terminated) for data communications. All 8P8C/modular 8 jacks shall be terminated using the EIA/TIA 568B pin out. All Category 5e data communications jacks shall be orange in color. Station jacks shall be terminated with a minimum of 6" of slack in the outlet box. All pairs of the station cable shall be terminated.

4.14 VOIP Services between Telecommunication Room and Workstation

Distribution runs shall consist of two plenum rated Category 5e compliant four-paired unshielded twisted pair cables, blue in color.
Other cables are to be installed as required by the specific functional requirements of the inhabiting department.
Contact the IT Division office prior to the preparation of specifications for any exceptions to this distribution standard
The contractor shall maintain recommended Category 5e bending radius, pulling tension, and cable support requirements.
All cables, wires, and equipment shall be securely and neatly installed.
Inside routing shall be installed parallel and perpendicular to existing structural lines and members.
Cable ties may be used but shall be installed no more than finger tight.
All horizontal distribution runs hall work together to create a CHANNEL SOLUTION for wire and jack combination.
A channel solution is a pairing of wire and jack tested together to produce optimum efficiency and throughput.
The exception to installing a complete channel solution by the subcontractor is that the owner shall be responsible for all patch cords (the subcontractor will not be responsible for supplying patch cords).

5 Fiber Optic Transmission Media and Hardware

5.1 Fiber Optic Rack Hardware

5.1.1 Fiber Optic Rack Enclosures

OPTICOM Rack mounted fiber optic enclosures shall be designed to manage and organize fiber optic cable to and from the equipment or cabling plant. Enclosures shall protect fiber optic connections for patching or splicing requirements. Enclosures shall accommodate up to 36 fibers (with Fiber Jack) per rack space and shall be constructed of steel material. Enclosures shall have removable front and rear covers and top and bottom pass through holes.

5.1.2 Trays for Rack

The *OPTICOM* Fiber Optic/Multi-Media Interconnect Trays shall be used to provide rack mounted fiber optic trays that manage and protect optical fiber terminations and splices.

The trays shall be used with 24 or 48 port *MINI-COM* modular patch panels or giber optic adapter panels. The trays shall include a removable cover.

They shall mount to EIA standard 19” and 23” (with extender bracket) racks or cabinets, include multiple cable entry points and include a fiber optic cable routing accessory kit.

5.1.3 Drawers for Rack

The *OPTICOM* Fiber Optic/Multi-Media Interconnect Drawers shall be used to provide 24 and 48 port rack mounted drawers that manage and protect optical fiber terminations and splices. The drawers shall be able to slide out on the front side to provide easy access to the fiber connectors, splice tray and cable storage area. The drawers shall be used with *OPTICOM* fiber adapter panels / multi-media modular panels.

5.2 Fiber Optic Wall Enclosures

OPTICOM Wall mounted fiber optic enclosures shall be constructed of steel material with pre-assembled patch cord bend radius control panels. Enclosures shall be capable of doubling the capacity by increasing fiber cable density within the allotted space when removing the bend radius control panels. Enclosures shall provide patch cable protection without the installation of an additional attachment. Enclosures shall maintain discrete locking capability between installer and end user segments.

5.3 Fiber Connectors

All singlemode fiber shall be terminated using factory-manufactured pigtails with SC type connectors. All multimode fiber shall be terminated using SC type connectors. Use one of the following products or an equivalent as pre-approved by IT Division:

-To Be Determined-

The same manufacturer that supplied the couplers shall produce the connectors for single mod fiber and multimode fiber.

5.4 Fiber Couplers

All singlemode fiber LIU panels shall be equipped with SC-to-SC couplers. All multimode fiber LIU panels shall be equipped with SC-to-SC couplers. Use one of the following products or an equivalent as pre-approved by IT Division:

-To Be Determined-

The same manufacturer that supplied the connectors shall produce the couplers for singlemode fiber and multimode fiber
Multimode fiber cables to be terminated using SC type fiber connectors in rack mounted lightguide panels.
Single-mode fiber cable is to be terminated using factory assembled pigtails with SC type fiber connectors in rack mounted lightguide panels.
The LIU to be installed shall be constructed to accept the proposed couplers. If more than one cable is to be installed in a single telecommunications closet, the

contractor shall determine the size and number of LIUs that should be installed to take up the least amount of space in the rack as possible.

5.5 Fiber Optic Splicing Hardware

5.5.1 Fiber Optic Splice Case

All splice cares shall be specified for the particular environment in which they will be placed and shall be sized to accommodate the cable count spliced. End plates shall be designed for the number and size of the cables served by the splice and shall be designed to seal around each cable individually. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly, adhering to all appropriate electrical codes.

5.5.2 Fiber Optic Splice Unit:

All splices shall use a splice case specified for the particular environment in which they will be placed (i.e. the vault or maintenance hole) and shall be sized to accommodate the cable count spliced.

All splices shall be performed using fusion technology. The fusion splice machine shall be capable of splicing using Local Injection and Detection (LID) technique.

No splices allowed on inside building fiber optic cable.

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Telephone and Data Wiring Requirements

5.6 Multi-Mode Versus Single-Mode Fiber

5.6.1 Fiber Distance

The distance of a fiber run is important when deciding on what type of fiber to install on a project. The basic rule to follow is if the distance is less than 3 miles, multimode fiber should be used. If the distance to be covered is greater than 3 miles, single mode fiber should be used.

5.6.2 Difference Between Multi-Mode and Single-Mode

Multimode fiber has a relatively large light carrying core, usually 62.5 microns or larger in diameter with LED based fiber optic equipment. Single-mode fiber has a small carrying core of 8 to 10 microns in diameter with laser diode fiber optic transmission equipment. Single-mode equipment can be anywhere from 2 to 4 times as expensive as multimode equipment. You can not use multimode equipment on single-mode fiber, it will not inject enough light.

6 CCTV Transmission Media and Termination Hardware

6.1 Coaxial Cable

6.1.1 Patch Panel and Jacks

Modular patch panels (section 2) shall be used at the main distribution point for the coaxial cables.

Panduit self terminating type F connectors shall be used in conjunction with the patch panels and the workbox faceplate at the user end.

Manufacturer	Part Number	Description
Panduit	CMFSRIW	Mini Com F-Type connector Self Terminating 1 module space

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Telephone and Data Wiring Requirements

7 Fire-stopping

New and existing raceways, cable trays, and cables for power, data, and communications systems penetrating non-rated and fire-rated floors, walls, and other partitions of building construction shall be fire-stopped where they penetrate new or existing building construction. Fire-stopping must comply to National Fire Protection Association requirements as well as the International Building code as adopted by the State of Michigan.

7.1 General Fire-stopping Guidelines

7.1.1 Fire-stop Design

Fire-stop for each type of penetration shall conform to requirements of an independent testing laboratory design drawing or manufacturer's approved modification when used in conjunction with details shown on the Drawings .

7.1.2 Materials Used

Fire-stopping shall be accomplished by using a combination of materials and devices.

Use materials that have no irritating or objectionable odors when fire-stopping is required in existing buildings and areas that are occupied.

7.1.3 Fire-stopping Devices and Systems

Select appropriate type or types of through penetration fire-stop devices or systems appropriate for each type of penetration and base each selection on criteria specified herein.

Selected systems shall not be less than the hourly time delay ratings indicated in the Contract Documents for each respective fire-rate floor, wall, or other partition of building construction.

7.1.4 Fire-stopping installation:

All fire-stops shall be installed in accordance with the manufacture's instructions in order to maintain the specific rating assigned by the independent testing laboratory.

Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction with respect to size and shape

of each opening to be constructed and device or system approved for use in each instance.
Coordinate each fire-stop selection with adjacent Work for dimensional or other interference and for feasibility.
In areas accessible to public and other “finished” areas, fire-stop systems work shall be selected, installed, and finished to the quality of adjacent surfaces of building construction being penetrated.

Provide damming materials, plated, wires, restricting collars, and devices necessary for proper installation of fire-stopping.
Remove combustible installation aids after fire-stopping material has cured.
Verify that cabling and other penetrating elements and supporting devices have been completely installed and temporary lines and cables have been removed.

7.1.5 Additional fire-stopping requirements for existing penetrations are as follows:

Existing raceways, cable trays, and cabling that penetrate existing building construction shall be fire-stopped to the extent necessary to fill cavities that may exist between existing building construction and existing penetrations or existing conduit sleeve, and between conduits and existing conduit sleeve.
Assemblies consisting of individual steel hat type restricting collars filled with in tumescent type materials that completely surround communications penetration shall be used for nonmetallic raceways and cabling.

7.1.6 Fire-Stopping Inspection

If required by inspecting authorities: Expose and remove fire-stopping to the extent directed by inspecting authority to permit his or her inspection.
Reinstall new fire-stopping and restore Work where removed for inspection.

City of Lansing
Telephone and Data Wiring Requirements

8 Cable Trays

8.1 Cable Tray Installation

Cable trays will not be installed in buildings that the city is renting. “J” hooks will be used in rental property.
Cable trays shall be installed per manufacturer specifications.

8.1.1 Approved Cable Tray Systems

City of Lansing specifies the following cable tray systems:

- Mfg: Mono-Systems
  - Aluminum Tray
  - Single Rail
  - Size and coverage to be determined on a case by case basis

8.1.2 Sharing the Cable Tray

Shared trays shall have non-communication power conduits on the N+E sides of the tray. Communications cables shall use the S+W sides.

City of Lansing
Telephone and Data Wiring Requirements

9 Labeling

Permanently label all terminal strips, junction boxes, pull points and conduit rims as per the telephone industry standards (TIA/EIA 606 Administration standards for the telecommunications infrastructure of commercial buildings) and these specifications.

9.1 Label equipment room terminations:

9.1.1 Label Feeder cables:

All cables that feed other communications closets shall be labeled/tagged as to the location of other end of that particular cable.
The patch panels or punch downs where that cable is terminated shall also be labeled in the same manner.
All labels shall be permanent installations, no paper tags.

9.2 Patch Panel Labels

9.2.1 Labeling Patch Panels

Each patch panel will be labeled consecutively using letters A-Y with the exception of the letters I,O,V, and Z. This labeling will be present on the front and backside of the patch panel. In the event that more than 22 panels are utilized in a single closet the additional panels will receive a dual letter designation (i.e. AA, BB, and CC).

Labels shall follow this format on the patch panel:
A01 A02 A03 <<<<<<<<<<<<…….thru……..>>>>>>>>>>A24
B01 B02 B03 <<<<<<<<<<<<…….thru……..>>>>>>>>>B24

9.3 Face Plate Labels

9.3.1 Labeling Face Plates

Labels shall follow this format at the wall outlet, example 92-A02

1st digit is the floor number of the Telecommunication Room (ex 9)
2nd digit is the closet number of the Telecommunication Room (ex 2)
3rd letter is the patch panel within that closet (ex A)
4th and 5th digit is the jack relative jack position on the patch panel (ex 02)

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On the single jack faceplate label jack using top label and label cover

On the double jack faceplate, label left most jack using top label and label cover

On the double jack faceplate, label the right most jack using the bottom label and label cover

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On the quad faceplate:

Label the two top jacks using the top label and label cover.

Label the two bottom jacks using the bottom label and label cover.

10 Test and Acceptance Procedures

A written copy of all tests shall be provided to the City of Lansing after completion.

10.1 Warranty Period

The warranty period shall not begin until the acceptance procedure has been completed.

10.2 Acceptance Procedure

The city will not accept an installation or modification to existing facilities until the city is satisfied that everything is installed according to specifications, meets certification requirements (if required) and is functioning properly.

10.3 Mapping Requirements

A floor plan shall be provided to the city indicating ‘as built’ locations of newly installed equipment, jacks and other relevant information related to the contractors responsibilities in the project. The map shall be provided to the city in both electronic and ‘hard copy’ format.

10.4 Testing Copper Telephone Feeder Cable

After installation and splicing at each communications room is complete (sections provided under this contract only) and again after the sections provided by others are connected.

10.5 Testing Outside Plant Copper

10.5.1 Cables shall be tested for the following:

- Continually of each conductor from end-to-end – open test.

- Shorted conductors with other conductors – short test.
- Proper polarity of paired conductors from end-to-end – reverse test (for correct tip & ring and data terminations).
- Proper termination of wire pairs from end-to-end – cross test (for splits and other wrong terminations).
- Proper ground and shield bonding (for shielded cables only) – effective ground test (for zero potential difference bonding).
- Grounded conductors (for all cables) – ground fault test.
- Detection of AC or DC power on any conductor – power fault test.
- All data cables shall be tested per ETA/TIA TSB-67 Level II requirements.
- A maximum of 1% defective pairs will be allowed in the Outside Plant Copper Cable. For any number higher than this, the cable shall be replaced or repaired at the splice point.

10.6 Testing Singlemode Fiber Optic Cable

Singlemode fiber cables shall be tested at both 1310 urn and 1550 rim after installation.

Printed test results for each fiber strand are required.

All tests are to be performed in accordance with ANSI/TIA/EIA526-7, Method A. 1, One Reference Jumper. Fibers will be considered acceptable if the OTDR trace for that fiber shows an end to end loss of less than xxdB + zz(0.5)dB (where yy is the number of splices, zz is the number of connector pairs and xx is calculated using the following formula: xx = distance X fiber attenuation/unit distance @ lambda). In addition, no splice may show a loss of greater than 0.5 dB. Any additional tests required by the ANSI / TIA / EIA standard shall also be performed and also included in the written test report.

The vendor shall test each fiber strand utilizing an OTDR bi-directional tester at the wavelengths specified above. Overall, the OTDR test results shall be made up of the wavelength of the conducted test, the link length, attenuation, cable

identification, and the locations of the near end, the far end and each splice point or points of discontinuity.

Hard-copy results for each fiber strand shall be submitted as part of “AS-Built” documentation.

If the cable fails to meet the above requirements, it shall be replaced by the contractor at the contractor’s expense.

10.7 Testing Multimode Fiber Optic Cable

All multimode fiber cables shall be tested at both 850 rim and 1300 rim after installation. Printed test results for each fiber strand are required. All tests are to be performed in accordance with ANSI/TIAIEIA526-7. Method A. 1, One Reference Fibers will be considered acceptable if the OTDR trace for that fiber shows an end to end loss of less than xxdB + yy(0.2)dB + zz(0.5)dB (where yy is the number of splices, zz is the number of connector pairs and xx is calculated using the following formula: xx = distance X fiber attenuation/unit distance @ lambda). In addition, no splice may show a loss of greater than 2.0 dB and no connector pairs may show a loss of greater than 0.5 dB. Any additional tests required by the ANSI/EIA/TIA shall also be performed and also included in the written test report.

The vendor shall test each fiber strand utilizing a OTDR bi-directional tester at the wavelengths specified above. Overall, the OTDR test results shall be made up of the wavelength of the conducted test, the link length, attenuation, cable identification, and the locations of the near end, the far end and each splice point or points of discontinuity. Hard-copy results for each fiber strand shall be submitted as part of “As-Built” documentation.

If the cable fails to meet the above requirements, it shall be replaced by the contractor at the contractor’s expense.

10.8 Station Cable Testing

Category 5e Cable

The testing will be performed according to All Category 5e distribution cables will be tested in accordance TIA/EIA TSB-67 level II and the TIA/EIA-568-A-5 requirements by certified technician in a basic link model.

City of Lansing
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Contractor tests shall utilize a Category 5e TIA/EIA-568-A-5 Level II or Level III compliant cable tester.

Electronic results for each UTP Category 5e; 4-pair cable will be submitted as part of the Contractor's "AS-Built" project performance acceptance records.

In addition to the above information, the documentation will also include a pass/fail indication for the specified cable, the test date, the serial number and software version of the scanner, and a copy of the calibration certificate for the scanner.

Necessary applications for reading the results will be provided by the contractor at no additional charge to The City of Lansing.

The category 5e cable shall be tested for:

- Wire Map
- Length
- Attenuation
- Return Loss
- Delay
- Skew
- Power Sum Near End Cross Talk
- Power Sum Equal Level Far End Cross Talk
- Power Sum Attenuation Cross Talk Ratio

-END-