

## **Technical Specifications for the Installation of UTP Cabling**

### **1.0. Introduction**

The City currently specifies the installation and use of Category 6 and Category 6A Unshielded Twisted Pair (UTP) cable (plenum rated (CMP) where applicable) to support voice and data communication services. The standard UTP communications cabling required shall be of a specific type and must be installed according to the following standards and specifications. The standards for communications cable may be more restrictive than those normally encountered by cable installers. In general the requirements include:

- A specified cable type
- Restricted cable topology
- Maximum end-to-end circuit length
- Specific handling and installed cable protection
- Specific outlet types and placements
- Compliance testing and acceptance of installed cabling

### **2.0. General**

Cables shall be installed in unbroken segments from Telecommunications Rooms (TR) to individual communication outlet locations. In the TR, cables shall be terminated on patch panels from specified manufacturer designated for voice and data communication service. At each workspace location cables shall be terminated in a wall mounted TIA/EIA 568A compliant communications outlet from specified manufacturer. All installed cabling runs shall be tested for compliance with specified parameters, documentation provided, and both ends of each cable run shall be labeled. Test results must be verified for compliance prior to activation of cables for voice or data use.

### **3.0. Cable Type**

All installed cable shall be 100 ohm, 4 pair, unshielded twisted pair (UTP), #24 AWG solid copper inside wire which meets or exceeds ANSI/TIA/EIA 568-B.2-10 standards for UL Category 6/6A cable.

- Cable jackets shall be legibly marked with the following information:
- Manufacturer's Name
- Copper conductor gauge
- Pair count
- UL or CSA listing
- Manufacturer's Trademark

- Category rating
- Sequential foot markings, in one- or two-foot increments
- Plenum rated cable shall be installed where applicable
- Cable specification sheets for all cable must be provided to the City prior to installation

#### **4.0. Physical Installation**

Where cable pathways transition from horizontal to vertical, there shall be installed an appropriate 'waterfall' component to provide minimum bend radius. No cable or cable support structure may be installed in any fashion that might prevent maintenance of or access to any utility facility.

#### **4.1. General Topology**

Cabling between TR and communication outlet locations shall be made as individual home runs. No intermediate punch down blocks or splices may be installed or utilized between the TR and the communications outlet. It is imperative that only the specified rated Category 6/6A cable be used in all cabling and that the factory twist be maintained throughout the runs.

#### **4.2. Concealed Cabling**

All cabling shall be installed inside walls or ceiling spaces wherever possible. Within office spaces any exposed cable-run must be enclosed in appropriate raceway, as described below.

##### **4.2.1. Raceways**

Cable that cannot be run inside a protected space must be enclosed in protective raceway such as cable tray or a wiremold. Protective raceways must be permanently attached to underlying wall surfaces with appropriate wall anchors.

##### **4.2.2. Wall Penetrations**

Cable penetrations of walls or floors are to be sleeved with metallic conduit and bushings. Cable penetrations of walls or floors designed as fire barriers are to be sleeved with metallic conduit and bushings and packed with fire blocking material in compliance with the City fire codes.

### 4.3. Maximum Length

The maximum length of any cable run shall not exceed 89 meters (295 feet).

### 4.4. Securing Exposed Cables

All exposed cables shall be dressed neatly and physically secured to prevent accidental dislocation or damage. It is not permissible to secure cabling to the outside of conduit or to gas, plumbing, steam, or any other functional pipes. Cables shall not be secured to any utility structures. No staples may be used to secure cables to any surface.

Since modern twisted pair cabling must be expected to carry high signal rates, it is necessary to avoid stressing the wire. Tight 90-degree bends are not permissible, and no plastic "cinch-type" tie-wraps are to be used. Care should be taken to avoid routing cables within 18 inches of electrical noise generating devices such as transformers and light ballasts.

### 5.0. Cable Termination

Cables shall be terminated on patch panels in the TR and on communications outlets at the office locations.

#### 5.1. Patch Panel and Other Hardware

The following Patch Panel, cabling and associated materials are specified for use by the City. Exact configurations must be cleared with the City prior to installation. As part numbers are subject to change without notice, contractor is to obtain the City's approval for use of any parts not listed.

Part Number – Fibre	Part Name
760230938	360DPis-12LC-LS
760230946	360DPis-12LC-SM
760245399	G2-SP-12LCX-PT
760245401	G2-SP-12LCG-PT
760117887	MFC-LCF-09-5X QWIK II™ LC
760117895	SFC-LCF-09-8X QWIK II™ LC
760012138	P-006-DS-5K-FSUAQ
760004333	P-006-DS-8W-FSUYL
760036384	P-006-OD-8W-FSUBK
FEWLCLC42-JXM002	
FEXLCLC42-MXF007	

760209940	HD-1U
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Part Number – Cooper	Part Name
700206725	MGS400-WH
108356312	FLEXIMAX
760207274	CPP-UDDM-M-1U-24
760207282	CPP-UDDM-M-2U-48
760248523	SMB-1P-266
760248527	SMB-2P-266
700210032	2071E WHT C6 4/23 U/UTP R1000
700212046	1071E WHT C6 4/23 U/UTP W1000
760008888	1571A BK 4/24 R1000
CO13JX2-88N018	CCA-CAT6-WH-18IN
CPC3312-08F004	
CO15542-01M010	
760249144	FP-LBL-1P-266
760249145	FP-LBL-2P-266
760249146	FP-LBL-4P-266

### Cabinets and Fans Fits

Hammond SWC194920BK1 52" Cabinet  
Hammond SWC193520BK1 38" Cabinet  
Hammond HWM2412U20WDBK Cabinet  
Hammond 20U Wallmount Cabinet – (HWM2420U20WDBK)  
Hammond 24U Wallmount Cabinet – (HWM2424U20WDBK)  
Hammond Double Fan Kit – (DNFK2AC120)  
Hammond Fan Kit  
Hammond Lock Set

Hubbell Wallmount REBOX Cabinet – (PR RE4XB)  
Hubbell Fan Kit – (PR REKF)

### 5.2. Location

Where possible, the communications outlet shall be located so that its horizontal centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. In no case shall it be installed lower than 12 inches above floor level without prior written approval from the City. Surface mounted outlets are acceptable if well secured. Recessed outlets are preferred and require metal-mounting boxes in any wall designated as a fire barrier.

Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches. This restriction does not apply to modular furniture. (e.g. Steel Case 9000)

#### **5.2.1. Adapter Inserts**

A variety of inserts are available to make the specified communications outlets usable for different wiring applications. For all installations, unless specified otherwise, the default installed insert shall be the one designated for Category 6A, wiring. It is critical that only those specified below be used.

#### **5.3. Telecommunication Rooms Station Cable Termination**

In the TR all cables shall be terminated the patch panels firmly mounted inside a network enclosure. Where necessary, a new fire-rated 3/4" plywood panel, properly painted and inspected by the City, shall be firmly anchored to the wall to accommodate mounting of the enclosure. Blocks shall be located adjacent to any existing data wiring blocks. City staff must approve the proposed locations of all blocks and/or plywood backboards before installation begins.

Each cable shall be left with a service loop of approximately five (5) feet in the overhead cable pathway in the TR to facilitate future changes.

At the patch panel, it is imperative that the twist of each individual pair be maintained up to the connection point. Only the minimum amount of sheath shall be removed at each connection point. There shall never be more than one half inch of unsheathed Category 6A UTP cable at the termination location.

#### **5.4. Outlet Station Cable Termination**

At the communications outlet "service slack" of approximately six (6) inches shall be provided to facilitate future changes or re-termination.

There shall never be more than one half inch of unsheathed Category 5E UTP cable at the workstation termination location.

#### **6.0 Labeling**

Each individual cable and communications outlet shall be labeled.

#### **7.0 Testing**

## **7.1. General**

Category 6A UTP cabling may be used for 10BaseT, 100BaseT, Gigabit Ethernet or 10GE as well as all voice applications. The city requires that all pairs of all installed UTP wiring is tested for full compliance with Category 6A specifications regardless of intended use. Contractors are required to provide documentation of test results for all conductor pairs of each cable.

## **7.2. Testing Strategy**

After installation all cables shall be tested for Category 6A compliance. Tests shall be run from the patch panel cross-connect termination through the installed communications outlet at the workspace end of the cable.

## **7.3. Testing Parameters**

All pairs shall meet or exceed the following measured specifications. Any cable not meeting or exceeding the following shall be inspected for anomalies and re-terminated or replaced if necessary to ensure compliance.

## **8.0. Exceptions**

The City must approve any exceptions to the above specifications in writing before work begins.

## **Technical Specifications for the Installation of Fiber Optic Cable**

### **1.0 Introduction**

The City currently specifies the installation of OM4 62.5/50 micron multimode and 8.3/125 micron single mode fiber optic cable to support data communication services. The following specifications for the selection and installation of fiber-optic cable and associated hardware are intended to ensure a reliable and consistent fiber optic media infrastructure for the City.

### **2.0. Fiber Cable Specifications**

Fiber installed must meet or exceed the following specifications:

#### **2.1. Multimode Fiber**

Installed cable shall be 6 strand Multi-mode OM3 FT6 fibre 50/125micron core/cladding, enhanced grade, multimode, and graded index glass fiber. All materials in the cable shall be dielectric.

##### **2.1.2. Inside Cable**

Plenum rated cable shall be used where applicable. Installed cable shall meet or exceed the following specifications:

- Tight buffered 900 um, mechanical strippable Teflon (for plenum applications)
- Cable must meet the ANSI/ICEA S-83-596 specifications
- Minimum Bend Radius, loaded 7.1 cm | 2.8 in
- Minimum Bend Radius, unloaded 4.7 cm | 1.9 in
- Tensile Load, long term, maximum 45 lbf | 200 N
- Tensile Load, short term, maximum 150 lbf | 667 N

##### **2.1.3. Outside Cable**

Outside plant cable shall be used for all applications where cable is to be run outdoor or in underground conduits. Outside plant cable may not be used for interior applications and shall meet the following specifications:

Installed fiber must meet or exceed the Optical Components Standard ANSI/TIA-568-C.3 specifications and must support operation between -40 °C to +70 °C (-40 °F to +158 °F)

##### **2.1.4. Recommended Suppliers**

CommScope fiber is currently recommended for installation. Cable from other manufacturers will be considered. All cable installed must be cleared by the City prior to installation.

### **3.0. Underground Inter-Building Cable**

All fiber cable is to be protected with inner duct. After installation, inner ducts are to be permanently labeled as containing fiber optic cable. Instruction for labeling will be provided by the City.

All cable and inner duct are to be fully supported throughout its entire run.

At no time shall more than 400 pounds of tension be placed on any fiber cable while it is being pulled through tray or conduit. It is preferred that all fiber cable be pulled with hand power only. If power winches or mechanical advantage devices are used to pull cable, a tensionometer must be used to insure that maximum tension is not exceeded. Alternatively, a "mechanical fuse" rated at 350 pounds may be included in the linkage. Torsion shall be avoided by the use of a swivel at the cable end. While under tension, a minimum bend radius of 20 times the outside cable diameter will be maintained through the use of pulleys and sheaves where required. After pulling, no bend may have a radius, at rest, of less than 10 times the outside cable diameter.

#### **3.1. Labeling**

Each cable and inner duct is to be permanently labeled at each end with a unique cable number. In addition, labels shall be affixed to the cable/inner duct at every transition of a vault, hand hole, riser closet, or major pull box.

### **4.0. Termination Standards**

The terminal ends of all fibers cable strands shall be field connectorized. The connectors shall be mounted on bulkheads and installed in Fiber patch panels. It is the City's practice to terminate both ends of all fibers within a fiber cable with LC style connectors. Termination of older cables may be of several types including mechanical or fusion spliced pigtails. The choice of termination method must be cleared with the City prior to termination.



#### 4.1. Fiber Organizers

Fiber cables are to be terminated on CommScope patch panel/cartridges. The final choice of fiber organizer shall be cleared with IST prior to installation.

Each fiber optic strand shall be labeled with a unique identifier at the LC coupler in the patch panel. Connectors shall be labeled on the identifying sheets on the front of the patch panel. Each fiber shall be labeled where it enters the back of the patch panels.

#### 4.2. Connectors and Splices

Fiber ends are to be terminated in SFP-type connectors.

If it is necessary to splice pigtails onto an existing, partially terminated fiber cable, the splice type utilized must conform to whatever is already in use at that location. Clearance from the City must be obtained before installing any type of splice.

#### 4.3. Miscellaneous

At each end of the cable, sufficient slack (15 - 30') shall be left to facilitate reasonable future relocation of the patch panel. Slack shall be mounted on walls or upper ladder racks according to the City's direction.

#### 4.4. Patch Panel and Other Hardware

The following Patch Panel, cabling and associated materials are specified for use by the City. Exact configurations must be cleared with the City prior to installation. As part numbers are subject to change without notice, contractor is to obtain the City's approval for use of any parts not listed.

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760117887	MFC-LCF-09-5X QWIK II™ LC
760117895	SFC-LCF-09-8X QWIK II™ LC
760012138	P-006-DS-5K-FSUAQ
760004333	P-006-DS-8W-FSUYL
760036384	P-006-OD-8W-FSUBK
FEWLCLC42-JXM002	
FEXLCLC42-MXF007	
760209940	HD-1U

<b>Part Number – Cooper</b>	<b>Part Name</b>
700206725	MGS400-WH
108356312	FLEXIMAX
760207274	CPP-UDDM-M-1U-24
760207282	CPP-UDDM-M-2U-48
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 Hammond Fan Kit  
 Hammond Lock Set

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 Hubbell Fan Kit – (PR REKF)

## **5.0. Testing**

### **5.1. Before Installation**

It is suggested that each individual fiber in a cable be tested with an OTDR for length and transmission anomalies while on the reel before installation.

### **5.2 After Installation and termination**

**5.2.1.** All single mode and multi-mode fiber strands shall be tested end-to-end for bi-directional attenuation, 850 nm/1300 nm for multimode and 1310 nm/1550 nm for singlemode fibers. Tests should be conducted according to the manufacturer's instructions for the test set being utilized.

**5.2.3. After the cable is in place it shall be tested in the following manner:**

After termination, each fiber shall be tested with an ODTR for length, transmission anomalies, and end-to-end attenuation. Results are to be recorded and supplied to the City. After termination and bulkhead mounting, each terminated fiber is to be tested for end-to-end loss with a power meter/light source. As above, results are to be recorded and supplied to the City.

The maximum allowable attenuation for any splice or termination is 0.3 dB.

**6.0. Exceptions**

The City must approve any exceptions to the above specifications in writing before work begins.