## SECTION W - AT&T GIDC ENVIRONMENTS

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<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
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<tr>
<td>12/2014</td>
<td></td>
<td></td>
<td>Revised to updated document in comparison to ATT-TP-76300</td>
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</tbody>
</table>

1 General

1.1 Introduction

1.1.1 This section provides the complete installation standards for HDA (Horizontal Distribution Area) build outs and its cabling pathways, Managed Cage build outs, MDA (Main Distribution Area) build outs and its cabling pathways, SCS (Structured Cabling Systems) in an IDC (Internet Data Center) environment, including AT&T owned equipment in Third Party Data Centers (3PDC). This technical publication is produced on behalf of AT&T Global Internet Data Centers, (AT&T GIDC) as a guide for the designers and manufacturers of information services equipment, including the providing of engineering and installation services relating to AT&T GIDC CTI (Core Transport Infrastructure) systems and its equipment.

1.1.2 The Installation Suppliers (all parties responsible for installation activities as defined in section 1.2 “General Requirements”) shall ensure, as part of the evaluation of the installation that all work has been completed in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 AT&T GIDC assumes no responsibility for any costs incurred by a given manufacturer or Supplier in conforming to the requirements of ATT-TP-76300 section W. Further, conformance to all requirements delineated in this document does not constitute a guarantee of acceptance of a given Supplier's product/service for use in AT&T GIDC environment.

1.1.4 AT&T GIDC reserves the right, without prior notice, to revise ATT-TP-76300 section W for any reason.

1.1.5 AT&T GIDC reserves the right to audit Installation Suppliers for compliance to ATT-TP-76300 section W.

1.1.6 Questions concerning the audit process or quality results should be referred to:

AT&T Quality Assurance
1700 Space Park Drive, Room # A212.
Santa Clara, Ca 95054
Attention: Mike Cassidy
mc8792@att.com

1.1.7 The intent of ATT-TP-76300 section W is to familiarize the Installation Supplier with AT&T GIDC installation procedural requirements by:
a) Covering the precautions to be taken to protect personnel and to prevent service interruptions and degradation during the installation activity.

b) Outlining the basic standards to which the Installation Supplier’s performance will be expected to conform for job acceptance purposes.

c) Defining the necessary documentation used to detail the installation activity.

d) Defining installation start, job completion and job acceptance procedures.

e) Identifying AT&T’s involvement during the various aspects of the installation operation.

1.2 General Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T GIDC installation specifications.

1.2.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.3 This section covers general requirements related to safety, environmental, care of building facilities and premises, compliance with laws, rules and ordinances, and equipment preparation for installation.

1.2.4 Many of the items addressed in this section (e.g., building facilities, building conditions, etc.) will require joint AT&T GIDC/CRE/Installation Supplier review in advance of the actual installation activity. Sufficient time shall be incorporated into the total job schedule to allow for alterations, additions (prior to the equipment installation timetable) and/or the additional expense approval by CRE project manager and/or the Product House representative.

1.2.5 For warranty purposes, the equipment manufacturer may have documented installation requirements pertaining to the “foot print of the equipment.” If these requirements conflict with the requirements given in ATT-TP-76300 section W, the manufacturer’s requirements shall apply.

1.2.6 The Installation Supplier shall provide at a minimum, a Level 3 representative on-site to oversee any non-volatile work performed by the Installation Supplier’s non-approved sub-contractors.

1.2.7 The Installation Supplier shall provide a Level 4 representative on-site to oversee any volatile work performed by the Installation Supplier’s non-approved sub-contractors.

1.2.8 For general safety requirements, refer to TP 76300 Section B 1.2.

1.2.9 For requirements regarding safety, tools and precautions, refer to TP 76300 Section B 1.3.

1.2.10 For requirements regarding the use of vacuum cleaners, refer to TP 76300 Section B 1.5.

1.2.11 For physical access requirements to the facility and care of premises, refer to TP 76300 Section B 2.1.

1.2.12 For AC Power, Heat and Light, refer to TP 76300 Section B 2.2.
1.3 Third Party Data Centers (3PDC)

1.3.1 A 3PDC is a location where AT&T has negotiated GIDC space for network equipment. AT&T owned equipment that is added, rearranged or modified within this negotiated space must be in conformance with AT&T installation specifications.

1.3.2 The negotiation details for space and power shall not be provided anywhere in this section of the document.

1.3.3 As additional space is added this space may not be contiguous. The installation supplier cabling between noncontiguous space shall utilize the buildings own common cabling pathways. The cabling installed in these common pathways shall be placed inside a protective material to prevent any tampering or any accidental cuts or brakes.

1.3.4 The standard cabling specified in this section shall apply to the negotiated space whether it is contiguous or noncontiguous.

1.4 Floor Space for Administrative & Equipment Storage Purposes

1.4.1 An agreement shall be reached with representatives of AT&T GIDC and the Installation Supplier as to the availability of suitable floor space at installation start and during progress of the installation work to be used. Additional requirements can be found in TP 76300, Section B 2.3.

1.5 Openings, alterations or repairs to buildings

1.5.1 If openings, alterations or repairs to buildings are required, Installation Supplier must refer to TP 76300 Section B 2.4.

1.6 Equipment Protection and Building Security

1.6.1 The Installation Supplier shall provide adequate protection of buildings and equipment. Such protection shall be of a nature to ensure against any possible damage, or wear and tear to, or degradation of operational, physical, chemical and/or electrical properties of buildings and equipment. See more detail regarding equipment and building protection in TP 76300 Section B 2.5.

1.7 COMPLIANCE WITH LAWS, RULES AND ORDINANCES

1.7.1 The Installation Supplier shall comply with all applicable federal, state, county and local laws, ordinances, regulations and codes.

1.7.2 The Installation Supplier shall be responsible for providing all necessary permits from the local authorities having jurisdiction.

1.7.3 The Installation Supplier shall comply with all applicable Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations when dealing with hazardous materials and other work place hazards.

1.7.4 Where applicable, all work performed by the Installation Supplier shall meet or exceed the technical requirements of the National Electrical Code (NEC) and all state, county and local codes.

1.7.5 All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association (if in the US), the State Electrical Code (if in the US) and present manufacturing standards. All materials shall be listed by UL and shall bear the UL label. If UL has
no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled. For a list of parts for cage and HDA build out, refer to Appendix A.

1.8 Earthquake Bracing

1.8.1 Applicable codes shall be followed, should the data center fall under specific Seismic Zone designations. ATT-TP-76408, ATT-TP-76409, and EIA/TIA 942.

<table>
<thead>
<tr>
<th>Earthquake Risk Zone</th>
<th>Richter Magnitude</th>
<th>Modified Marcalli Index (MMI)</th>
<th>Low Frequency Ground Acceleration (g’s)</th>
<th>Low Frequency Upper Building Floor Acceleration (g’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&lt; 4.3</td>
<td>V</td>
<td>&lt; 0.05</td>
<td>&lt; 0.2</td>
</tr>
<tr>
<td>1</td>
<td>4.3 – 5.7</td>
<td>V – VII</td>
<td>0.05 – 0.1</td>
<td>0.2 – 0.3</td>
</tr>
<tr>
<td>2</td>
<td>5.7 – 6.3</td>
<td>VII – VIII</td>
<td>0.1 – 0.2</td>
<td>0.3 – 0.4</td>
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<tr>
<td>3</td>
<td>6.3 – 7.0</td>
<td>VII – IX</td>
<td>0.2 – 0.4</td>
<td>0.4 – 0.6</td>
</tr>
<tr>
<td>4</td>
<td>7.0 – 8.3</td>
<td>IX – XII</td>
<td>0.4 – 0.8</td>
<td>0.6 – 1.0</td>
</tr>
</tbody>
</table>

Note: For each risk zone, there is a 90% likelihood that an earthquake event of this severity will not be exceeded over a 50 – year period.

1.8.2 Seismic bracing for cage construction shall meet the requirements determined by the Authority Having Jurisdiction (AHJ) for that area/location and the AT&T Project Manager for that specific project.

1.9 Hazardous Waste

1.9.1 This sub-section represents a brief listing of the requirements related to Hazardous Materials. For further details consult ATT-TP 76300 Section V – HAZARDOUS MATERIALS AND WASTE MANAGEMENT.

1.9.2 In the job start meeting, the Installation Supplier shall discuss with the AT&T GIDC Manager any hazardous materials existing in the IDC Site and/or hazardous materials to be used or handled on the job.

1.9.3 The Installation Supplier shall coordinate with the AT&T GIDC Manager before starting any activity related to hazardous material/waste.

1.9.4 Compliance with environmental laws and regulations is the responsibility of every person working in an AT&T facility.

1.9.5 The AT&T GIDC Manager shall direct the Installation Supplier regarding hazardous materials and waste management prior to, during and after completion of work activities.

1.9.6 The AT&T GIDC Manager shall adhere to guidelines and procedures established by AT&T EH&S, available on the AT&T EH&S (Environment, Health & Safety) web site, http://www.ehs.att.com/, or contact the AT&T EH&S Hotline at 1-800-KNOW-EHS (1-800-566-9347).
1.10 Material Substitution

1.10.1 A complete description of the material which the OSWF proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to AT&T shall be provided and approved by an AT&T representative (IDC Manager for HDA build outs and System Solutions Certification (SSC) Team for MDA build outs).

1.10.2 The Installation Supplier and/or the AT&T representative (IDC Manager and SSC Team) are responsible for showing the proposed substitution spec sheet matching suggested material.

1.10.3 The Installation Supplier shall receive written approval from the IDC Manager and SSC Team on all substitutions of material prior to the material installation.

1.11 Job Start and Completion Reports

1.11.1 The Installation Supplier shall prepare the IDC Job Start & Completion Report upon receipt of job authorization from IDC and submit it via email to QAS@ATT.com, indicating the proposed start and completion dates. The subject line of the email shall state “IDC Report”.

1.11.2 The Installation Supplier shall update and resubmit the IDC Job Start & Completion Report no later than 5 calendar days after the completion of each job indicating the actual completion date, and email the report to QAS@ATT.com. The subject line of the email shall state “IDC Report”.

2 Raised Floor Cuts and Brush Seals

2.1 Brush Seals

2.1.1 The purpose of Brush Seals in the IDC is to allow for cable pass-through in the raised floor while still maintaining a seal to ensure proper air pressure of the cooling system under the floor. Location of the brush seals are a very important part of providing the data center with the best possible cooling by keeping raised floor under pressure.

2.1.2 Brush seals are placed flush with the raised floor and are installed before the racks and vertical wire managers are attached to the raised floor as required.

2.1.3 Brush seals shall be placed at the base of each vertical wire managers in each row of racks.

2.2 Raised Floor Cuts

2.2.1 The configuration and sizes of the floor cuts have been designed to maximize the available floor space. All cutting of raised floor tiles shall take place outside of the IDC raised floor. All cuts shall be trimmed with a rubber or plastic edging material to protect against sharp edges.

2.2.2 The floor cut location for HDA rack shall be determined on site by the IDC Manager. There shall be a floor cut provided for HDA and power as required. Normally, it shall be located at rear inside of the HDA rack. The brush seals shall be used to cover the opening of the floor cuts.

3 Grounding & Bonding

3.1 Cage and Racks/Cabinets

3.1.1 Communication bonding and grounding shall be in accordance with the NEC® and NFPA. Horizontal equipment shall be grounded in compliance with current AT&T practices, ANSI/NFPA 70, ANSI/NFPA 78, EIA/TIA-607 and local requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and
test apparatus and equipment. This is part of the grounding and bonding infrastructure (part of the telecommunications pathways and spaces in the building structure), and is independent of equipment or cable. Refer to AT&T IDC standards TP 760-400-105 Chapter 7, Section 12 & ATT-TP-76403 for more detailed information.

4 Basket Cable Tray Systems

4.1 Below Raised Floor

4.1.1 The Cable Basket tray system shall be installed based on the SSC design. There are multiple cable basket tray pathways below the raised floor connecting the MDA panels to the HDA panels. These are common pathways that intersect with the perimeter cable basket tray that runs throughout the data center. For new Data Center builds, there shall be two cable basket trays; one basket tray for copper & coax, and one basket tray for fiber. For existing Data Centers that are expanding, the ‘two cable basket tray method’ is preferred, if applicable. This is a case by case basis. SSC Team shall be consulted before the installation of any new cable basket tray pathways below the raised floor.

4.1.2 Cable pathway extensions from the perimeter cable tray to the customers HAD (IDF) shall be a basket cable tray. There shall be two separate trays, one for copper (UTP CAT6 and Coaxial) and another for fiber (Multimode and single Mode). The extension cable tray shall be no less the 4 inches wide by 2 inches deep.

4.1.3 The distances in the table below, shall be maintained between the electrical power cables and UTP cables. Note that electrical codes may require a barrier or greater separation when specified. Refer to NFPA 70, article 800 or applicable electrical code for additional information.

<table>
<thead>
<tr>
<th>Quantity of Circuits</th>
<th>Electrical Circuit Type</th>
<th>Separation Distance (mm)</th>
<th>Separation Distance (in)</th>
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<tbody>
<tr>
<td>1 – 15</td>
<td>20A 110/240V 1 – phase shield or unshiled</td>
<td>Refer to 568B annex C</td>
<td>Refer to 568B annex C</td>
</tr>
<tr>
<td>16 – 30</td>
<td>20A 110/240V 1 – phase shielded</td>
<td>50 mm</td>
<td>2 in</td>
</tr>
<tr>
<td>31 – 90</td>
<td>20A 110/240V 1 – phase shielded</td>
<td>100 mm</td>
<td>4 in</td>
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<td>61 – 90</td>
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<td>6 in</td>
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<td>91+</td>
<td>20A 110/240V 1 – phase shielded</td>
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<td>1+</td>
<td>100A 415V 3 – phase shielded feeder</td>
<td>300 mm</td>
<td>12 in</td>
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4.1.4 The cable basket tray shall be supported from the pedestals below the raised floor.

4.1.5 The top of the basket tray shall be no less than 6 inches below the raised floor.

4.1.6 Each cable basket tray support brackets shall be no more 6 feet apart.

4.1.7 Service slack storage for cable underneath the raised floor shall be utilized for controlling bend radius so that the cable, (CAT6 and Coaxial) and armored fiber bend radius limitations are not exceeded. Cable and Fiber slack storage may be stored within the cabinet, (see Figure 1 and figure 2) or routed up and over the two-post rack with use of a top-mount waterfall tray-type to avoid the use of the overhead ladder rack/basket tray system being utilized for network/infrastructure type cabling.
4.2 Overhead

4.2.1 The basket cable tray system shall be installed in accordance to the SSC design. As stated above, there are multiple cable basket tray pathways connecting the MDAs to the HDA, and then from the MDAs to the IDAs. These are common pathways that intersect with the perimeter cable basket tray that runs throughout the data center.

4.2.2 The basket cable tray system shall be supported either directly from the ceiling or from a preexisting strut structure support from the ceiling.

4.3 MDA Basket Cable Tray

4.3.1 A cable tray is usually overhead or under a raised floor but the wiring is open for easy access to cables. They are used to distribute cables from the source to the point of use. The work covered
under this section describes the materials, support structure and services to install a complete overhead basket tray system and its supporting frame work structure.

4.3.2 The basket tray system is defined to include, but not limited to straight sections of basket type cable tray, bends, tees, elbows, drop-outs, supports and all other related accessories necessary for a complete installation.

4.3.3 The installation supplier shall provide a minimum 6 inch vertical separation between the rack and the basket cable tray and between any additional tiers of basket cable tray.

4.3.4 The installation supplier shall verify that the racks and superstructure has been installed in a manner that will not block future growth of the area.

4.3.5 The MDA cage shall be installed with 18 inches wide x 6 inches deep basket tray (Black for copper & coax) and 8 inches wide X 4 inches deep basket tray (Yellow for fiber) including all parts/materials and consumables.

4.3.6 The frame work structure is defined to include, but not limited to straight, perma green II, channel sections of strut, 3/8 inch or 5/8 inch (for seismic rated areas) threaded rod, cross section brackets, polygon brackets and all other related accessories necessary for a complete installation. The customer cage shall be installed with B-line or Unistrut, Perma Green II, 10 ft. sections including all parts/materials and consumables.

4.3.7 The purpose of the over-head support structure is to carry the copper and fiber cable basket trays. Provide a smooth transition from the cable basket tray to the vertical wire managers. The support can be constructed of channel strut, channel strut brackets and finishing products, threaded rod, miscellaneous nuts and bolts and cabinet/rack attachment brackets.

4.3.8 Furnish products listed and classified by Underwriters Laboratories, Inc. and Electrical Testing Laboratories, Inc. as suitable for purpose specified and shown in Project Drawings.

4.3.9 Refer to figure 3 and the following bullet points for more details on the overhead support structure.

4.4 Managed Cage Basket Cable Tray

4.4.1 The Managed Cage is a designated location within the IDC that supports those customers who will require their installations to be fully maintained, managed and monitored by AT&T.

4.4.2 The installation supplier shall complete the basket cable tray within the managed cage in accordance with the design drawings that accompanied the project.

4.4.3 The installation supplier shall complete the basket cable tray within the managed cage in a fashion that allows for growth and expansion within the IDC.

4.4.4 The managed cage shall be installed with a 18 inch wide X 6 inch deep basket tray (Black for copper & coax) and 8 inch wide X 4 inch deep basket tray (Yellow for fiber) including all parts/materials and consumables as indicated in the accompanied shop drawings.

4.5 Copper Cable Basket tray

4.5.1 The copper cable tray shall be no less than 18 inches wide, 6 inches deep and shall be of a basket style constructed material. Such as but not limited to Cablofil or Flextery.
4.5.2 The sections of the cable tray shall not exceed 6 feet in length without being supported by from either above or below in a fashion consistent with the manufacturer's installation instructions.

Note: The copper cable tray supports the copper cross connect cabling from the cross connect termination panels to networking equipment or from a cross connect termination panel to cross connect termination panel.

4.5.3 The copper cable basket tray, (with both Copper and Coaxial cable runs), is not to exceed a capacity of more than 60% of the depth of the tray, (4 inches). Should the capacity of 60% be reached or exceeded, than a meeting shall be organized with the parties involved to implement solutions alleviating this capacity rule. At no time shall the depth of the copper cable basket tray exceed the 6 inch depth.

4.6 Fiber Cable basket tray

4.6.1 The fiber cable basket tray shall be no less than 8 inches wide x 4 inches deep. It shall be of a basket style constructed material. Such as but not limited to Cablofil or Flextery.

4.6.2 The sections of the cable tray shall not exceed 6 feet in length without being supported by from either above or below in a fashion consistent with the manufacturer's installation instructions.

Note: The fiber cable tray supports the fiber cross connect cabling from the cross connect termination panels to networking equipment or from a cross connect termination panel to cross connect termination panel.

4.6.3 The fiber cable basket tray, (with fiber cable only), is not to exceed a capacity of more than 60% of the depth of the tray, (4 inches). Should the capacity of 60% be reached or exceeded, than a meeting shall be organized with the parties involved to implement solutions alleviating this capacity rule. At no time shall the depth of the copper cable basket tray exceed the 6 inch depth.
5 HAD – HAD Buildout

5.1 Roles and Responsibilities

5.1.1 IDC is responsible for the following:

a) Provide approved parts lists to the Installation Supplier. This parts list will include the necessary materials as indicated in the provided shop drawings to build the customer cage.

b) Provide power requirements and receptacle placement on the floor.

c) Provide information regarding the placement of power strips in racks and/or cabinet.

5.1.2 The Installation Supplier shall be responsible for the following:

a) Provide all labor, tools, equipment, materials, transportation, erection, construction, unloading, inspection and all spare materials - Must also itemize any spare/left over material which shall be specified towards the end of the project.

b) Furnish and install materials through ANIXTER or specified/approved distributor.

c) Obtain the permission from the facility/site leads or management, before proceeding with any work necessitating cutting into or through any part of the building structure such as girders, beams, concrete, tile floors or partition ceilings.

d) Provide a detailed MOP using AOTS Change Management system.

e) Promptly repair all damage to the building and its components, (e.g. walls floor tiles and etc.), during the course of the project and exercising reasonable care to avoid any damage to the building. Reporting to the specified AT&T project manager any damage to the building that may exist or may occur during the Installation Supplier’s progression of the project.

f) Install the wire, cable and hardware in accordance with the specifications outlined herein, in accordance with the manufactures installation guide lines and industries standards best practices.

g) Install all permanent labels per AT&T standards as described in this document and Project Drawings.

h) Conduct tests and inspections (walk through) as specified post-installation.

i) Ensure the prevention of and correction of any cable dives. By definition, dives are cable runs that cause a significant difference in cable length at the terminating point in comparison to the other cable runs of the same link.

j) Installation Supplier shall promptly correct all punch-list items as determined by a joint walk through or audit performed by AT&T Quality Auditor.

k) Coordinate with IDC Manager who will determine what to do with the left over excess materials from the project.

l) Coordinate all work with designated AT&T Project Manager before the commencement of the installation.

m) Remove all tools, equipment, rubbish and debris from the premises and leaving the premises clean and neat upon completion of the work. Including all work underneath the raised floor.
n) Abide by the safety and security rules in force on the work site per local and governmental regulations. Workers shall be wearing all appropriate safety gear per job site requirements.

o) Follow industry standard installation practices as defined in the installation practices sections.

p) Meet with IDC manager for onsite walkthrough to close the completion of the project to address corrected concerns and issues that may have risen during the course of the project.

5.2 Horizontal Area Distribution (HAD) Construction:

5.2.1 An HAD (also known as an Intermediate Distribution Frame (IDF)) shall provide network connectivity for managed and non-managed clients from the MDA or directly from Telecommunication Room (TR).

5.2.2 The IDC Project Manager shall identify the location of the HDA in a caged/cabinet environment. The HDA shall support the Copper, Coax and Fiber connectivity as required by the scope of work captured in the TOF. The IDC Project Manager is responsible for to providing the connectivity requirements of each project to the Installer.

5.2.3 The HDA panels shall have a total capacity of twenty-four (24) ports per panel. Panels shall not exceed one (1) unit in height (1.75 inches). The HDA panel shall be supported by a 1-U horizontal cable manager. The cable manager shall be placed underneath the cable panel.

5.2.4 All data cabling terminated at the patch panel installed in an HDA rack shall be neatly organized and secured with velcro style tie wraps.

5.2.5 Each port in the HDA patch panel used to terminate the data cabling shall be sequentially numbered from left to right, starting with number media type then port number. For example for copper will be designated as C – HDA Number – Port Number and for Coax, D-HDA Number-Port Number, etc. More detailed information regarding the port numbering of a patch panel can be found in section 11.6. The cable type designation is as follows; 1) C = UTP Category 6 copper; 2) X = 734 Coaxial cable; 3) 6 = 62.5 micron Multimode fiber; 4) 5 = 50 micron Multimode fiber; 5) S = Single Mode fiber. 

Ex. – A01AD0744.

5.2.6 All installed cables shall fully comply with recommendations and regulations imposed by local, state and federal regulatory bodies and must also comply with the guidelines and standards set forth in the National Electric Code (NEC), the National Protection Association (NFPA), and the Underwriter Laboratories for domestic use.

5.2.7 Each HDA and its ports shall be labeled to identify the media type, HDA number and port number.

5.2.8 These are the cable termination panels from the customers HDA cabinet or cage to the MDF. The HDA patch panel locations are listed below (refer to Figure 9.13 for more details);

a) Customer CAT 6 copper panels use 24 position modular patch panels with 10Gig CAT 6 plugs

b) Customer coaxial copper panels use 24 position modular patch panels with BNC couplers inserts

c) Customer single mode fiber panels if required
d) Customer multimode fiber panels if required

5.3 **Power Requirements**

5.3.1 The power requirements are based on the geographical location of the data center (domestically or globally). The power designated for the specific row/bay of racks in the customer cage shall be installed by CRE designated electrical installer. The power receptacles installed in a rack/cabinet shall be NEMA L5-20/30R or L6-20/30R. The power strips shall meet the requirement of the project and must have a lockable plug and must be metered. Power strips needed for certain network equipment shall be installed by OSWF or the Installation Supplier, as per the designs provided for the project. A list of approved power strips is provided in Appendix C.

5.3.2 Domestically and internationally the power requirements are based on the power requirements information captured in the Technical Order Form (TOF).

5.3.3 The power receptacles shall be fed from two distinct Remote Power Panels, each being sourced from a distinct Power Distribution Unit (PDU), designated as "A" and "B".

5.3.4 Each electrical receptacle shall be labeled indicating its RPP source and its terminating circuit number in the RPP panel. The receptacles shall be installed per the local code. In some jurisdictions, where it is required to install the receptacles above the raised floor otherwise the receptacles goes below the floor. It is the Installation Supplier’s responsibility to have a full knowledge of the local codes.

5.3.5 The power strip must support the receptacle voltage & current. The power requirements are provided and they shall be furnished to the Installation Supplier by the local IDC manager.

5.3.6 Each power strip shall be installed in a rack/cabinet per manufacturer’s recommendations.

5.3.7 Each power strip shall be labeled indicating its electrical source (RPP) and its terminating circuit within that RPP. The plug side of the power strip shall be labeled indicating its source receptacle.

5.3.8 Whips & Outlets shall be labeled at both ends.

5.3.9 All electrical work shall be performed during the hours stipulated in the Ask Yourself Matrix.

5.3.10 All electrical work shall require an approved SMOP or AOTS-Change Request.

5.3.11 Domestically and internationally, where there is a raised floor, it is specified in the Project Drawings, that the power outlets be mounted to the pedestals 6 inches below the raised floor and attached to the Unistrut or approved locations provided by AHJ. The electrical contractor shall use this as a guide to how the receptacles are to be located in relation to the row. Underneath the equipment row as specified in the project drawings.

5.4 **Rack/Cabinet Placement, Clearances and Dimensions**

5.4.1 The typical cabinet dimensions are based on upon 36 inches in depth and 24 inches in width. The extended depth of the typical cabinet is approximately 76 inches as measured from the fully extended open door at the front to the fully extended open door at the rear. The minimum clearance in front of a cabinet or rack is 36 inches as measured from the surface of the front cabinet door or from the front surface of the rack. The minimum clearance behind a cabinet or rack is at least 24 inches as measured from the surface of the rear cabinet door or from the rear surface of the rack. The space inside of the cage is composed of multiple rows of 19 inch 4 post
racks. One 19 inch rack and if required one 8 inch vertical wire manager are 28-¼ inches wide at the base where they meet the raised floor.

5.4.2 The cold aisle shall have a clearance of at least 36 inches from the surface of the rack to; the hot aisle shall be at least 24 - 26 inches of clearance from the rear surface of the rack.

5.4.3 Racks or cabinets shall have a zero (0) side to side clearance requirement. Side panels are installed for air flow.

5.4.4 Each rack/cabinet shall be designated on the front and back with its FIC location.

5.4.5 Bolt Cabinets/racks to floor using Unistrut where required.

6 Cage Build Out

6.1 Cage Requirements

6.1.1 The installation supplier installing the cage shall verify with the IDC Project Manager format and location of cages to be built (i.e., 5-rack cage, 10-rack cage, or any other custom cage size).

6.1.2 If materials are needed the installation supplier shall create a material list and forward to IDC Project Manager. The cage size is driven by customer requirements.

6.1.3 The standard cage size is 96 square feet for a 5-rack cage, 192 square feet for a 10 rack cage, 288 square feet for a 15 rack cage, and 384 square feet for a 20-rack cage. Ultimately the dimensions of the cage size are driven by customer’s power requirements.

a) Space
i. Locking Cabinet = 20 sf
ii. 5 rack space = 96 sf
iii. 10 rack space = 192 sf
iv. 15 rack space = 288 sf

b) Typical Circuit / Receptacles in the US
i. 12A/120V circuit = L5-20R
ii. 30A/120V circuit = L5-30R
iii. 15A/208V – 1 phase circuit = L6-15R
iv. 20A/208V – 1 phase circuit = L6-20R
v. 30A/208V – 1 phase circuit = L6-30R
vi. 50A/208V – 1 phase circuit = Either a Hubbell or Russell Stoll receptacle
vii. 60A/208V – 1 phase circuit = Either a Hubbell or Russell Stoll receptacle
viii. 20A/208V – 3 phase circuit = Either a L21-20R or L15-20P or L14 -20P verify with customer
ix. 30A/208V – 3 phase circuit = Either a L21-20R or L15-20P or L14 -20P verify with customer
x. 50A/208V – 3 phase circuit = Either a Hubbell or Russell Stoll receptacle
xi. 60A/208V – 3 phase circuit = Either a Hubbell or Russell Stoll receptacle

6.1.4 In the US we do not sell 220 or 230 volt circuits.

6.1.5 We do not allow 208 volt circuits in locking cabinets unless approved by the Product House.

6.1.6 IDC project managers shall use the power vs. space calculator to calculate the required cage space for requested power and cage built out.

6.1.7 There are no Locking Cabinets in Lithia Springs Phase3, Boston Expansion, Webb Chapel Phase 3, Irvine Phase 3, Lisle Google area, Mesa Expansion and Ashburn Building B.
7 MDA and Structured Cabling Systems

7.1 Introduction

7.1.1 This document intends to provide a clear overview of the AT&T Internet Data Center Main Distribution Area (MDA) – (which is to replace the legacy term MDF, as it pertains to a Central Office (CO), or office environment) and the Structured Cabling System (SCS). The term, MDA shall be used for any of the brand new data center installations happening after the submittal of this document, July 25, 2011. The term MDF shall be used for any legacy and newly expanded data centers prior to the release of the submittal of this document. (July 25, 2011). This document provides a point of reference for all of the standards that comprise and define the MDA and SCS. This includes how each are built, what materials are used to construct them, how they should be used and their intended functions and capacities. The two diagrams below are of what the current naming nomenclature is today for the AT&T Hosting Data Centers and what they will be as new data centers are built, globally.

7.1.2 For brand new Hosting data center builds, please click on the hyperlink below to read the Telecommunications Infrastructure Standard for Hosting Data Centers. It covers why the legacy terminology does not work for the Hosting data center environment.

Note: This document does not have to be referenced for the Legacy data centers, since the terminology will remain the same.

Structured Cabling Standards Document

7.1.3 MDA and MDA shall be used for all brand new data center builds and shall not replace current and legacy builds still termed as MDFs and HDAs. MDA and HDA will be used in lieu of MDF and IDF throughout this document.

7.1.4 This document outlines the standards, procedures and best practices that should be followed when building, deploying and cabling the infrastructure cabling within the IDC. This document DOES NOT apply to any carrier cages (AGN, LNS, RBOCS, LECs or TELCO cages). This section covers general requirements for hazardous materials and waste management in AT&T sites.

7.1.5 A Structured Cabling System (SCS) is defined as a set of cabling and connectivity products that integrates the voice, data, video, and various management systems of a building (such as safety alarms, security access, energy systems, etc.). An SCS consists of an open architecture, standardized media and layout, standard connection interfaces, adherence to national and international standards, and total system design and installation. Other than the structured cabling system, voice, data, video and building automation systems (BAS) have nothing in common except similar transmission characteristics (analog or digital data signals) and delivery methods (conduit, cable tray, raceway, etc.) that support and protect the cabling investment. The elements of a structured cabling system and the operational advantages such an approach may enable.

7.1.6 An MDA is the central network and connectivity hub in an AT&T IDC area. The area serviced by the MDA is referred to as an MDA Service Area (MSA), (formally called ‘phase’ or ‘zone’). All customers in the MDA Service Area obtain network access through the MDA. This Network footprint provides connectivity to the AT&T Common Backbone (CBB) for WAN access and Ethernet aggregation to all customers resident in the respective MDA Service Area. Additionally
the MDA is the acting hub for all passive connectivity in the MDA Service Area in the form of UTP RJ type patch panels, Coax patch panels and Fiber Optic Shelves. There may be multiple MDAs and MDA Service Areas in a single IDC.

7.1.7 The original MDA, referred to simply as MDA1 always provides the WAN connectivity for the IDC and all other MDAs. Secondary MDAs are LAN Aggregation Hubs with no WAN uplinks.

7.1.8 The SCS and MDA work together in the IDC to provide and fulfill all connectivity requirements in any MDA Service Area both for customers and AT&T internal services in a flexible, manageable and organized fashion. The SCS distributes connectivity from the MDA throughout the MDA Service Area as well as from MDA to MDA and HDA, (formerly IDF), to Carrier Cages.

7.1.9 The following specifications provide a framework for the construction and installation specifications for the MDA as well as for the BAS, voice, and video and data communication cabling in AT&T Internet Data Centers (IDC). Any substitution of materials must be approved by the System Solutions Certification Team, dl-ssc@attens.com. Any disparity between this document and a Request for Proposal must be approved.

7.1.10 For a list of low voltage networking structured cabling system standards, refer to appendix A.

7.1.11 Changes to this issue of Section W are summarized in Table W-1.

7.2 General Requirements

7.2.1 All projects shall follow the specifications as outlined in this document. In accordance with the following Terms and Conditions and System Requirements, work shall be at the specified project location.

7.2.2 The Installation Supplier and/or OSWF shall have an opportunity to ask any additional questions regarding this project via the listed procedures in this document.

7.2.3 Any questions posed following the document shall be addressed in writing and e-mailed to specific engineer from the SSC Team. The resulting answers, along with the questions, will be forwarded to the OSWF receiving this document, except as noted below. Bi-Weekly meetings will be held prior to work and as work starts. The Prior Bi-Weekly Meetings shall consist of review of project plans, - BOM and delivery dates. The Bi-Weekly meetings will then evolve to weekly meetings held during the duration of the project shall cover progress of project via photographs, confirmed verification that materials were delivered and in good condition and lessons learned.

7.2.4 The specific OSWF acknowledges that SSC Team will rely on the Installation Supplier’s ability, expertise and knowledge of the system. OSWF shall be obligated to exercise the highest standard of care in performing its obligations. OSWF shall be aware that this project is on a construction fast-track and have a multi-phase completion schedule.

7.2.5 **MDA Equipment Cabling:** The installation and interconnection cabling of the entire core networking infrastructure equipment being deployed in the IDC MDAs shall be completed by the local onsite work force (OSWF) or by the System Solutions and Certification Team Member (SSC).

7.2.6 **SCS Cabling:** To provide consistency throughout the domestic IDCs, this document intends to establish the minimum requirements for the cabling between MDA1 and all secondary MDAs and MDA1 and all carrier cages including, AGN/LNS as well as 3rd party PTTs.
7.2.7 Only Plenum rated cable, (CMP), shall be used for all physical media types for Domestic Builds. Only Low Smoke Zero Halogen, (LSZH), rated cable, shall be used for all physical media types for International Builds.

7.2.8 Fiber optic, jumpers shall be ran intra-floor only and not through floors or through fire-rated walls.

7.2.9 Below is a chart detailing the different cable quantity requirements of the SCS in an AT&T IDC:

| Cable Counts                              |  |  |
|-------------------------------------------|  |  |
| From / To                                 | Cable Type              | Cable Count  |
| Primary MDA to Secondary MDA (Domestic)    | CAT 6 UTP               | 96 Cables    |
|                                          | 734C Coax               | 48 Cables    |
|                                          | SM Fiber (Primary Pathway) | 24 Strands |
|                                          | SM Fiber (Secondary Pathway) | 24 Strands |
|                                          | MM OM4 Fiber (Primary Pathway) | 48 Strands |
|                                          | MM OM4 Fiber (Secondary Pathway) | 48 Strands |
| Secondary MDA to Secondary MDA            | CAT 6 UTP               | 96 Cables    |
|                                          | 734C Coax               | 48 Cables    |
|                                          | SM Fiber (Primary Pathway) | 24 Strands |
|                                          | SM Fiber (Secondary Pathway) | 24 Strands |
|                                          | MM OM4 Fiber (Primary Pathway) | 48 Strands |
|                                          | MM OM4 Fiber (Secondary Pathway) | 48 Strands |
| Primary MDA to Secondary MDA (International – Outside US) | CAT 6 UTP               | 96 Cables    |
|                                          | 734C Coax               | 48 Cables    |
|                                          | SM Fiber                | 24 Strands   |
|                                          | MM OM4 Fiber            | 48 Strands   |
| Primary MDA to AT&T AGN / LNS             | Cat 6 UTP (POTS and DS1) | 96 Cables    |
|                                          | 734C Coax               | 48 Cables    |
|                                          | SM Fiber (Primary Pathway) | 24 Strands |
|                                          | SM Fiber (Secondary Pathway) | 24 Strands |
|                                          | MM OM4 Fiber (Primary Pathway) | 48 Strands |
|                                          | MM OM4 Fiber (Secondary Pathway) | 48 Strands |
| Primary MDA to 3rd Party Carrier Cage/Area| Cat 6 UTP (POTS and DS1) | 96 Cables    |
|                                          | 734C Coax               | 48 Cables    |
|                                          | SM Fiber (Primary Pathway) | 24 Strands |
|                                          | SM Fiber (Secondary Pathway) | 24 Strands |
|                                          | MM OM4 Fiber (Primary Pathway) | 48 Strands |
|                                          | MM OM4 Fiber (Secondary Pathway) | 48 Strands |

7.2.10 The system offered shall incorporate all features and facilities listed in this specification.

7.2.11 The project will follow the specifications as outlined in this document. In accordance with the following Terms and Conditions and System Requirements, work shall be at the specified project location.

7.2.12 **SCS Cable Capacity Management between Core Areas:** Each IDC grows at a different rate but at no time should a customer have to wait for cabling that has to be run between the carrier cages and the MDA or for cable between MDAs. To cut down on cost it is recommended that when the cable capacity (available port capacity) between these core areas reaches 70% utilization the IDC should pull enough cable for each media type to last a year. One year’s capacity should be determined by the OSWF and should be based on specific trending data of that IDC. Some data
centers may find that their growth rate requires them to replenish before they reach 70% utilization.

7.2.13 The Installation Supplier shall submit and record all documents and events during the course of the installation and throughout the duration of the project. This would include accurately record exact sizes, locations and quantities of cables.

7.2.14 The Installation Supplier shall deliver products to and receive products at the site under provisions of Division 25, General Requirements.

7.2.15 All cable types, Coax, Copper and Fiber shall be stored according to manufacturer’s recommendations at a minimum.

7.2.16 In addition, all cables shall be stored in a location protected from vandalism and weather. If air temperature at cable storage location will be below 40 degrees F, the cable shall be moved to a heated (50 degrees F minimum) location.

7.2.17 Cables shall not be stored in or at any locations where the temperature is at or above 100 degrees F.

8 MDA Buildout

8.1 Introduction

8.1.1 The space required for an MDA is partly based on the shape of the raised floor space it’s supporting. Other contributing factors also determine the size and location of an MDA build out.

a) MDA other contributing factors
   1. Shape of the raised floor space
   2. Equipment diversity
   3. Circuit diversity
   4. Data center aisle ways
   5. Overall build architecture

8.1.2 The support structure is assembled from channel strut materials. This structure spans above all rows of a MDA’s cage.

8.2 Roles and Responsibilities

8.2.1 SCC Regarding MDAs and SCS:

a) Define the Standards for the SCS and MDA

b) Provide a complete detailed design to guide and support the construction of any new MDA or SCS systems. (This does not include customer HDA extensions installed throughout the lifecycle of an IDC).

c) Provide an approved parts list for all IDC installations, excluding customer networking equipment. This parts list will include everything necessary to build the MDA and SCS as well as all of the patch panels and cabling recommended for all deployments including HDA extensions.
d) Provide and maintain the full equipment elevations for all MDAs.

e) SSC holds sole responsibility for how and where all shared infrastructure equipment is racked and stacked in the MDA.

f) Make determinations for all network upgrade paths and provide a full Equipment Installation Plan (EIP) for said upgrades.

8.2.2 Installation Supplier:

a) Providing all labor, tools, equipment, materials, transportation, erection, construction, unloading, inspection and all spare materials. Must also itemize any spare material which shall be specified towards the end of the project. For tools & such see B1.3, for spare or left over material see E7.

b) Furnishing and installing materials through ANIXTER or specified/approved distributor for a complete structured cabling system unless specific provisioning or installation of materials is denoted in this document.

c) Obtaining the permission from the facility/site leads or management, before proceeding with any work necessitating cutting into or through any part of the building structure such as girders, beams, concrete, tile floors or partition ceilings.

d) Promptly repairing all damage to the building during the course of the project and exercising reasonable care to avoid any damage to the building. Reporting to the specified AT&T project manager any damage to the building that may exist or may occur during the Installation Supplier’s progression of the project.

e) Installing the wire, cable and hardware in accordance with the specifications outlined herein. Installing all permanent labels per AT&T standards as described in this document and Project Drawings.

f) Conducting tests and inspections as specified post-installation.

g) To ensure the prevention of and correction of any cable dives. By definition, dives are cable runs that cause a significant difference in cable length at the terminating point in comparison to the other cable runs of the same link.

h) Taking weekly photographs during the duration of project’s process.

i) Promptly correcting all punchlist items for which the Installation Supplier, as determined by a joint walk through and documentation.

j) Coordinating with OM who will determine of what to do with the left over excess materials from the project. Coordinating all work with designated AT&T Project Manager before the commencement of the installation.

k) Removing all tools, equipment, rubbish and debris from the premises and leaving the premises clean and neat upon completion of the work. Including all work underneath the raised floor.

l) Abiding by the safety and security rules in force on the work site per local and governmental regulations. Workers shall be wearing all appropriate safety gear per job site requirements. B1.3.
m) Following industry standard installation practices and as defined in the installation practices sections.

n) Meet with SSC Engineer for onsite walkthrough close to the completion of the project to address corrected MDA concerns and issues that may have risen during the course of the project. E8.2.1.

8.2.3 **OSWF is responsible for the following:**

a) OSWF is empowered to exercise their best judgment and will be held accountable to assure there is always reserve cable capacity available. Each IDC will have discretion as to the quantity of extra cables per media type based on their particular data centers growth rate.

8.3 **MDA Construction**

8.3.1 For MDA Construction requirements refer to the detailed set of CAD drawings pertaining to the specific project that supports the information being depicted per project.

8.3.2 The MDA network engineer/design architect is solely responsible for all aspects of the construction of the MDA and all of its components. What follows is a logical view into how the MDA is to be constructed. For specific detail, refer to project CAD drawings.

8.3.3 The space inside of the MDA is composed of multiple rows of 6, 7 or 8 foot tall, 19 inch wide 2 post racks, each row is made of 5 or 6 racks with 8, 10 or 12 inch vertical wire managers between each rack as well as on the end of each row of racks.

8.3.4 Open, four (4) post, (refer to Approved Parts List link for part number) racks and or cabinets may be used for certain international data centers only to keep to the uniformity of the data center. This is done because AT&T does not own the MOW Data Centers that we have established a point-of-presence in.

8.3.5 For new MDA builds, two-post racks are the required type of enclosures to house the MDA devices. Should an existing Legacy MDF need to be expanded in a high density cabinet environment, a 4 Post cabinet would be the suggested enclosure type to use, due to the airflow of the devices house in the MDF. The SSC Engineer, shall design which type of enclosure will work best for such an environment.

8.3.6 Where there is equipment mounted in the racks the alias spacing shall be no less 36 inches from the back of the deepest device to the front of the next rows cabinet. This space is not only a standard that should be enforced but is allows for clear work space between rows of racks and clear access to the equipment and cabling patch panels. When placing the racks on the raised floor, the racks shall not block access to below raised floor at either the front or the rear of each row of racks. This access is for pulling cables into the racks for terminations and/or plugging into power outlets. TP76402 3.3.7.

8.3.7 A minimum of 3 feet, with a preference of 4 feet, front clearance **shall** be provided for installation and management of equipment. A minimum of 2 feet, with a preference of 3 feet, rear clearance **shall** be provided for installation, service access at the rear of racks and cabinets. A minimum of 1 foot side clearance **shall** be provided between the wall/cage wall for the installation of a cabinet or two-post rack. See equipment manufacturer requirements. TP76402 3.3.7.
8.3.8 The racks shall be bolted to the raised floor in a manner to add rack stability. Where it is required, seismic bracing shall be used to secure the racks through the raised floor to the concert sub floor. TP76402.

8.3.9 One side of the rows shall be no less than 48 inches from the MDA cage wall and the other side shall be no less than 18 inches from the MDA cage wall.

8.3.10 The Installation Supplier shall install and verify that the rows are vertically and horizontally aligned. Should they not be, the Installation Supplier shall correct the alignments of the rows at no labor charge to AT&T. section I 2.6.11 & 2.6.12.

8.3.11 There shall be an overhead basket cable try system to support the cabling to and from the network devices installed in the MDA.

a) General:
   1. The channel strut support structure is installed above the racks in the MDA to support a cabling pathway and can support multi layers of basket cable trays.
   2. The multi layers are comprised of a copper basket cable tray and fiber basket cable tray.
   3. All strut sections are attached utilizing command strut materials such as channel strut, angle fitting, flat fittings, threaded rod, nuts and bolts.

b) When two post racks are used in the MDA the channel strut not only supports the basket cable tray but also stabilizes the individual rows of racks.

c) TWO POST RACKS:
   1. For a two post rack there shall be a three inch channel plate placed at the top the racks in order to provide support for the channel strut. These plates are attached to the top of the racks with 5/16 inch bolts. The channel plate shall be modified as indicated on the drawings provided with the project.
   2. The three inch plates shall be placed above the racks at intervals to best support and basket cable tray support structure. As an example; with a multi row, six racks per row, the channel plate is best placed above racks 1, 3, 4, and 6.

d) FOUR POST RACKS:
   1. Four post racks/cabinets do not require the type of inter-row support, but there shall be channel strut placed at the tops of the racks to support the overhead basket cable tray. In the case of a 2 row 8 four post rack/cabinet layout the channel strut shall be place in the following locations when facing the front of the row; 1) shall be placed at the left top of rack one; 2) shall be place at the left top of rack four; 3) shall be placed at the right top of rack five; 4) shall be placed at the right top of rack eight. These locations best support the overhead basket cable tray in this type of layout.
   2. When there multiple rows racks/cabinets are used there shall be an overhead channel strut run between the rows at racks 2 and 6. These provide inter-row basket cable tray support.

e) All components in regards to connectors, taps, lugs and etc., shall be shiner free.
f) All strut framing section shall be installed straight (without any twisting), and level unless indicated in the shop drawings provided with the project.

g) There are four channel struts that span the rows of racks across the top of racks where the 3 inch channel plates had been previously attached to the racks.

h) These four channel struts shall be attached to the top of these racks by using 3/8 inch (3/8”) bolts.

i) Above each rack the strut shall be attached so there will be 2 vertical channel struts approximately 2'-6” apart and standing approximately 2'-2” high. These shall be secured to the 4 channel struts that span the rows of racks with 3/8 inch bolts.

j) There shall be 4 channel struts that span the length of the row of racks for each row. These channel struts are approximately 16 feet in length. The base of the lower 2 spanning channel struts shall be approximately 9 inches from the top of the rack. The base of the upper 2 spanning channel struts shall be approximately 19 inches from the top of the rack. These shall be attached to the vertical channel struts with 90 degree (90˚) fittings and 3/8 inch bolts.

k) There will be 6 cross members for each set of spanning channel struts installed along the length of the row of racks. Each of these cross members will be approximately 2'-6” in length. These cross members will be placed in a fashion so the cable basket tray is sufficiently supported.

l) There will be channel strut supports attached to the spanning channel struts where the cable basket tray crosses the aisles between the rows of racks. These cable basket tray support struts will be of 2 sizes, the first being 8 inches long and the second being 18 inches long. They will be attached to the spanning channel strut with 3/8 inch bolts.

m) All ends of the channel strut material and any exposed bolts shall be capped to prevent any damage to equipment or physical injury to any persons.
8.4 MDA Domestic Power Requirements

8.4.1 The power requirements are based on the geographical location of the data center (domestically or globally).

8.4.2 Domestically the power requirements are based on the number of devices being deployed in the MDA at the time of construction. Following are a few different deployments that effect the power requirements of the MDA.

8.4.3 The power receptacles shall be fed from two distinct remote power sources as designated as “A” and “B”.

8.4.4 Primary MDA of a new –build data center. In this deployment the following power requirements apply.

a) There shall be 8 dedicated 220 volt 30 amp circuits; each circuit having an L6-30 twist lock receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

b) There shall be 8 dedicated 110 volt 20 amp circuits; each circuit having an L5-20 twist lock receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

FIGURE W-4 - OVER HEAD BASKET CABLE TRAY
c) There shall be 12 shared 110 volt 20 amp circuits; each circuit having an L5-20 twist lock receptacle. With 6 outlets from power source “A” and the other 6 outlets from power source “B”.

8.4.5 Subtending MDAs in an existing data center. The remaining data center MDAs are to be deployed with the following power requirements.

a) There shall be 8 dedicated 220 volt 30 amp circuits; each circuit having an L6-30 twist lock receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

b) There shall be 8 dedicated 110 volt 20 amp circuits; each circuit having an L5-20 twist lock receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

c) There shall be 12 shared 110 volt 20 amp circuits; each circuit having an L5-20 twist lock receptacle. With 6 outlets from power source “A” and the other 6 outlets from power source “B”.

8.5 MDA MoW Power Requirements

8.5.1 Globally, as with domestic installations, the power requirements are based on the number of devices being deployed in the MDA at the time of construction. A list of the various power receptacle types used in MoW are located here:

a) **POWER CONFIGURATIONS IN MOW**

b) Following are a few different deployments that effect the power requirements of the MDA.

8.5.2 The power receptacles shall be fed from two distinct remote power sources designated as “A” and “B”.

a) Primary MDA of a new-build data center shall be deployment the following power requirements.

i. There shall be 8 dedicated 200 - 250 volt 32 amp circuits; each circuit having a Commando type receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

ii. There shall be 16 dedicated 220 - 250 volt 16 amp circuits; each circuit having a Commando type receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”.

iii. There shall be 6 shared 220 - 250 volt 16 amp circuits; each circuit having a Commando type receptacle. With 6 outlets from power source “A” and the other 6 outlets from power source “B”.

b) Secondary MDAs in an existing data center. (The remaining data center MDAs are to be deployed with the following power requirements.).

i. There shall be 8 dedicated 200 - 250 volt 32 amp circuits; each circuit having a Commando type receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”
ii. There shall be 8 dedicated 200 - 250 volt 32 amp circuits; each circuit having a Commando type receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”

iii. There shall be 16 dedicated 220 - 250 volt 16 amp circuits; each circuit having a Commando type receptacle. With 4 outlets from power source “A” and the other 4 outlets from power source “B”

8.5.3 Domestically and internationally, where there is a raised floor specified in the Project Drawings, the power outlets shall be mounted to the pedestals 6 inches below the raised floor or approved locations provided by AHJ. The electrical contractor shall use this as a guide to how the receptacles to be located in relation to the row.

8.6 MDA Cabling Patch Panels

8.6.1 These are the cable termination panels from the customers HDA cabinet or cage, the telco’s (Meet-me-Room, building entrance facility, LNS cage and/or AGN cage), MDA to MDA connectivity, and on site work force wiring closets.

8.6.2 The cabling panel types are listed below.
   a) The MDA patch panels
      i. Category 6 and Coaxial panels are 1RU 24 position modular and can support both the 10Gig CAT6 plugs and the BNC barrel.
      ii. Depending on the application Single Mode and Multimode fiber panels come in 3 different styles; 1) 4RU with 12 slots of LC port adapters supporting 288 strands of fiber; 2) 2RU with 8 slots of LC port adapter supporting 192 strands of fiber; 3) 1RU with 4 slots for LC port adapters supporting 96 strands of fiber.

   b) Customer HDA patch panels
      i. Category 6 and Coaxial panels are 1RU 24 position modular and can support both the 10Gig CAT 6 plugs and the BNC barrel.
      ii. Single Mode and Multimode fiber panels are 1RU with 4 slots for LC port adapters supporting up to 96 strands of fiber.

   c) The Telco space (these would include the LNS cage, AGN cage and any Meet-me-Rooms), there shall be multiple pathways to these locations
      i. Category 6 and Coaxial panels are 1RU 24 position modular and can support both the 10Gig CAT6 plugs and the BNC barrel.
      ii. Depending on the application Single Mode and Multimode fiber panels come in 3 different styles; 1) 4RU with 12 slots of LC port adapters supporting 288 strands of fiber; 2) 2RU with 8 slots of LC port adapter supporting 192 strands of fiber; 3) 1RU with 4 slots for LC port adapters supporting 96 strands of fiber.

8.7 MDA Initial Cable Counts

8.7.1 As an initial installation of a new data center build or an existing data center expansion, there is a default number and types of cables.
   a) Single Mode Optical fiber (OS2)
i. 96 strands from the Meet-me-Room, LNS or AGN, as a new data center build
ii. 72 strands from all other MDF/MDA, as an existing data center expansion

b) Multimode Optical Fiber (OM4)
   i. 48 strands from the Meet-me-Room, LNS or AGN, as a new data center build
   ii. 144 strands from all other MDF/MDA, as an existing data center expansion

c) Copper Category 6
   i. 24 cables from the Meet-me-Room, LAN or AGN, as a new data center build
   ii. 24 cables from all other MDF/MDA, as an existing data center expansion

d) Copper Coaxial cable
   i. 24 cables from the Meet-me-Room, LNS or AGN, as a new data center build
   ii. 24 cables from all other MDF/MDA, as an existing data center expansion

8.7.2 In some case the Coaxial cables will not be used because the data center does not support DS3s or E3s connectivity. This is primarily in MoW data centers.

8.7.3 Any connectivity that exceeds the cable specified distance limitations, media convertors can be used to extend this distance.

8.7.4 The standard cabling path is to run all connection through an MDF/MDA. In some cases the data center customer will request a site-to-site cross connect. In these cases a waver will need to be filled out and then approved by the cable plant design engineer before the connectivity can be made.

8.8 MDA Cabling

8.8.1 Cables shall be installed via dedicated routes, (under floor and overhead), neatly dressed in separate basket trays as follows:
   a) Copper Basket Tray – To hold Copper and Coaxial cable runs.
   b) Fiber Basket Tray – To hold Fiber cable runs only

8.8.2 This separation shall be implemented and maintained.

8.8.3 When cable and fiber runs are being installed, providing additional cable slack, (not loop), at both ends should be considered to accommodate future cabling system changes. At no time shall the cable slack be more than 10% of the cable length.

8.8.4 Slack is exclusive of the length of coaxial, copper or fiber at both ends that is required to accommodate termination requirements and is intended to provide for cable repair, future cabling system changes and/or equipment relocation. The cable slack shall be stored in a fashion as to protect it from damage and be secured in the termination enclosure or a separate enclosure designed for this purpose.

8.8.5 Cable wraps, (Velcro preferably), will not cinched so tightly as to deform the cable sheath and be at varying distances. Since armored fiber is being used, the use of inner duct shall not be used, unless approved by SSC Engineer.
The Horizontal Cable System is based on the installation of Unshielded Twisted Pair (UTP) DATA (CAT 6) copper, coaxial cables and armored fiber types of CMP designation to be installed. Refer to the floor plan drawings(s) which identify the location of the wiring interconnect locations.

### 8.9 Maximum cable Distance

**8.9.1** A ‘typical’ configuration corresponds to the typical data center with an entrance room, MDA, and one or more HDAs. The table below describes the maximum circuit lengths which include backbone cabling, horizontal cabling, and all patch cords or jumpers between the access provider demarcation point and the end equipment (As stated in the TIA-942-1 document).

#### TABLE W-5 – MAXIMUM CIRCUIT CABLE DISTANCES

<table>
<thead>
<tr>
<th>Circuit Type</th>
<th>Category 3</th>
<th>Category 5e, 6, 6A</th>
<th>734 Type Coaxial</th>
<th>735 Type Coaxial</th>
</tr>
</thead>
<tbody>
<tr>
<td>T – 1</td>
<td>442 ft (135 m)</td>
<td>603 ft (184 m)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CEPT – 1 (E – 1)</td>
<td>303 ft (92 m)</td>
<td>439 ft (134 m)</td>
<td>1001 ft (305 m)</td>
<td>448 ft (137 m)</td>
</tr>
<tr>
<td>T – 3</td>
<td>-</td>
<td>-</td>
<td>462 ft (141 m)</td>
<td>236 ft (72 m)</td>
</tr>
<tr>
<td>CEPT – 3 (E-3)</td>
<td>-</td>
<td>-</td>
<td>503 ft (153 m)</td>
<td>257 ft (78 m)</td>
</tr>
</tbody>
</table>

**8.9.2** With maximum horizontal cable lengths, maximum patch cord lengths, and no customer DSX, the maximum backbone cable lengths for a ‘typical’ data center where T-1, E-1, T-3, or E-3 circuits can be provisioned to equipment anywhere in the data center are shown in the table below. This ‘typical’ data configuration assumes that the entrance room, MDA, and HDAs are separate rather than combined. The maximum backbone cabling distance is the sum of the length of cabling from the entrance room to the MDA and from the MDA to the HDA (As stated in the TIA-942-1 document.).

#### TABLE W-6 - MAXIMUM BACKBONE CABLE DISTANCE

<table>
<thead>
<tr>
<th>Circuit Type</th>
<th>Category 3</th>
<th>Category 5e, 6, 6A</th>
<th>734 Type Coaxial</th>
<th>735 Type Coaxial</th>
</tr>
</thead>
<tbody>
<tr>
<td>T – 1</td>
<td>0 ft (0 m)</td>
<td>150 ft (46 m)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CEPT – 1</td>
<td>0 ft (0 m)</td>
<td>0 ft (0 m)</td>
<td>624 ft (190 m)</td>
<td>95 ft (29 m)</td>
</tr>
<tr>
<td>T – 3</td>
<td>-</td>
<td>-</td>
<td>85 ft (26 m)</td>
<td>0 ft (0 m)</td>
</tr>
<tr>
<td>CEPT – 3 (E-3)</td>
<td>-</td>
<td>-</td>
<td>126 ft (38 m)</td>
<td>0 ft (0 m)</td>
</tr>
</tbody>
</table>

**8.9.3** Distance Definition: From ‘carrier’s cage’ handoff through HDA links to MDA to client’s HDA patch panel, from MDA link to AGN and from MDA link to MMR. Distance calculations must include appropriate patch cords and cross connects in carrier’s cage, MDA and customer’s cage.

**8.9.4** Following are the distance limitations for various medium:
a) CAT-6: 90 meters (295 feet) between the MDA and HDA or from the MDA to the client’s HDA patch panel, from MDA link to AGN and from MDA link to MMR. The maximum physical length of the channel shall be 100 meters or 328 feet including equipment cable and patch cords.

b) CAT-6: 198 meters (650 feet), for T1 applications at 1.544 Mbps and E1 applications at 2.048 Mbps.

c) CAT-6: 55 meters for 10GBASE-T applications

d) Multi-mode Fiber-Optic: Any distance up to 2km. 50 micron fiber with the potential to support 10 GBs will be limited to 300 meters unless otherwise specified.

e) Coax: The maximum station-to-station cabling distance for Commscope 734C DS3 coaxial cable is 137 meters (450 feet). This distance must be calculated from the MDA demark to the receiving customer or AGN Rack location.

8.9.5 In the event distance limitations cannot be met appropriate hardware will be installed. That could be network equipment such as switches, routers, Transition media converters, and or ADC repeaters. Contact ssc@attens.com for any distance limitation issue.

8.10 Single Mode Fiber

8.10.1 All single mode fiber shall be plenum and armored bend insensitive type fiber and shall be terminated with LC connectors.

8.10.2 The single mode fiber shall meet or exceed the following cable specifications.

### TABLE W-7 - SM FIBER CABLE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20°C to +70°C</td>
</tr>
<tr>
<td>Installation Temperature</td>
<td>0°C to +70°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40°C to +70°C</td>
</tr>
<tr>
<td>Crush Resistance</td>
<td>85 N/mm</td>
</tr>
<tr>
<td>Impact Resistance</td>
<td>35 N-m</td>
</tr>
<tr>
<td>Flexing</td>
<td>Exceeds</td>
</tr>
<tr>
<td>Cable Bend</td>
<td>Exceeds</td>
</tr>
</tbody>
</table>
### TABLE W-8 - SM ARMORED FIBER STRAND COUNTS

Aluminum Armored Plenum Cable:

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Outer Diameter in. (mm)</th>
<th>Weight lbs/kft (kg/km)</th>
<th>Minimum Bend Radius in. (cm)</th>
<th>Max. Tensile Load lbs. (Newtonses)</th>
<th>Maximum Vertical Rise Feet (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Loaded</td>
<td>Unloaded</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0.5</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>0.5</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>0.5</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>0.5</td>
<td>6</td>
<td>14</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>0.7</td>
<td>6</td>
<td>19</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>24</td>
<td>0.8</td>
<td>6</td>
<td>20</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>36</td>
<td>0.8</td>
<td>6</td>
<td>21</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>48</td>
<td>0.9</td>
<td>6</td>
<td>23</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>1.0</td>
<td>6</td>
<td>25</td>
<td>35</td>
<td>2</td>
</tr>
<tr>
<td>72</td>
<td>1.1</td>
<td>6</td>
<td>28</td>
<td>41</td>
<td>8</td>
</tr>
<tr>
<td>96</td>
<td>1.2</td>
<td>6</td>
<td>31</td>
<td>56</td>
<td>9</td>
</tr>
</tbody>
</table>

### TABLE W-9 - SM PHYSICAL / MECHANICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Physical Characteristics</th>
<th>Mechanical Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cladding Diameter</td>
<td>Proof Test</td>
</tr>
<tr>
<td>125.0 ± 0.7 µm</td>
<td>100 kpsi (.96 Gpa)</td>
</tr>
<tr>
<td>Core/Clad Offset</td>
<td>0.3 – 2.0 lbf (1.3 – 8.9 N)</td>
</tr>
<tr>
<td>≤ 0.5 µm</td>
<td>Fiber Curl</td>
</tr>
<tr>
<td>Coating Diameter</td>
<td>≥ 4 m</td>
</tr>
<tr>
<td>(Uncolored)</td>
<td>Dynamic Fatigue Parameter (nd)</td>
</tr>
<tr>
<td>245 ± 10 µm</td>
<td>≥ 18</td>
</tr>
<tr>
<td>Coating Diameter (Colored)</td>
<td>Macrobending, max. (100 turns)</td>
</tr>
<tr>
<td>245 ± 7 µm</td>
<td>0.005dB (1310/1550nm @ 50mm) 0.05 dB (1625NM @ 60 MM)</td>
</tr>
<tr>
<td>Coating/Cladding Concentricity Error, Max</td>
<td>Marcobending, max. (1 turn @ 32 mm mandrel)</td>
</tr>
<tr>
<td>12 µm</td>
<td>0.05 dB @ 1550nm</td>
</tr>
<tr>
<td>Clad Non-Circularity</td>
<td>1%</td>
</tr>
</tbody>
</table>
TABLE W-10 - SM WAVELENGTH SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>1310 nm</th>
<th>1385 nm</th>
<th>1550 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Attenuation, Loose Tube Cable</td>
<td>0.34 dB/km</td>
<td>0.31 dB/km</td>
<td>0.22 dB/km</td>
</tr>
<tr>
<td>Max. Attenuation, Tight Buffer Cable</td>
<td>0.70 dB/km</td>
<td>0.70 dB/km</td>
<td>0.70 dB/km</td>
</tr>
<tr>
<td>Mode Field Diameter</td>
<td>9.2 ± 0.3 µm</td>
<td>9.6 ± 0.6 µm</td>
<td>10.4 ± 0.5 µm</td>
</tr>
<tr>
<td>Group Refractive Index</td>
<td>1.467</td>
<td>1.468</td>
<td>1.468</td>
</tr>
<tr>
<td>Dispersion, Max.</td>
<td>3.5 ps/(nm-km) from 1285 to 1330 nm</td>
<td>18 ps/(nm-km)</td>
<td></td>
</tr>
</tbody>
</table>

TABLE W-11 - SM FIBER GENERAL / ENVIRONMENTAL CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Optical Characteristics, General</th>
<th>Environmental Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Defects, Max.</td>
<td>0.10 dB</td>
<td>≤ 0.05 dB</td>
</tr>
<tr>
<td>Cutoff Wavelength</td>
<td>≤ 1260</td>
<td></td>
</tr>
<tr>
<td>Zero Dispersion Wavelength</td>
<td>1302 – 1322 nm</td>
<td></td>
</tr>
<tr>
<td>Zero Dispersion Slope, Max.</td>
<td>0.090 ps/(km-nm-nm)</td>
<td></td>
</tr>
<tr>
<td>Polarization Mode Dispersion Link Design Value</td>
<td>≤ 0.06 ps/sqrt(km)</td>
<td></td>
</tr>
<tr>
<td>Temperature Dependence -60 C to +85 C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Humidity Cycling -10 C to +58 C up to 95% RH</td>
<td>≤0.05 dB</td>
<td></td>
</tr>
<tr>
<td>Water Immersion, 23+2 C</td>
<td></td>
<td>≤0.05 dB</td>
</tr>
<tr>
<td>Heat Aging, 85 + 2 C</td>
<td></td>
<td>≤0.05 dB</td>
</tr>
</tbody>
</table>

8.10.3 Intra MDA Cabling Connectivity:
   a) These are the device and patch panel interconnection single mode fiber, multimode fiber, coaxial copper and CAT6 copper cables, this is within one MDA.
   b) All patch panels : see appendix C

8.10.4 Inter MDA Cabling Connectivity:
   a) The single mode fiber used within the data center shall be a bend insensitive type fiber, this fiber allows for a better bend radius for the fiber connectivity with data center. (See Appendix B for approved products and materials used). To reduce the amount of space used in the cable basket tray all single mode fiber shall be armored. The armored fiber does not require inner-duct. When installing armored fiber the cable shall be grounded at one end as instructed by manufacturer.
b) There shall be no less than 48 strands of single mode fiber along the primary cable pathway between the primary MDA and any secondary MDA, unless noted otherwise, by SSC Engineer.

c) There shall be no less than 48 strands of single mode fiber along the secondary cable pathway between the primary MDA and any secondary MDA, unless noted otherwise, by SSC Engineer.

d) The single mode fiber is used for any type of OCx telco circuits that will be terminated in the MDAs.

8.10.5 LNS Cabling Connectivity:

a) There shall be no less than two 24 strand -of single mode fiber terminated between the primary DA and the LNS cage. Strand count can only be modified by SSC Engineer.

b) Place diversity verbiage here. along two separate cabling pathways that are required to be no less than 10 feet apart.

d) These fiber strands shall be terminated in a 288 strand fiber panel with 24 strand bulkheads. If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.

8.10.6 Entrance Facility – Meet-me-Room (MMR) Cabling Connectivity:

a) There shall be no less than 48 strands of single mode fiber terminated between the primary MDA and the MMR cage along two separate cabling pathways that are required to be no less than 10 feet apart, for brand new data center installations.

b) These fiber strands shall be terminated in a 288 strand fiber panel with 24 strand bulkheads. If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.

8.10.7 HDA Cabling Connectivity

a) The single mode fiber cabling to the HDA is on customer-by-customer bases.

b) There is no cable count initially for the HDA patch panel rack.

8.10.8 Grounding and Bonding of Armored Fiber:

a) The single mode fiber shall be bonded to ground as specified by the fiber/cable manufacturer.

8.11 Multimode Fiber

8.11.1 All multimode fiber shall be plenum and armored enhanced 550 50/125 micron, OM4 fibers and terminated with LC connectors.

8.11.2 The multimode fiber shall meet or exceed the following cable specifications.
### TABLE W-12 - MM PHYSICAL / MECHANICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Physical Characteristics</th>
<th>Mechanical Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Diameter</td>
<td>Proof Test</td>
</tr>
<tr>
<td>50.0 ± 2.5 µm</td>
<td>100 kpsi (.69 Gpa)</td>
</tr>
<tr>
<td>Cladding Diameter</td>
<td>Coating Strip Force</td>
</tr>
<tr>
<td>125.0 ± 1.0 µm</td>
<td>0.3 – 2.0 lbf (1.3 – 9.8 N)</td>
</tr>
<tr>
<td>Core/Clad Offset</td>
<td>Dynamic Fatigue Parameter (nd)</td>
</tr>
<tr>
<td>≤ 1.5 µm</td>
<td>≥18</td>
</tr>
<tr>
<td>Coating Diameter (Uncolored)</td>
<td>Marcobending (100 turns @ 75mm mandrel)</td>
</tr>
<tr>
<td>245 ± 10 µm</td>
<td>0.50 dB max. @ 850 nm and 1300 nm</td>
</tr>
<tr>
<td>Coating diameter (Colored)</td>
<td></td>
</tr>
<tr>
<td>254 ± 7 µm</td>
<td></td>
</tr>
<tr>
<td>Coating/Cladding Concentricity Error, Max.</td>
<td></td>
</tr>
<tr>
<td>6 µm</td>
<td></td>
</tr>
<tr>
<td>Clad Non-Circularity</td>
<td></td>
</tr>
<tr>
<td>≤ 1%</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE W-13 - MM WAVELENGTH SPECIFICATIONS

<table>
<thead>
<tr>
<th>Optical Characteristics, Wavelength Specific</th>
<th>850 nm</th>
<th>1300 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Attenuation, Loose Tube Cable</td>
<td>3.0 db/km</td>
<td>1.0 dB/km</td>
</tr>
<tr>
<td>Max. Attenuation, Tight Buffer Cable</td>
<td>3.0 db/km</td>
<td>1.0 dB/km</td>
</tr>
<tr>
<td>Bandwidth, OFL, min.</td>
<td>3500 MHz-km</td>
<td>500 MHz-km</td>
</tr>
<tr>
<td>Bandwidth, laser, min</td>
<td>4700 MHz-km</td>
<td>500 MHz-km</td>
</tr>
<tr>
<td>Differential Mode Delay, max.</td>
<td>Superior to TIA-492AAAC and IEC 60793-2-10</td>
<td>0.88 ps/m</td>
</tr>
<tr>
<td>Group Refractive Index</td>
<td>1.483</td>
<td>1.479</td>
</tr>
<tr>
<td>1 Gb Ethernet Distance</td>
<td>1100 m</td>
<td>600 m</td>
</tr>
<tr>
<td>10 Gb Ethernet Distance</td>
<td>550 m</td>
<td>300 m (LX4)</td>
</tr>
</tbody>
</table>
TABLE W-14 - MM GENERAL / ENVIRONMENTAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Optical Characteristics, General</th>
<th>Environmental Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical Aperature</td>
<td>Temperature Dependence</td>
</tr>
<tr>
<td></td>
<td>-60 C to +85 C</td>
</tr>
<tr>
<td>Point Defects, max.</td>
<td>Temperature Humidity Cycling</td>
</tr>
<tr>
<td></td>
<td>-10C to +85C up to 95% RH</td>
</tr>
<tr>
<td>Zero Dispersion Wavelength</td>
<td>Water immersion, 23 + 2 C</td>
</tr>
<tr>
<td>1297 – 1316 nm</td>
<td>Heat Aging, 85 + 2 C</td>
</tr>
<tr>
<td>Zero Dispersion Slope, max</td>
<td></td>
</tr>
<tr>
<td>0.105 PS/((km-nm-nm))</td>
<td></td>
</tr>
</tbody>
</table>

8.11.3 Intra MDA Cabling Connectivity:

a) These are the device and patch panel interconnection single mode fiber, multimode fiber, coaxial copper and CAT6 copper cables.

8.11.4 Inter MDA Cabling Connectivity:

a) The multimode fiber is used for any inter MDA networking device connectivity. This can also be used for telco circuits that utilize multimode fiber such as GigaMAN connectivity. All inter phase multimode fiber runs shall be armored fiber. This is to reduce the amount of space in the cable basket tray. The armored fiber does not require innerduct to be pulled first and then the fiber to be pulled in the innerduct. When installing armored fiber the cable shall be grounded at both ends.

b) With all inter MDA multimode fiber connectivity shall be completed with enhanced 550 multimode, OM4 fiber. This is to support the higher speed bandwidth being supported within the data centers.

c) There shall be no less than 72 strand multimode fibers run along the primary cabling pathway between the primary MDA and all other secondary MDAs within the data center. (Strand count can only be modified by SSC Engineer.) If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.

d) There shall be no less than 72 strand multimode fibers run along the secondary cabling pathway between the primary MDA and all other secondary MDAs within the data center(Sstrand count can only be modified by SSC Engineer. ) If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.

8.11.5 Entrance Facility – Meet-me-Room (MMR) Cabling Connectivity:

a) There shall be no less than two (2) separate, 24 strand trunks ofSM and MM fiber routed between the primary MDA and the MMR cage along two separated cabling pathways that are required to be no less than 10 feet apart. (Strand count can only be modified by SSC Engineer. ) If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.
b) These fiber strands shall be terminated in a 288 strand fiber panel with 24 strand bulkheads. (Strand count can only be modified by SSC Engineer.) If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.

8.11.6 **HDA Cabling Connectivity:**

a) The multimode fiber cabling to the HDA is on customer-by-customer bases.

b) There is no cable count initially for the HDA patch panel rack.

8.12 **Coaxial Copper**

8.12.1 All coaxial copper cable shall meet or exceed the following specifications. 734C Coaxial Cable shall be used. 735C shall not be used under any circumstance.

8.12.2 The minimum inside bending radius of non-bundled coaxial cable and bundled 734 type coaxial type is 7 times the cable/bundle diameter.

8.12.3 The minimum inside bending radius of bundled coax (734 type) cable is 10 times the bundle diameter.

### TABLE W-15 COAXIAL CABLE CONSTRUCTION

<table>
<thead>
<tr>
<th>Coaxial Cable Construction:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Center Conductor:</strong> 20 AWG Solid Copper</td>
</tr>
<tr>
<td><strong>Dielectric:</strong> Foamed Fluorinated Ethylene Propylene (FFEP) Dia. Over Dielectric: 0.150” Nom.</td>
</tr>
<tr>
<td><strong>Shield:</strong> Foil: Aluminum/Poly Tape Braid: 34 AWG Tinned Copper 80% Covered Dia. Over Braid: 0.184” Nom.</td>
</tr>
<tr>
<td><strong>Jacket:</strong> Kynar (PVDF) Dia. Over Jacket: 0.215” +/- 0.004” Jkt. Thickness: 0.015” Nom. Min. Spot: 0.013”</td>
</tr>
</tbody>
</table>

### TABLE W-16 - COAXIAL ELECTRICAL / PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>ELECTRICAL PROPERTIES</th>
<th>PHYSICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sparker Test: 2500 VAC</td>
<td>Minimum Bend Test:</td>
</tr>
<tr>
<td>Dielectric Strength: Conductor to Shield: 5 Sec. @ 3500 VAC</td>
<td>Loaded: 20 Time cable OD</td>
</tr>
<tr>
<td>Shield to Shield: 1200 VAC</td>
<td>Unloaded: 10 Times</td>
</tr>
<tr>
<td>Capacitance: 17.0 pF/ft. Nom.</td>
<td>Cable OD</td>
</tr>
<tr>
<td>Impedance: 75.0 +/- 3.0 Ohms</td>
<td>Jacket Temp. Rating:</td>
</tr>
<tr>
<td>Velocity of Propagation: 80% Nom.</td>
<td>Temp.: 125°C</td>
</tr>
<tr>
<td>DCR: Conductor: 11.0 Ohms/1000 ft.</td>
<td></td>
</tr>
<tr>
<td>SRL: 30.0 dB Min. (15 – 95 MHz) 100% Swept Tested</td>
<td></td>
</tr>
</tbody>
</table>
TABLE W-17 - COAXIAL CABLE ATTENUATION

<table>
<thead>
<tr>
<th>ATTENUATION:</th>
<th>dB/100 Ft. (Nom.)</th>
<th>@ Frequency MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>.25 dB</td>
<td>1 MHz</td>
<td></td>
</tr>
<tr>
<td>.27 dB</td>
<td>1.024 MHz (CEPT-1)</td>
<td></td>
</tr>
<tr>
<td>.49 dB</td>
<td>4.224 MHz (CEPT-2)</td>
<td></td>
</tr>
<tr>
<td>.54 dB</td>
<td>5 MHz</td>
<td></td>
</tr>
<tr>
<td>.76</td>
<td>10 MHz</td>
<td></td>
</tr>
<tr>
<td>.99</td>
<td>17.184 MHz (CEPT-3)</td>
<td></td>
</tr>
<tr>
<td>1.15 dB</td>
<td>22.368 MHz (DS-3)</td>
<td></td>
</tr>
<tr>
<td>1.25 dB</td>
<td>25.920 MHz (STS-1)</td>
<td></td>
</tr>
<tr>
<td>1.69 dB</td>
<td>44.736 MHz</td>
<td></td>
</tr>
<tr>
<td>1.75 dB</td>
<td>50 MHz</td>
<td></td>
</tr>
<tr>
<td>2.09 dB</td>
<td>69.632 MHz (CEPT-4)</td>
<td></td>
</tr>
<tr>
<td>2.22 dB</td>
<td>77.760 MHz (STS-3)</td>
<td></td>
</tr>
<tr>
<td>2.53 dB</td>
<td>100 MHz</td>
<td></td>
</tr>
<tr>
<td>3.03 dB</td>
<td>137.088 MHz (DS-4)</td>
<td></td>
</tr>
<tr>
<td>3.79 dB</td>
<td>200 MHz</td>
<td></td>
</tr>
</tbody>
</table>

8.12.4 Intra MDA Cabling Connectivity:
   a) These are the device and patch panel interconnection single mode fiber, multimode fiber, coaxial copper and CAT 6 copper cables

8.12.5 Inter MDA Cabling Connectivity
   a) There shall be 96 coaxial cables run along the primary cabling pathway within the data center between the primary MDA and any secondary MDAs within the data center raised floor space. (Strand count can only be modified by SSC Engineer)

8.12.6 LNS Cabling Connectivity
   a) There shall be no less than 96 coaxial cables terminated between the primary MDA and the LNS cage. This connectivity does not require redundant cabling pathways. (Cable count can only be modified by SSC Engineer)
   b) These coaxial cables shall be terminated on a 1U 24 position modular patch panel with BNC couplers

8.12.7 Entrance Facility – Meet-me-Room (MMR) Cabling Connectivity:
   a) There shall be no less than 48 copper cables terminated between the primary MDA and the MMR cage. - (Cable count can only be modified by SSC Engineer.) If design calls out for fiber pre-term solution instead, SSC engineer will adjust and instruct accordingly.
   b) These fiber strands shall be terminated in a 288 strand fiber panel with 24 strand bulkheads. (Strand count can only be modified by SSC Engineer)

8.12.8 HDA Cabling Connectivity:
   a) The coaxial copper cabling to the HDA is on customer-by-customer bases.
   b) There is no cable count initially for the HDA patch panel rack.
8.12.9 Grounding and Bonding:

a) Coaxial Cable in a data center environment has no requirements of being grounded. The cable is grounded through the BNC connector that is connected to the panel which is grounded via the grounded rack/cabinet.

b) Coaxial cable only needs to be grounded in a tower environment. For more information, refer to the J-STD-607-A document, section C.10.

8.13 Category 6 Copper

8.13.1 All CAT 6 copper cable shall meet or exceed the following specifications. Electrical parameter (1 – 250 MHz) and guaranteed Channel Margins.

8.13.2 All CAT 6 shall not exceed the nominal bend radius of 4 times its outside diameter.

8.13.3 Intra MDA Cabling Connectivity:

a) These are the device and patch panel interconnection single mode fiber, multimode fiber, coaxial copper and CAT 6 copper cables.

b) There are three different type CAT 6 patch cords, straight through, cross over and roll over. See Figures 9.3, 9.4, 9.5, 9.6.

8.13.4 The Internet Data Centers shall use T-568B pin outs for terminations.

8.13.5 In the events where the cable needs to be extended, couplers shall not be used. At no time shall a coupler be used for any situation within the entire data center. See diagram below for an example of what a coupler looks like.

The following diagrams are intended to provide a visual depiction of the different types of CAT 6 copper cabling patch cords.

**FIGURE W-5 – UTP COPPER CABLE PIN OUT**
FIGURE W-6 - STRAIGHT THROW PATCH CABLE

FIGURE W-7 - CROSS OVER PATCH CABLE

FIGURE W-8 - ROLL OVER PATCH CABLE
8.13.6 Inter MDA Cabling Connectivity:
   a) The CAT 6 copper cable is for all DS0, DS1 and Ethernet connectivity in the data center.
   b) There shall be no less than 96 CAT 6 cables run along the primary cabling pathways between the primary MDA and any secondary MDAs within the data center raised floor space. (Cable count can only be modified by SSC Engineer)

8.13.7 LNS Cabling Connectivity:
   a) There shall be no less than 96 CAT 6 cables terminated between the primary MDA and the LNS cage. This connectivity does not require redundant cabling pathways.
   b) The CAT 6 copper cable terminations are for all DS0s, DS1 and Ethernet connections.
   c) The CAT 6 copper cables shall be terminated on a 1U 24 position modular patch panel with 10Gig RJ45 plugs.

8.13.8 Entrance Facility – Meet-me-Room (MMR) Cabling Connectivity:
   a) There shall be no less than 96 CAT6 cables terminated between the primary MDA and the MMR cage. This connectivity does not require redundant cabling pathways. (Cable count can only be modified by SSC Engineer)
   b) The CAT 6 copper cable terminations are for all DS0s, DS1, and Ethernet connections.
   c) The CAT 6 copper cables shall be terminated on a 1U 24 position modular patch panel with 10Gig RJ45 plugs.

8.13.9 HDA Cabling Connectivity:
   a) The CAT 6 copper cabling to the HDA is on customer-by-customer bases.
   b) There is no cable count initially for the HDA patch panel rack.

8.14 Cable connectors Type

8.14.1 The information here is to depict the different cables and there connector types. This includes single mode fiber, multimode fiber, coaxial copper and CAT 6 copper cables. See approved products list, Appendix C.

8.14.2 Single Mode Fiber:
   a) For Customer connections, All terminated fibers in the racks shall be mated to couplings, (adapter panels), mounted on patch panels. Couplings/Adapter Panels shall be mounted on a panel that, in turn, snaps into the housing assembly. Any unused panel positions shall be fitted with a blank panel inhibiting access to the fiber optic cable from the front of the housing.
      i. For Connections to LNS/AGN, fiber trunks on MDF side shall be the pre-connectorized MPO type to connect pre-term cassettes with front facing LC Connectors. On the LNS/AGN side, fiber trunks shall be to breakout harness to legs with SC connectors at the ends to plug into the rear of the adapter panel of the AGN standard OMX Panels. Each MPO connector contains 12 strands of fiber, thus there will be 12 individual cable legs with SC connectors at the ends.
      ii. For Connections in the MMR, fiber trunks on MDF side shall be of either pre-connectorized MPO type, or raw fibers to fusion splice into fiber pigtailed cassettes with
front facing LC or SC Connectors. On the MMR side, fiber trunks on MDF side shall be of either pre-connectorized MPO type, or raw fibers to fusion splice into fiber pigtailed cassettes with front facing LC or SC Connectors. The variation of Connector types varies from data center to data center.

iii. For connection to subtending MDFs from primary MDFs, fiber trunks on both sides shall be of either pre-connectorized MPO type, or raw fibers to fusion splice into fiber pigtailed cassettes with front facing LC Connectors.

b) Fibers shall be positioned consecutively and mapped "position for position" between patch panels. There shall be no transpositions in the cabling.

c) Unless specified, all single mode fiber jumpers shall have LC to LC connects. All single mode fiber panels shall have LC bulkheads.

8.14.3 Multimode Fiber:

a) For Customer connections, All terminated fibers in the racks shall be mated to couplings, (adapter panels), mounted on patch panels. Couplings/Adapter Panels shall be mounted on a panel that, in turn, snaps into the housing assembly. Any unused panel positions shall be fitted with a blank panel inhibiting access to the fiber optic cable from the front of the housing.

i. For Connections to LNS/AGN, fiber trunks on MDF side shall be the pre-connectorized MPO type to connect pre-term cassettes with front facing LC Connectors. On the LNS/AGN side, fiber trunks shall be to breakout harness to legs with SC connectors at the ends to plug into the rear of the adapter panel of the AGN standard OMX Panels. Each MPO connector contains 12 strands of fiber, thus there will be 12 individual cable legs with SC connectors at the ends. NOTE: Currently, LNS/AGN do not require any Multimode fiber, This statement shall act as a guide, should LNS/AGN ever feel a need to have Multimode installed in their space.

ii. For connections to the MMR fiber trunks on MDF side shall be of either per-connectorized MPO type, or row fiber to be fusion splice into fiber pigtail cassettes with front facing LC connectors or fiber pigtails with LC connectors. On the MMR side the fiber trunks shall be of either per-connectorized MPO type, or row fiber to be fusion splice into fiber pigtail cassettes with front facing LC connectors or fiber pigtails with LC connectors. There can be a variation in the connector types from data center to data center.

iii. For connection to subtending MDFs from primary MDFs, fiber trunks on both sides shall be of either pre-connectorized MPO type, or raw fibers to fusion splice into fiber pigtailed cassettes with front facing LC Connectors.

b) Fibers shall be positioned consecutively and mapped "position for position" between patch panels. There shall be no transpositions in the cabling.

c) Unless specified, all multimode mode fiber jumpers shall have LC to LC connects. All multimode fiber panels shall have LC bulkheads.

8.14.4 Coaxial Copper:

a) All coaxial copper cable jumpers shall be terminated with BNC connectors. All coaxial copper patch panels shall have BNC couplers.
8.14.5 **CAT 6 Copper:**

   a) At data patch panels, the installer shall ensure that the twists in each cable pair are preserved to within 0.5-inch of the termination for data cables. The cable jacket shall be removed only to the extent required to make the termination.

   b) All CAT 6 copper cable jumpers shall be terminated with RJ45 connectors. All Patch cables shall be stranded-type, not solid type. All CAT 6 copper patch panel shall have 10Gig plugs.

8.15 **Office Work Space**

8.15.1 The network connectivity cabling from the wiring closet to the workstation areas shall all be CAT 6 copper cables. Each work area shall have no less than 6 cables run from the wiring closet. This would be 4 cables for data and 2 cables for voice. The following describe the color code for the work area outlets: the 4 data outlets are – Blue, Red, Green and Yellow; the 2 voice outlets are – Black and White.

8.15.2 The onsite work force (OSWF) wiring closet shall not exceed the distance limitations of Ethernet cabling. If for some reason the work area distance is greater than the Ethernet distance limitation a second work area wiring closet is required.

8.16 **Cabling Testing**

8.16.1 All cabling installed in the data center shall be tested and certified. Results must be brought into acceptable levels at no cost to AT&T. This is inclusive of a new site MDA build out, an expansion MDA build out or a customer HDA.

8.16.2 At the conclusion of the before mentioned cabling installs, a complete set of cabling test results shall be provided by the network cabling low voltage contractor in either a printed format or an electronic format or both as specified by the AT&T representative. A copy of these results shall be supplied to the following list;

   a) The AT&T Data Center Operations Manager.

   b) The AT&T SSC Engineer (for MDA builds only).

8.16.3 **Single Mode and Multimode Fiber see TP76900**

8.16.4 All fiber testing shall be performed on all fibers in the complete end-to-end system. There shall be no splices unless clearly defined in an RFP. Testing consists of a bi-directional end to end OTDR trace performed per the EIA/TIA 455-61 and/or a bi-directional end-to-end power meter test performed per the EIA/TIA 355-53A. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode fiber and 1310 and 1500 for single mode fibers. These tests also include continuity checking of each fiber. Additionally, conformance to EIA/TIA 455-71 and EIA/TIA 526-14 are required.

8.16.5 Intra-building testing may be limited to power meter testing, but any inter-building or other outside plant fiber cabling requires OTDR testing.

8.16.6 The Installation Supplier shall test all fiber-optic cable prior to the installation of the cable. The Installation Supplier shall assume all liability for the replacement of the cable should it be found defective at a later date.
8.16.7 Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurement and dividing that sum by two. Any link not meeting the requirements of the standard shall be brought into compliance by the Installation Supplier, at no charge to AT&T.

8.16.8 No single mode optical fiber shall show a point discontinuity greater than 0.05 dB at the specified wavelengths (1310 and 1550 nm). Such a discontinuity or any discontinuity showing a reflection at that point shall be cause for rejection of that fiber by AT&T.

8.16.9 No multi-mode optical fiber shall show a point discontinuity greater than 0.2 dB at the specified wavelengths. Such a discontinuity or any discontinuity showing a reflection at that point shall be cause for rejection of that fiber by AT&T.

8.16.10 Documentation shall be provided in both electronic and hard copy to the designated points of contact. The designated points of contact may require only one type of format at their discretion.

8.16.11 The following tests shall be conducted as well for both Single and Multi-Mode Fiber runs:

a) ANSI/TIA/EIA-568-B.1 11.3.3.1 Horizontal Link Measurement
   i. The horizontal link segment is from the telecommunications outlet/connector to the horizontal cross-connect. The horizontal optical fiber cabling link segments need to be tested at only one wavelength. Because of the short length of cabling (90 m [295 ft] or less), attenuation deltas due to wavelength are insignificant. The horizontal link should be tested at 850nm or 1300nm in one direction in accordance with ANSI/EIA/TIA-526-14-A, Method B, One Reference Jumper. The attenuation test results shall be less than 2.0 db. This value is based on the loss of two connector pairs, one pair at the telecommunications outlet/connector and one pair at the horizontal cross-connect, plus 90m (295 ft) of optical fiber cable.

b) ANSI/TIA/EIA-568-B.1 11.3.3.2 Backbone Link Measurement
   i. There are three typical backbone link segments: main cross-connect to intermediate cross-connect, main cross-connect to horizontal cross connect and intermediate cross-connect to horizontal cross-connect. The backbone optical fiber cabling link segment shall be tested in at least one direction at both operating wavelengths to account for attenuation deltas associated with wavelength. Single mode backbone links should be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7 Method A.1 One Reference Jumper. Multimode backbone links shall be tested at 850 nm or 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation (16) should be used to determine acceptance values based upon this Standard’s component requirement at each of the applicable wavelengths.

c) ANSI/TIA/EIA-568-B.1 11.3.3.4 Link Attenuation
   i. The acceptable link attenuation for a recognized horizontal optical fiber cabling system is based on the maximum 90m (295 ft) distance. The link attenuation equation is provided to determine acceptable link performance for multimode and single mode backbone cabling systems.

d) Link Attenuation = Cable Attenuation + Connector Insertion Loss + Splice Insertion Loss.
8.16.12 Coaxial Copper:

a) All coaxial copper cable shall be tested with a BERT test to accurately provide testing results for the complete connectivity for a DS3 circuit.

b) At a minimum the coaxial cable shall be tested in a manner that depicts continuity and ohms test results.

c) When testing coaxial cable the cable installer shall use a Fluke DTX – 1800 test set with the female-to-female F-connector adapters (standard). The F-connectors shall then be attached to the BNC adapters for testing.

d) A physical test shall also be completed to ensure that all connectors have been installed properly and securely fastened. Should the connectors not be securely fastened, they shall be replaced, reinstalled and retested at no expense to AT&T.

e) The cables shall be terminated with its characteristics impedance, and in the case of 70-75 ohm, DS3 cable, an appropriate matching pad shall be used to match the analyzer to the cable. Cable shall be rejected if any single fault is observed of amplitude greater than .003 voltage reflection coefficient. Characteristic Impedance shall also be measured at 5% of nominal value.

8.16.13 CAT 6 Copper:

a) Testing of all cabling shall be performed prior to acceptance. 100 percent of the horizontal and riser wiring pairs shall be tested according to current EIA/TIA 568B and meet minimum Systimax guaranteed channel performance margins. Horizontal cable testing shall be a Channel test. The CAT 6 cable runs shall be tested for conformance to the current specifications of EIA/TIA 568B CAT 6 including all relevant Technical Service Bulletins. All CAT 6 testing shall be performed with a Fluke DTX-1800. Any pairs not meeting the requirements of the standard and guaranteed channel performance margins shall be brought into compliance by the Installation Supplier, at no charge to AT&T. Any failed or physically damaged cables shall be replaced and retested successfully, at no charge to AT&T. Results marked with an * are not acceptable and must be brought into acceptable levels at no cost to AT&T. Complete end to end test results must be submitted to AT&T in electronic format and a paper copy as required.

b) A minimum of 10% of the cabling will be tested and verified by the On Site Work Force or a third party vendor at AT&T’s choice.

c) Cabling standards will use the Channel Link for testing purposes. The Channel configuration includes the end-to-end cabling components necessary to interconnect two pieces of communications devices. Therefore, channel performance determines the overall quality of the communications and provides a true indication of end-to-end cabling system performance. All applications refer to end-to-end channel performance.

d) The Channel test configuration is intended to be used by system designers and users of data telecommunications systems to verify the end-to-end performance of cabling systems. It is important to note that the Channel includes the work area cords, equipment cords and cross-connects that make up the end-to-end cabling system.
e) Channel under test. The 4-connector channel includes up to 295 ft. (90 m) of horizontal cable, a work area cord, a telecommunications outlet/connector, an optional transition point close to the work area, and 2 cross-connect connections in the telecommunications closet. The total length of equipment cords, patch cords, and jumpers shall not exceed 32 ft. (10 meters). The connections to the equipment at each end of the channel are not included in the channel definition.

9 Workmanship

9.1 Installation Supplier

9.1.1 The Installation Supplier selected for a project must be proficient in using the manufacturer's products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this project.

9.1.2 The Installation Supplier shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. A minimum of three (3) years of experience is required.

9.1.3 The Installation Supplier shall own and maintain tools and equipment necessary for successful installation and testing of optical and CAT 5/6 metallic premise distribution systems and have personnel who are adequately trained in the use of such tools and equipment a minimum of three (3) years of experience on similar cabling systems.

9.1.4 The strut frame work shall be installed as specified and designed in the Project drawings and shall be strong enough to support the two (2) tiers of basket trays and its contents. The strut frame work shall be installed as per the instructions provided by the strut manufacturer.

9.1.5 When working with any materials for any project the Installation Supplier should perform a complete and thorough clean up prior to leaving for the day.

9.1.6 All cable damaged during the installation of the project shall be removed, replaced and retested at no expense to AT&T.

9.1.7 All cut materials that are to be installed shall have any sharp or rough edges finished with a file or grinder.

9.1.8 The Installation Supplier shall coordinate the installation of the basket tray and frame work with plumbing and HVAC Contractors so that clearance is maintained between the cable tray and other trades work. This clearance shall be a minimum of one (1) foot on both sides of the basket tray and six (6) inches from the top of the rack to the bottom of the strut supporting the cable basket tray.

9.1.9 Additionally, any scratches or blemishes to the materials shall be touched up with the appropriate finish coating.

9.1.10 Cable shall not hang or spill over past the edge of the pathways and vertical cable managers. If a patch cable is too short, it shall not be used.

9.1.11 Cable entering & exiting equipment racks shall be run so they do not block access for future cables.
9.1.12 Cables shall be installed via dedicated routes, (under floor, overhead and in the frame uprights), neatly dressed and combed. There is no requirement for bundling the cables underneath the raised floor in basket trays. Velcro tie wraps shall be used above the raised floor, where the aesthetic appearance adds value to the data center. It is recommended that Velcro tie wraps be used every 8 – 12 inches. Nylon tie wraps shall not be used.

9.1.13 Cables shall be secured on racks with the use of Velcro tie wraps. E.G. leading down the vertical managers to the back of the patch panels for termination. Nylon tie wraps shall not be used.

10 Warranty

10.1 Manufacturer and Contractor

10.1.1 The Installation Supplier shall provide a minimum of 3-year installation warranty that is separate from the product warranty. All cable tests must meet or exceed the manufacturer’s minimum guaranteed levels.

10.1.2 Systimax provides a 20-year warranty and when using a Systimax certified installer. The Installation Supplier must provide the Installation Certificate to the Operations Manager.

11 Network Element Cabling Labeling

11.1 Date Center Raised Floor Grid

11.1.1 In rooms that have access floor systems, identification for the location shall use the access floor grid identification scheme described in this clause. In rooms without access floor, the ceiling tile grid, if present, should be used as the basis for location identification. If the room has neither a floor tile grid nor ceiling tile grid, a grid should be applied to the floor plan. The grid should be dense enough to ensure that two cabinets do not occupy the same grid coordinates – consider grid spacing of 24 in (600 mm).

11.1.2 The quantity of characters used along the “X” and “Y” axes shall be adequate to cover the entire grid space.

11.1.3 The “X” and “Y” axes may be reversed to minimize the quantity of characters required – consider selecting the long axis of the room as the “X” axis and the short axis of the room as the “Y” axis.

11.1.4 The starting point for the grid may be any one of the four corners of the space to be covered.

11.1.5 When selecting the starting point, consider the direction in which the room might be expanded.
11.2 Cabinet/Rack ID – Grid Location ID

11.2.1 Cabinets and racks are identified by using a grid system from the above stated IDC floor grid. Utilizing the right facing corner of the cabinet or rack and the raised floor grid the ID can be formulated. As an example using the diagram below rack AD07 is identified by the right facing corner being in grid location “X” axis coordinate AD and the “Y” axis coordinate 07. If you notice there is no cabinet or rack ID of AD09, the cabinets or racks being used in this example are wider then a 2 foot (600 mm) square floor tile and can cause the cabinets or racks right facing corner to skip a grid coordinate location.
11.3 Rack / Cabinet Labeling

11.3.1 Rack/cabinet label identifiers are derived from the IDC raised floor grid using the "X" and "Y" axis coordinates.

11.3.2 All racks and/or cabinets shall be designated at the top and bottom as well as front and back of the each rack/cabinet, see figure below for more details.
Note: By labeling each rack and/or cabinet with a unique identification number makes it easier in found its location within an IDC.

11.4 Trunk Cables

11.4.1 Trunk or tie cables are defined as cables that are run between two distribution areas of a building. In the case of an Internet Data Center these cables are placed between the following locations; 1) Primary MDA and the MMR; 2) Primary MDA and the LNS cage; 3) Primary MDA and the Secondary MDAs; 4) Any MDA and an IDF of a customer’s cage or a managed cage.

11.4.2 Label color coding is as follows; 1) trunk cables from the MMR and the LNS cage or room to the Primary MDA or to any other MDA in the IDC shall be labeled with White Labels; 2) trunk cables between the Primary MDA and any Secondary MDAs shall be labeled with Gray labels; 3) trunk cable labels from and MDA to any IDF shall be labeled with Blue labels. All the before mentioned labels shall be printed as indicated here; Black ink on White label, Black ink on Gray label, and White ink on Blue label.
11.5 **Label Field Identifiers and/or Numbering**

11.5.1 Each trunk cable or bundle of cables shall be identified with a numbering scheme to determine the location of either end of the trunk or bundle of cables.

Sample of a 50 micron multimode fiber cable label from the Primary MDA to a Secondary MDA:

**MDA/MDF to MDA/MDF Multimode 50 Micron Fiber**

<table>
<thead>
<tr>
<th>Label – 1 (MDA1 Side)</th>
<th>Label – 2 (MDA2 Side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near End: M001M5LGXA01AD0741072.013-084</td>
<td>Near End: M002M5LGXB01BA1226072.145-216</td>
</tr>
<tr>
<td>Far End: M002M5LGXB01BA1226072.145-216</td>
<td>Far End: M001M5LGXA01AD0741072.013-084</td>
</tr>
</tbody>
</table>

The cable identifier will follow a similar format as the equipment patch cables (near end / far end), example as follows:

a) **Near End: M 001 M5 LGX A 01 AD 07 41 072 . 013-084** (spaces have been added for readability)

1) M = MDA/MDF or IDF of the IDC
2) 001 = the number of MDA/MDF or IDF in the IDC
3) M5 = 50 micron multimode fiber
4) LGX = fiber patch panel (Light Guide Cross Connect)
5) A = Building in IDC complex
6) 01 = floor number, (this field can be more than 2 characters long)
7) AD = “X” axis coordinate of Data Center Floor Space, (this field can be more than 2 characters long)
8) 15 = “Y” axis coordinate of Data Center Floor Space, (this field can be more than 2 characters long)
9) 41 = RU Rack Unit (RU number starts at the bottom of the rack and goes up)
10) 072 = is the number of strands or cables in a bundle
11) . = Separator
12) 013 – 084 = the single fiber port on the back of a patch panel

b) Far End: M 002 M5 LGX B 01 BA 12 26 072 . 145-216 (spaces have been added for readability)

1) M = MDA/MDF or IDF of the IDC
2) 002 = the number of MDA/MDF or IDF in the IDC
3) M5 = 50 micron multimode fiber
4) LGX = fiber patch panel (Light Guide Cross Connect)
5) B = Building in the IDC complex
6) 01 = floor number, (this field can be more than 2 characters long)
7) BE = “X” axis coordinate of Data Center Floor Space, (this field can be more than 2 characters long)
8) 67 = “Y” axis coordinate of Data Center Floor Space, (this field can be more than 2 characters long)
9) 26 = RU Rack Unit (RU number starts at the bottom of the rack and goes up)
10) 072 = is the number of strands or cables in the bundle
11) . = Separator
12) 145 – 216 = the single fiber ports on the back of a patch panel
11.5.2 Cable label field definitions are listed below using sample “M001C6COPA01GX6943012.007-018”:

**TABLE W-18 - CABLE LABEL FIELD DEFINITIONS**

<table>
<thead>
<tr>
<th>M</th>
<th>001</th>
<th>C</th>
<th>6</th>
<th>CO</th>
<th>P</th>
<th>A</th>
<th>01</th>
<th>A</th>
<th>H</th>
<th>08</th>
<th>43</th>
<th>01</th>
<th>2</th>
<th>007-018</th>
</tr>
</thead>
</table>

- **The number of fiber stands in a fiber cable or the number of copper cables in a bundle or a single coax cable**
- **A separator**
- **This indicates the total number of fiber strands or individual copper cables in the bundle**
- **RU (Rack Unit, the numbering starting at the bottom of the rack and goes up)**
- **This is the “Y” axis coordinates of the raised floor space of an IDC, this can be more than 2 characters long**
- **This is the “X” axis coordinates of the raised floor space of an IDC, this can be more than 2 characters long**
- **This is the floor number of the building and can be more than 2 characters long. Positive numbers are floors above ground, B1 = basement levels, L1 = lower levels.**
- **The letter indicates the number of the buildings in the IDC complex A – Z**
- **Indicated the type of cabling patch panel; 1) LGX = fiber panel (Light Guide Cross-Connect); 2) COP = category 6 UTP panel; 3) COX = coaxial copper panel**
- **Indicates the type of cables in the rack; 1) MM = 62.5 micron multimode fiber; 2) M5 = 50 micron multimode fiber; 3) SM = single mode fiber; 4) C6 = category 6 copper; 5) CX = coaxial copper**
- **The 001 is defined as the number of MDAs/MDFs or HDAs/IDFs in an IDC. These can be on multiple floors of a single or even multiple buildings**
- **The M and I are defined as follows; 1) M – MDA/MDF; 2) I – IDF. These can be on multiple floors of a single building or even multiple buildings**
11.6 Patch Panel Port Numbering

11.6.1 A 288 strand 4RU fiber panel supporting up to 144 ports, (ports being a pair of fiber strands) shall be numbered per Figure 12.

FIGURE W-12 - 4RU FIBER PANEL
11.6.2 A 192 strand 2RU fiber panel supporting up to 96 ports, (ports being a pair of fiber strands) shall be numbered per Figure 13.

**FIGURE W-13 - 2RU FIBER PANEL**

192 STRAND - 2RU SINGLE MODE / MULTIMODE FIBER PANEL

11.6.3 A 96 strand 1RU fiber panel supporting up to 48 ports, (ports being a pair of fiber strands) shall be numbered per Figure 14.

**FIGURE W-14 - 1RU FIBER PANEL**

96 STRAND - 1RU SINGLE MODE / MULTIMODE FIBER PANEL
11.6.4 A 24 port 1 RU Category 6 UTP copper patch panel shall be numbered per Figure 15. The panel is modular so and requires inserts.

**FIGURE W-15 - 1RU CAT 6 PATCH PANEL**

11.6.5 A 24 port 1 RU Coaxial copper patch panel shall be numbered per Figure 16. The panel is modular so and requires inserts.

**FIGURE W-16 - COAXIAL PATCH PANEL**

11.7 MDA Patch Cords

11.7.1 Patch cables are defined as cables connecting active equipment to active equipment or active equipment to a patch panel utilizing one of the following cable types, Single Mode Fiber, Multimode Fiber, UTP Category 6 Copper and Coaxial Copper.

11.7.2 The patch cord labels shall follow the standards currently being used by the IDCs. The following is a sample label:

Near End: MDF001C6513R0001

Far End: MDF001C6513R0003
12 Appendix A

12.1 Cabling Standards

Other applicable standards are as follows:

- ANSI/TIA/EIA-568-B.1 and addenda
  “Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements”
- ANSI/TIA/EIA-568-B.2 and addenda
  “Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair”
- ANSI/TIA/EIA-568-B.3 and addenda
- ANSI/TIA/EIA-569-A and addenda
  “Commercial Building Standard for Telecommunications Pathways and Spaces”
- ANSI/TIA/EIA-606 and addenda
  “Administration of the Telecommunications Infrastructure of Commercial Buildings”
- ANSI/TIA/EIA-607 and addenda
  “Commercial Building and Grounding Requirements for Telecommunications”
- ANSI/TIA/EIA-526-7
  “Measurement of Optical Power Loss Measurements of Installed Single-Mode Fiber Cable Plant”
- ANSI/TIA/EIA-526-14A
  “Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant”
- IEC/TR3 61000-5-2- Ed. 1.0 and amendments
  “Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthling and cabling”
- ISO/IEC 11801:2000 Ed 1.2 and amendments
  “Information Technology – Generic cabling for customer premises”
- CENELEC EN 50173:2000 and amendments
  “Information Technology – Generic cabling systems”

12.2 Reference Documents

The latest edition of referenced standards (from the latest available draft in the case of proposed standards) shall be the controlling document. Where the standards appear to conflict with one another, the one with the most stringent requirements shall be applicable.

- ANSI/ICEA S-90-661 and amendments
  “CAT 3, 5, and 5e individually UTP indoor cables used for general purpose and LAN communication wiring systems”
- CSA
  “Canadian Standards Association”
- UL 444 and addenda
  “Underwriters Laboratories – Standard for Safety for Communications Cable”
- ISO/IEC 11801:2000 Ed 1.2 and amendments
  “Information Technology – Generic cabling for customer premises”
- NEC, NFPA 70 and amendments
  “National Fire Protection Association, Inc. – National Electric Code requirements for residential, commercial and industrial installations”
- NEMA WC 63.1 and amendments
  “Performance Standard for Twisted Pair Premise Voice and Data Communications Cable”
- ANSI/NEMA WC 63.2 and amendments
  “Performance Standard for Coaxial Premise Data Communications Cable”
NEMA WC 66 -2001 and amendments
“Performance Standard for CAT 6 and CAT 7 100 OHM Shielded and Unshielded Twisted Pair Cables”

In addition to the requirements shown above, all indicated cables shall meet or exceed the requirements of:

ANSI/TIA/EIA-568-B.1 (CAT 6) and addenda
“Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements”
ANSI/TIA/EIA-568-B.2 (CAT 6) and addenda
“Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair”
ISO/IEC 11801:2000 Ed 1.2 (CAT 6) and amendments
“Information Technology – Generic cabling for customer premises”
ANSI/TIA/EIA-942 and addenda
“Telecommunications Infrastructure Standard for Data Centers”

All connecting hardware and patch cords shall previously meet, as a minimum, all the requirements including the electrical and mechanical performance requirements of:

CSA
“Canadian Standards Association”
UL 1863 and addenda
“Communication Circuit Accessories”
ANSI/TIA/EIA-568-B.1 and addenda
“Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements”
ANSI/TIA/EIA-568-B.2 and addenda
“Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair”
ANSI/TIA/EIA-568-B.3 and addenda
ISO/IEC 11801:2000 Ed 1.2 and amendments
“Information Technology – Generic cabling for customer premises”
ISO/IEC 60603-7 and amendments
“Connectors for Electronic Equipment - Detail specification for 8-way, shielded, free and fixed Connectors, for data transmissions with frequencies up to 600 MHz”
CENELEC EN 50173:2000 and amendments
“Information Technology – Generic cabling systems”
NEC, NFPA 70 and amendments
“National Fire Protection Association, Inc. – National Electric Code requirements for residential, commercial and industrial installations”

ANSI/NFPA 70 - National Electrical Code. (US Only)
ASTM A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
ASTM A 607 -- Specification for Steel Sheet and Strip, Hot-rolled and Cold-Rolled, High Strength, Low-Alloy Columbium and/or Vanadium
ASTM B 633 -- Specification for Electro-deposited Coatings of Zinc on Iron and Steel
NEMA VE 1 - Metallic Cable Tray Systems. (US Only)
Conform to requirements of ANSI/NFPA 70. (US Only)

The following AT&T TP docs shall also be referenced with these documents that pertain to current Internet Data Center Installation Standards are identified by the following Practices and will be used to support the audits in all cases unless specific waivers are authorized:

- ATTP-TP-76300 – All Sections AT&T Internet Technical Publication Notice & All Associated Sub-Reference Documents
- ATTP-TP-76403 Grounding and Bonding Requirements for Internet Service Facilities
- ATTP-TP-76408 Common Systems Network Facility Auxiliary Framing and Bracing Requirements
- ATTP-TP-76409 Common Systems Network Facility Cable Rack Requirements
- ATTP-TP-76416 Grounding and Bonding Requirements for Network Framing

All Standards and Reference documents shall be adhered to during all installation activities. Methodologies outlined in the latest edition of the BICSI Telecommunications Distribution Methods Manual, (Latest Version), shall also be used during all installation activities. Should conflicts exist with the foregoing, the authority having jurisdiction for enforcement will have responsibility for making interpretation.

13 Appendix B

13.1 Acronyms and abbreviations

AHJ Authority Having Jurisdiction

ANSI/ITIA/EIA-942 – Telecommunications Standards for Data Centers that provides structured cabling guidance for designing and building data centers.

Dives – Cable runs that cause a significant difference in cable length at the terminating point in comparison to the other cable runs of the same link.

EDA – Equipment Distribution Area – is the location of equipment cabinets or racks in the HDA, (Horizontal Distribution Area) and is where the Rack/Cabinets reside.

ER – Entrance Room – The space that is provider- and customer-owned, where it functions as the interface between the structured cabling from the data center and the inter-building cabling. Carrier equipment and Demarcation are located in this room.

ESD Electrostatic Discharge

HC – Horizontal Crossconnect – is the distribution point for cabling from the NDA to the mechanical termination, (patch panel), in the ZDA.

HDA – Horizontal Distribution Area – an area in a data center or phase that serves as the distribution point for horizontal cabling and houses HC and equipment for connectivity to the ZDA and EDA. For AT&T Hosting Data Centers it is where LAN/San/KVM switches reside.

HVAC heating, ventilation, and air Conditioning

IDC insulation displacement contact

IDF – Intermediate Distribution Frame – A term used for a frame in Central Office, (CO), or Customer premise environments that cross-connects cable of all media types to individual user line circuits and may serve as a main distribution point for multipair cables from the MDF to individual cables connected to equipment in areas remote from these frames.
ISO/IEC 11801 – International Standards Organization that specifies generic cabling for use within premises, which may comprise single or multiple buildings on a campus. It covers balanced cabling and optical fiber cabling.

**MC** – Main Cross-connect – Central point of distribution for structured cabling system for the core data center and phase that the MDA is servicing.

**MDA** – Main Distribution Area – (formerly MDF) – is the location of the MC that is centrally located to avoid exceeding maximum distances restrictions and includes the HC when equipment areas are directly served from the MDA. Every data center shall have at least one MDA. For AT&T Hosting Data Centers it is where the Routers, Backbone LAN/SAN Switches reside.

**MDF** – Main Distribution Frame – A term used for a frame in Central Office, (CO), or Customer premisis environments that is a signal distribution frame for connecting equipment, (inside plant) to cables and subscriber carrier equipment (outside plant).

**MoW** Most of World

**NEC** National Electrical Code

**NFPA** National Fire Protection Association

**OTDR** optical time domain reflectometer

**SCS** Structured Cabling System

**ScTP** screened twisted-pair

**TIA** Telecommunications Industry Association

**UTP** unshielded twisted-pair

**ZDA** – Zone Distribution Area – is the consolidation point, (interconnection), within the HDA. This space typically also includes patch panels for connecting equipment.

14 Appendix C

Click on Link to view Approved Parts List

[Approved Parts List]