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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 ATT-TP-76300, AT&T Installation Requirements, provides general requirements when doing equipment installation, modification, removals or building work activity in AT&T Technical Space.

Examples of AT&T Technical Space: COs (including ILEC COs), MTSOs, NTCs, RTCs, SNRCs, L-T POPs, VHOs, OSP Huts, CEVs, Environmentally Controlled Cell Sites, some Customer Premises, EDC, IDC, AIC Technical Space, etc.

1.1.4 Changes in this issue of Section A are summarized in Table A-1.

1.1.5 AT&T assumes no responsibility for any costs incurred by a given manufacturer or Supplier in conforming to the requirements of ATT-TP-76300. 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.

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

1.1.7 AT&T reserves the right to audit Installation Suppliers for compliance to ATT-TP-76300. Questions concerning the audit process or quality results should be referred to:

a) AT&T - U.S. Quality Assurance:

402 N 3RD ST
FLOOR 2
Saint Charles, MO 63301
Attention: Christine Holmes
ch5039@att.com

1.2. Scope

1.2.1 ATT-TP-76300 applies to all types of technical equipment installations, e.g., switching, transmission, power, etc and building infrastructure along with Electronic equipment that performs the telecommunications operations for the transmission of audio, video, and data, including technical support equipment (e.g. computers).

1.2.2 ATT-TP-76300 is applicable to all installation activities in the AT&T Technical Space, regardless of who performs the work. This includes AT&T personnel, Competitive Local Exchange Carriers (CLECs) personnel, as well as any contracted installation suppliers performing work for AT&T or on behalf of CLECs. For installations at Public Safety Answering Point (PSAP) locations, refer to ATT-TP-76911.
Note: ATT-TP-76300 is not applicable to installation activities in MOW and MTS.

1.2.3 The intent of ATT-TP-76300 is to familiarize the Installation Supplier with AT&T 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 involvement during the various aspects of the installation operation.

1.3. Definitions

1.3.1 Definitions of certain terms used in ATT-TP-76300 are as follows:

a) **AT&T Equipment Engineer** - AT&T equipment engineering representative or AT&T real estate management representative who is directly responsible for the installation in progress and who has overall responsibility for ensuring job completion and acceptance.

b) **AT&T Representative** - AT&T person(s), designated by the AT&T Equipment Engineer, who has responsibility for the daily coordination between the Installation Supplier’s on-site personnel and AT&T.

c) **Installation Supplier** - The provider of installation services, including telecommunications equipment and building infrastructure installation service providers, as well as AT&T personnel who perform installation activities, within the Carrier Communications Space of AT&T.

d) **Carrier Communications Space** - Existing Network Technical Space that is dedicated to housing telecommunications equipment infrastructure and utilizes the National Electric Code (NEC) Exclusion and Fire Code Sprinkler Exemption (e.g., COs, NTCs, SNRCs, MTSOs, etc.) (Provided by Tech Ops) [Domain 2.0]

e) **DESP** – Detail Engineering Service Provider

f) **High Seismic Zone** – Earthquake zones 3 and 4 as defined by USGS (United States Geological Survey).

g) **Installation activity** - Any activity provided by an Installation Supplier including, but not limited to, additions, modifications, removals, work performed on building infrastructure, and/or other contractual services performed within the Carrier Communications Space of AT&T.

h) **EJF** – Electronic Job Folder a mechanized system where job documentations are stored.

i) **Low Seismic Zone** - Earthquake zones 0, 1, and 2 as defined by USGS (United States Geological Survey).

j) **Shall** - Something that is mandatory and subject to audit.
k) **Should** - Something that is recommended.

### 1.4. General Requirements

1.4.1 Unless otherwise indicated on the Checklist of Current Sections, ATT-TP-76300 requirements become effective for jobs completing 90 days or more after the section issue date. The Checklist of Current Sections at the front of ATT-TP-76300 indicates the issue date and the effective date of each section. Revisions may be issued on a section-by-section basis. Along with the revised section(s), an updated Checklist of Current Sections will be issued to indicate the current issue date and effective date for each section.

1.4.2 The Installation Supplier shall contact the AT&T Equipment Engineer to request any variance from ATT-TP-76300. The Installation Supplier shall provide documentation of approved variances in the job folder at the job site.

1.4.3 The Installation Supplier shall have the ATT-TP-76300 currently in effect available (may be electronic or paper copy) at the job site.

1.4.4 The Installation Supplier shall have the detail specification available (may be electronic or paper copy) at the job site.

1.4.5 The Installation Supplier shall have available (may be electronic or paper copy) at the job site a copy of the appropriate AT&T equipment and interconnect drawings.

1.4.6 The Installation Supplier shall have available, electronically or paper, at the job site a copy of all furnished manufacturers’ drawings as required in the detailed specification.

1.4.7 The Installation Supplier shall refer questions pertaining to the detail engineering of the job to the appropriate detail engineer.

1.4.8 Limited to scope of the AT&T order and SPEC, the Installation Supplier shall notify the Detail Engineering Service Provider (DESP) and the AT&T Equipment Engineer in writing, of any conditions or items that do not meet the job (AT&T order and SPEC) documentation and specifically applicable and directly associated ATT-TP-76300 requirements.

1.4.9 The documents listed in Table A-2 support ATT-TP-76300 and provide additional details. The Installation Supplier shall have access to these documents and shall refer to them as needed.

1.4.10 The Installation Supplier shall correct all **CRITICAL** defects within 5 business days of notification, unless otherwise specified.

1.4.11 The Installation Supplier shall correct all **MAJOR** and **MINOR** defects within 30 days of notification, unless otherwise specified.

### 1.5. Quality Assurance Programs

1.5.1 The Installation Supplier shall comply with all Quality Assurance Programs as specified by the Regional Quality Assurance Organizations in support of Common Systems requirements.

### 1.6. Proprietary Information
1.6.1 All proprietary documents referenced in ATT-TP-76300 are available to contracted Suppliers through signed nondisclosure agreements or as detailed in current contracts between AT&T and Supplier.

1.7. Ordering Information

1.7.1 Internet access is available to approved suppliers for downloading electronic copies of ATT-TP-76300 and other non-proprietary AT&T references. Information concerning TP access can be obtained by going to this link https://ebiznet.sbc.com/sbcnebs/intropage3.htm.

1.7.2 Non-AT&T publications referenced herein should be obtained from the originator of the publication.

1.8. Comments On ATT-TP-76300

1.8.1 Comments on ATT-TP-76300 shall be submitted by e-mail to:

Serena Kwong
Specialist - Technical Process/Quality
sk5945@att.com
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TABLE B-1 – SUMMARY OF CHANGES IN SECTION B

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<td>1.2.19</td>
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B-1
1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 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.

1.1.4 Changes in this issue Section B are summarized in Table B-1.

1.1.5 Many of the items addressed in this section (e.g., building facilities, building conditions, etc.) will require joint AT&T/Installation Supplier review in advance of the actual installation activity. Sufficient time will 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 AT&T Equipment Engineer.

1.1.6 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, the manufacturer’s requirements shall apply.

1.1.7 The Installation Supplier shall provide at a minimum, a Level 3 employee (see Section C) on-site to oversee any non-volatile work performed by the Installation Supplier’s non-approved subcontractors.

1.1.8 The Installation Supplier shall provide a Level 4 employee (see Section C) on-site to oversee any volatile work performed by the Installation Supplier’s non-approved subcontractors.

1.2. Safety

1.2.1 The Installation Supplier shall be entirely responsible for the safety and instruction of its employees or representatives.

1.2.2 All temporary installations shall adhere to the safety requirements for permanent installations.

1.2.3 The Installation Supplier shall take precautions to avoid harm to personnel, equipment and building (e.g., cutting installed threaded rod).

1.2.4 The Installation Supplier shall suspend work operations immediately when so instructed by AT&T.

1.2.5 The Installation Supplier shall immediately report to the AT&T Representative any accident, outside agency inspection or hazardous condition, including:
a) Any accident or injury that occurs to employees or subcontractors of the Installation Supplier while on AT&T premises.

b) Any OSHA inspection or citations issued to the Installation Supplier while on AT&T premises.

1.2.6 Floors and work area shall be kept free of all potential hazards. The Installation Supplier shall avoid creating a slip or trip hazard.

1.2.7 Temporary storage of combustible materials during installation projects in non-fire suppressed Technical Spaces and electrical/mechanical areas is not permitted without prior approval from the site manager and documented as appropriate (JSA, MOP, etc.).

1.2.8 If space is available, secured storage containers outside of the building should be provided by installation contractors for combustible storage. All installation materials and network equipment packaging or transport structures that may be considered combustible requiring storage on site shall be stored away from network equipment, in-service network equipment and energized electrical equipment areas. Package staging areas in the building protected by suppression systems may be used for temporary storage if available.

1.2.9 If there is no other option for the temporary storage of combustible packaging materials and transport structures except within equipment areas or non-fire suppressed staging areas, then a fire retardant and anti-static tarp shall be used. The tarp shall completely cover and be tucked securely under the material. The materials shall be stored a minimum of 10 ft. away from active network and electrical equipment. Temporary storage groups shall not exceed 100 sq. ft. in area. A minimum 10 ft. firebreak shall be provided between each tarped storage group.

1.2.10 The tarp shall meet NFPA 701 and ASTM E-84 Class A, be clearly marked as such and have a surface resistance between $10^5$ and $10^{12}$ ohms psi.

1.2.11 All combustible materials temporarily stored shall be provided with the date the material arrived at the temporary storage location. The material shall also be identified with the name and phone number of the installation contractor. The maximum time materials may be temporally stored in an equipment area cannot exceed 7 calendar days. The temporary storage arrangement may be extended, if approved by the site manager, but for never greater than 30 calendars days from arrival without making other suitable arrangements for removing combustible materials from inside the building.

1.2.12 During a construction project, all combustible packaging shall be removed from all materials kept in Technical Spaces. When this is not possible, e.g. a wood cable reel, these materials shall be stored under an approved tarp (as outlined in 1.2.9) and shall not exceed 100 sq. ft. of floor space. These materials shall only be present while the job is in progress and shall be removed immediately upon completion of the job.

1.2.13 The Installation Supplier shall store flammable materials i.e. spray paint, solvents, etc., outside the building in a fire rated cabinet, if available, or remove the material from AT&T property.
1.2.14 All waste materials, such as waste paper, foam, plastic, cloth bags, packing boxes, packing material and similar material supplied during the installation, shall be removed from the building by the Installation Supplier on a daily basis (or more frequently if required).

1.2.15 All walkways, entrance and exit routes through the equipment area shall be kept clear of tools, equipment, equipment packaging, cable, etc. Caution signs shall be posted where needed.

1.2.16 The Installation Supplier shall not obstruct doorways, equipment aisles, corridors, stairs, fire exits, fire extinguishers and fire fighting equipment, pull box alarms and electrical breaker/fuse panels.

1.2.17 If the Installation Supplier has any questions in regard to safety, contact the AT&T Representative.

1.2.18 The Installation Supplier shall ensure the following during the installation:

   a) That its employees are informed of any hazards that may exist on the job and the action required, minimizing the risk of personal injury, property damage, or service interruption. Furthermore, all Installation Supplier personnel shall comply with the safety guidelines and policies that are followed by AT&T in installation equipment areas (e.g., safety glasses).

   b) That personal protective clothing and equipment, such as cotton gloves, heat resistant gloves, low-voltage rubber gloves, ear protection, safety eyeglasses, etc., are provided and used to minimize the risk of personal injury.

   c) That combustible furniture is not brought into equipment areas.

   d) That apparatus or materials are not stored in equipment aisles, corridors, stairs or fire exits.

   e) That Installation Supplier’s personnel adhere to AT&T’s no-smoking policy.

   f) That precaution is taken to prevent fire resulting from the use of temporary wiring, test wiring, lamps, soldering irons and other similar equipment.

   g) That Installation Supplier personnel are familiar with the building’s evacuation features.

   h) That Installation Supplier personnel are familiar with the location and use of the fire extinguishing equipment in the installation area.

1.2.19 Fall protection is required at all AT&T facilities and work locations whenever employees are on a surface (i.e. roof, platform, tank, cable rack, platform or other surface) within 6 feet (1.8 m) of an unprotected edge that present a falling hazard of 4 or more feet (1.2 m) to a lower level. In addition, employees on surfaces that are less than 4 feet (1.2 m) above a lower level, but are above or adjacent to dangerous equipment, materials or operations shall be protected by an appropriate fall protection system. Fall Protection can be defined as a system used to catch a person in a fall or restrain that person from being able to fall. It consists of an anchorage, connectors, a body belt or full body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. The Supplier is responsible for training and equipment necessary for compliance with Fall Protection
1.3. Safety, Tools and Precautions

1.3.1 The Installation Supplier shall provide its own tools.

1.3.2 Extension cords shall be NRTL listed, three conductor, 14 gauge or larger, commercial grade.

1.3.3 All battery and AC powered tools shall be grounded or double insulated.

1.3.4 All tools used for installation activities on and adjacent to “hot power” environments, (e.g., the common battery supply and grounded battery return in the power room or area, and power distribution boards, cabinets or bays, BDFBs, PCFDs, UPSs, FDCs, PDUs, GPDFs, and AC panels), shall be factory (OEM) double insulated. Grounded tools shall not be used around “hot power”. Only double insulated compliant single ended box and open end wrenches, socket sets (including compliant ratchets, sockets, extension bars and torque wrenches), nut drivers, screwdrivers and hex (allen) type wrenches are approved for hot power installation.

1.3.5 The Installation Supplier shall inspect all tools that are used for installation activity in AT&T equipment areas before the start of each shift.

1.3.6 The Installation Supplier shall remove all personal jewelry when performing any installation activities.

1.3.7 Safety goggles, face shields, appropriate protective clothing for the job being performed (i.e. battery apron and gloves) shall be worn when working with batteries. (ref OSHA technical manual Section 8 chapter 1)

1.3.8 Metal framed ladders, metal desks and metal chairs shall not be allowed in the immediate vicinity of telecommunication, information services, or power equipment.

1.3.9 Non-conductive measuring devices shall be used in the vicinity of working equipment.
1.3.10 Insulating floor mats shall be used for personal protection from electrical shock while performing work on or adjacent to power equipment.

1.3.11 Caution shall be exercised when working in the vicinity of equipment and tools with rotating components. Loose clothing may become entangled in the equipment.

1.3.12 Insulated blankets that comply with ASTM D1048-93 or ASTM D1048-88a shall be used when working in or around primary and secondary power equipment.

1.4. **Environmental Issues**

1.4.1 The Installation Supplier shall follow the guidance provided in Sections G and V of ATT-TP-76300 when addressing Hazardous Materials and Waste management.

1.5. **Vacuum Cleaners**

1.5.1 A vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) filter may be used for removing metal shavings and other debris, except debris that contains or is presumed to contain asbestos. The vacuum cleaner used shall conform to the following requirements:

   a) The HEPA filters shall provide a particle collection efficiency of 99.97% or greater for particle size of 0.3 microns or smaller.

   b) Hoses and any other vacuum cleaner components that may come in contact with electronic equipment shall be made with insulating material.

1.5.2 When it is necessary to use vacuum cleaners in the Technical Space, the following procedures shall be followed:

   a) Vacuum cleaners shall be plugged into a wall- or pillar-mounted AC receptacle only. Vacuums may never be plugged into the receptacles located within an equipment rack or bay.

   b) Electrostatic discharge (ESD) protection procedures, per Section N of ATT-TP-76300 and shall be followed when vacuuming electronic equipment.

   c) Bumping the vacuum cleaner into frames shall be avoided.

   d) The secondary air source (exhaust) coming from any vacuum cleaner shall be directed to previously cleaned surfaces. Exhaust air shall not hit unclean surface where the dust could be disturbed.

   e) When vacuuming on cable racks or other areas above equipment, the Installation Supplier shall cover the equipment with ESD-coated sheeting to prevent debris from dropping into the frames.

1.6. **Electrical Safety – Shock and Arc Flash Hazards**

1.6.1 All AT&T facilities contain voltages greater than 50V, and thus have shock hazards and potential arc flash hazards. The Installation Supplier shall follow the safe work practices required by NFPA 70E®, Electrical Safety in the Workplace, when these hazards are encountered.
1.6.2 As described in NFPA 70E® and in sections 1.2 and 1.3 above, the Installation Supplier is responsible for ensuring electrical safety hazards are communicated to personnel, and that personnel are trained and equipped with appropriate personal protective equipment (PPE) when working in the presence of these hazards.

1.6.3 Electrically Safe Work Condition

AT&T or a qualified person designated by AT&T shall place all circuits / equipment greater than 50Vac or nominal 140Vdc in an electrically safe work condition, as defined in NFPA 70E® (i.e., de-energized, with lockout / tagout implemented), before working on them, unless 1.6.4 applies. “Working on” energized equipment means intentionally coming into contact with energized electrical conductors or circuit parts with any part of the body or with tools, probes, or test equipment, including for diagnostic testing, maintenance, repair, or replacement activities. This requirement applies to work on the following, as well as to other types of equipment:

a) PSCs and branch circuits (e.g., task lighting and convenience outlet ac circuits).

b) PDSCs and output distribution circuits (e.g., rectifier ac input feeds).

c) PPSCs and output distribution circuits (e.g., data cabinet ac input feeds, inverter systems, larger than 30kVA equipped with an ac bypass circuit).

See ATT-TP-76300 Section M for definitions of PSC, PDSC, and PPSC.

1.6.4 Working on Energized Equipment

The Installation Supplier may work on equipment that has not been placed in an electrically safe work condition only if either

a) de-energizing would introduce additional hazards or increased risk, or

b) the task to be performed is infeasible in a de-energized state due to equipment design or operational conditions. This would include, without limitation, testing of electric circuits that can only be performed with the circuit energized.

1.6.5 When the work will be performed energized, an Energized Electrical Work Permit shall be required, except for testing, troubleshooting and voltage measuring. See ATT-TP-76300 section D paragraph 4.1.11 and Figure D-2.

1.6.6 DC Circuits and Equipment

a) AT&T has performed arc flash hazard risk assessments for nominal ± 24V, -48V, ± 130V, and 140V dc circuits and equipment deployed in AT&T facilities, and found the incident energy (IE) to be < 1.2 calories per centimeter squared (< 1.2 cal/cm²) at a working distance of 18 inches.

When working on unfused nominal 140V and below dc circuits and equipment while energized, wear the electrical safety PPE prescribed in NFPA 70E® for an IE level of < 1.2 cal/cm². (Although nominal dc voltages less than 140V pose neither a shock or arc flash hazard, a thermal hazard may exist when working around energized batteries and dc plant busbar.)
b) When working on greater than nominal 140V dc circuits and equipment while energized, such as a battery string within a UPS system, wear the electrical safety PPE specified in NFPA 70E® for dc systems (Table 130.7(C)(15)(B)).

c) **Exception:** The requirements at (a) and (b) above do not apply to circuits used for communications services (e.g., POTS, ADSL, HDSL, ISDN). The maximum steady-state dc voltage, power and current levels appearing in these communications circuits are 200 Vdc (190 Vdc nominal) to ground, 100 watts, and 1.3 amperes, while the instantaneous limits under fault conditions are 200 Vdc to ground, 150 watts and 2.4 amperes (all current- and duration-limited in the case of a fault condition to protect personnel). These limits are all in accordance with ANSI Standard ATIS-0600337.2016 and well within the limits of 400 V to ground and 150 W stated in the OSHA 29 CFR 1910.268(s)(11) definition of “communication lines.” All systems that can produce currents above 100 mA through simulated personnel contact conditions are duration-limited (reference Section 7.5.1 of Telcordia GR-1089-CORE, Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment). Therefore, these circuits do not pose either a shock or arc flash hazard, and may be contacted bare-handed.

1.6.7 **AC Circuits and Equipment**

All energized ac circuits and equipment greater than 50V pose a shock hazard. The arc flash hazard risk assessment label posted on the ac electrical equipment communicates the level of incident energy available at that equipment, and thus the level of arc flash rated PPE required to work on the equipment energized. The Installation Supplier shall read and follow the arc flash label when working on energized ac electrical equipment. If the label is missing, illegible, or states that “No safe PPE exists”, contact the AT&T Representative for resolution.

a) **Exception:** Arc flash studies are not being performed on PPSCs and their nominal 240Vac or below, single phase distribution circuits that are served by inverters, where the inverter system is served via -48Vdc input feeds only (i.e., no ac bypass circuit), or the inverter system is less than or equal to 30kVA, so such equipment will not have an arc flash label. However, AT&T has performed arc flash risk assessments for inverter-fed PPSCs that satisfy these parameters, and has found the incident energy is below 1.2 cal/cm² at a working distance of 18 inches. When working on these PPSCs or their distribution circuits, the Installation Supplier shall wear the electrical safety PPE prescribed in NFPA 70E® for an IE level of < 1.2 cal/cm². See ATT-TP-76300 Section M for definition of PPSC.

2. **BUILDING FACILITIES AND CARE OF PREMISES**

2.1. **Access**

2.1.1 Hours of access shall be specified in the Job Start Agreement before start of installation activity. Written agreement is not required when an AT&T employee accompanies the Installation Supplier for a site visit with no installation activity.

2.1.2 The Installation Supplier shall follow the directions from AT&T Equipment Engineer regarding the use of ID cards and electronic card keys and all metal keys.
2.1.3 Installation Supplier personnel shall wear his/her own approved company ID and their own AT&T approved Installation Supplier ID Card at all times while on AT&T premises. The cards shall be worn at or above the waist with the front side showing. The AT&T Representative may issue access cards and restrict Installation Supplier personnel to the facilities and dates specified on the card. Installation Supplier personnel shall surrender the card when so requested by the AT&T Representative.

2.1.4 Installation Supplier personnel shall sign AT&T building register, where required, upon entering and exiting the facility.

2.2. AC Power, Heat and Light

2.2.1 AT&T will provide electric power for all necessary purposes, with suitable outlets in areas in which work is to be performed. AC outlets located in equipment bays are for test equipment only and shall not be used for power tools, powering telecommunication, or information services equipment or any building maintenance apparatus (buffers, vacuums, etc.). Heat and general illumination (of a permanent or temporary nature) in rooms in which work is to be performed or material stored, will also be provided by AT&T.

2.2.2 The Installation Supplier shall provide temporary lighting for specific work operations. Use of fluorescent lights or other lights requiring ballast shall be approved by the AT&T Representative prior to their use. However, in no case shall fluorescent lights requiring ballast be used without an Alternating Current Equipment Ground (ACEG).

2.2.3 The Installation Supplier’s personnel shall make no adjustments to controls, thermostats or venting of the heating or cooling plant. Any adjustments needed shall be directed to the AT&T Representative.

2.2.4 Equipment aisle lighting that is controlled by switches rather than motion sensors shall be turned off when no work is being performed in the aisle.

2.3. Floor Space For Administrative And Equipment Storage Purposes

2.3.1 An agreement shall be reached with representatives of AT&T, the Installation Supplier(s), and the local operations group as to the availability of suitable floor space at installation start and during progress of the installation work, to be used for the following:

a) Storing major items of material. Floor space in equipment buildings shall not be used as warehouse space. Material shall not be stored in such a manner as to exceed the safe floor load of the building. If storage space is not available for storing job material, the Installation Supplier shall provide temporary storage space in an AT&T approved area.

b) Administrative space and luncheon facilities.
   1. Administrative space will only be provided at the location where the installation activity is occurring. Telephone services and office furniture are not included.
   2. Food or drink shall not be brought into the equipment areas.

c) Storing tools and other property belonging to the Installation Supplier.
d) Restroom facilities and supplies such as towels and soap at all locations in which work is in progress.

2.3.2 AT&T will not be responsible for:

a) Providing parking facilities for Installation Supplier’s vehicles without prior agreement.

b) The personal possessions of Installation Supplier’s employees (e.g., jewelry, tools, etc.).

c) Mail or equipment delivery service arrangements for the Installation Supplier.

d) FAX, internet access, or telephone service without prior agreement. All toll calls or charges are the responsibility of the Installation Supplier. When telephone services are to be used only for equipment testing purposes, the AT&T Representative will arrange for the necessary services.

e) Office Supplies

2.3.3 The Installation Supplier shall not use AT&T trash containers without approval.

2.3.4 Gas or electric welding/cutting equipment, torches or other open flame devices, and internal combustion engine-powered equipment will not be allowed in AT&T buildings without first obtaining a Hot Work Permit through the AT&T Representative. Refer to CRE Practice CRE-50-07-08-ATP-01 for Hot Work Permits and requirements and instructions for proper use of the permit.

2.3.5 The employees of the Installation Supplier shall not be allowed to bring any firearms, explosive devices, onto AT&T premises at any time. Powder actuated fastening devices, including exothermic welding devices, may not be brought onto AT&T premises without prior written approval.

2.4. **Openings, Alterations And Repairs To Buildings**

2.4.1 The Installation Supplier shall contact the AT&T Representative if openings, alterations or repairs to buildings are required to allow material to be placed in position or to provide necessary openings and ducts for cables/conductors in the floors and walls.

2.4.2 Installation supplier shall contact AT&T Equipment Engineer if existing openings have not been previously closed properly, not fire stopped to requirements, too full of cables or opening requires attention.

2.5. **Equipment Protection and Building Security**

2.5.1 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. The following are examples of protection and are not the only cases where protection is required:

a) An approved method of dust containment shall be used while drilling floors, walls, and ceilings. (See Section G of ATT-TP-76300 for floor drilling requirements.).

b) Fiberboard (e.g., Masonite) or approved floor mats shall be used to protect floors.
c) Existing equipment shall be protected, horizontally and vertically, to prevent damage during installation activities, as identified in the pre-start job meeting. The need for protection within a 10 foot sphere surrounding the equipment shall be considered.

d) Fiberboard (e.g., Masonite) shall be used to protect equipment from physical damage.

e) Anti-static and fire retardant tarp shall be used to protect working equipment from dust and debris. The tarp shall meet NFPA 701 or UL 214 and have a surface resistivity between $10^5$ and $10^{12}$ ohms psi.

f) For protection of equipment that is cooled by either a forced air fan or a heat baffle, fiberboard, in the form of “pegboard” that is treated with approved flame-retardant shall be used. The pegboard shall be placed immediately before starting the daily activity and removed immediately after completion of the daily activity.

g) Stored cable reels shall be blocked or otherwise secured at all times to prevent their movement.

h) Cable shall not be dragged across unprotected flooring. The use of fiberboard or approved floor mats shall be used as floor protection while running cable in Technical Spaces.

i) Electrostatic discharge protective devices necessary for handling and storing circuit packs and other sensitive equipment shall be provided and used by the Installation Supplier.

2.5.2 Installation Supplier personnel shall avoid climbing, standing, or performing any installation or removal activity while on cable racks. If an installation or removal operation cannot be performed from ladders, protection for the cables shall be provided. The protection provided shall be fire retardant and of sufficient size and thickness to spread the load of the installer’s weight on the cables and prevent damage to sheathing of the top layer of cables.

2.5.3 The Installation Supplier shall post warning signage identifying overhead work activity in progress.

2.5.4 All frames waiting installation or transportation and not bolted in place shall be secured to auxiliary framing or a building column with webbed polyester/nylon or equivalent straps of at least 1 inch width. Straps and buckles shall be rated at a minimum 1000 pounds tensile strength. In low seismic locations, one strap can be used. In high seismic locations two straps shall be used.

2.5.5 The Installation Supplier is responsible for Installation Supplier caused damages. The Installation Supplier shall correct the damage or reimburse AT&T for repair of damage before final job acceptance.

2.5.6 The Installation Supplier shall not act as an agent of AT&T.

2.5.7 The Installation Supplier shall guard against and take the necessary steps to prevent unauthorized visitors from entering that portion of AT&T premise for which the Installation Supplier is responsible. Exterior openings (e.g. doors, windows, etc.) or interior security openings shall not be left open and unattended.
2.5.8 AT&T may designate the particular gate and/or entrance to be used by the Installation Supplier to enter and leave the premises during installation activity.

2.5.9 The Installation Supplier shall comply with AT&T security policies by ensuring that the premises are locked and secured at all times. All security devices such as windows, screens, fences, doors, gates and other similar equipment shall be in place at all times, except when temporary removal is necessary for the installation of equipment. Any security equipment temporarily removed or disabled by the Installation Supplier shall be replaced at the end of each working day.

2.5.10 Radio frequency transmitting devices such as Cell phones, PCS, or two-way radios are restricted in Carrier Communications Spaces (CCS) such as COs and MTSOs. Two-way radios (e.g. commercial handheld radios, Family Radio Service FRS, or “walkie-talkies”) are prohibited and shall not be used in these areas due to the risk of equipment disturbance at significant distances. Personal mobile devices such as cell phones, PCS, and cellular-connected tablets are restricted to use no closer than 26” (twenty-six inches) from AT&T electronic equipment in these areas where equipment doors and covers may be removed, or no closer than 12” (twelve inches, one foot) from AT&T electronic equipment where doors and covers are all in place. See ATT-TELCO-002-200-354 for further information regarding use of RF transmitting devices in CCS.

2.5.11 Cell phones, PCSs, or two-way radios (e.g. commercial handheld radios, Family Radio Service FRS) can be used in an IS POP/Video room constructed within Carrier Communications Space (CCS) when the POP/video room is separated and enclosed within one hour rated fire walls.

2.5.12 Cell phones, PCSs, or a two-way radios (e.g. commercial handheld radios or FRS) can be used in Global Technical Spaces (GTS) unless otherwise posted.

2.5.13 Strobe flash equipment utilizing arc discharge devices (such as those used in flash photography) is prohibited in all Carrier Communications Spaces (CCS). The exception is visual alert safety devices associated with fire or other building alarms.

2.5.14 Cameras and Photo Equipment are prohibited in any room or area housing electronic telecommunication equipment with the following exceptions:

   a) Photos are taken for quality control or direct AT&T business purposes by a vendor with a current contract and non-disclosure agreement with AT&T. All photographs and videos in AT&T Technical Space are AT&T Proprietary and shall not be used or disclosed outside of AT&T except under written agreement. Photos must be deleted from vendor devices upon issue resolution.

2.6. Drilling in Ceilings and Walls

2.6.1 The Installation Supplier shall not install ceiling inserts unless authorized by the AT&T Representative.

2.6.2 Precautions shall be in place to protect equipment and personnel below, from falling debris.

2.6.3 Tools used for drilling holes into concrete ceilings shall be supplementally supported to avoid the craftsperson from having to hold tool unassisted.
2.6.4 A HEPA vacuum cleaner or drilling equipment equipped with a vacuum attachment shall be utilized when drilling holes in ceiling or walls.

2.6.5 If the drilling of holes in the ceiling or walls is within a 10-foot sphere or over working equipment, additional methods shall be utilized to isolate dust, debris or other air borne contaminates from equipment in the Technical Space. These methods may include but are not limited to:

a) Anti-static, fire retardant sheeting or canvas may be used to contain dust and masonry from equipment.

b) Drilling with various containment devices designed to control dust, debris or other air borne contaminates from equipment (i.e. cone, plunger or sphere surrounding shaft of drill).

2.6.6 Methods utilized to isolate dust, debris or other air borne contaminates from equipment in the Technical Space shall be addressed in a Job Start meeting.

2.7. Penetrating Waterproof Environments

2.7.1 Before drilling into any basement floor, basement wall, or power environment, the Installation Supplier shall determine from AT&T Representative whether waterproofing has been provided and the special requirements for anchoring equipment.

2.7.2 Concrete slabs on grade that have been unintentionally drilled all the way through the slab shall be sealed with silicon caulking at bottom of hole prior to installation of floor anchors.

2.8. Cutting, Filing or Drilling of Metal and Plastic

2.8.1 The Installation Supplier shall strictly control the cutting, filing or drilling of metal or plastic to prevent the introduction of metal filings and other contaminates in all Technical Spaces.

2.8.2 Any work activity that requires cutting, filing or drilling of metal or plastic shall be performed outside Technical Spaces. The Installation Supplier shall have AT&T Representative designate the location for this work activity.

2.8.3 The Installation Supplier shall maintain a clean work area by cleaning up the metal shavings and other contaminates as the work progresses.

2.8.4 Methods that must be used to prevent harm to AT&T equipment from debris from cutting, filing or drilling of metal or plastic outside of Technical Spaces may include but are not limited to:

a) A HEPA Vacuum cleaner shall be utilized to control metal filings and other contaminants.

b) Cutting, filing or drilling activity shall be performed in a manner that will prevent metal filings and other contaminates from entering Technical Spaces (i.e. cutting, filing or drilling activity performed over and into boxed area outside of walkways)

c) All surface areas of this material shall be wiped clean of all metal filings and contaminates before material is brought into Technical Spaces.
2.8.5 In unusual circumstances, where cutting, filing or drilling of metal or plastic cannot be performed outside Technical Space, the following precautions shall be taken to prevent the introduction of metal filings and other contaminates into the Technical Space.

a) A HEPA vacuum cleaner and/or cutting, filing or drilling equipment equipped with HEPA vacuum attachments shall be utilized.

b) Anti-static, fire retardant sheeting or canvas shall be utilized to control and contain metal filings and contaminates from Information Services and Central Office equipment. Various methods of deployment of anti-static, fire retardant sheeting or canvas are acceptable depending on the work activity to be performed. Precautions shall be taken in all methods of deployment not to restrict airflow to Information Services or Central Office equipment. Examples:

1. Placing or draping anti-static, fire retardant sheeting or canvas adjacent to Information Services and/or Central Office equipment in cutting, filing or drilling work area.

2. Taping and forming anti-static, fire retardant sheeting or canvas in the cutting, filing or drilling work area to prevent metal filings or other contaminates from entering Information Services and/or Central Office equipment.

3. Placing an anti-static, fire retardant sheeting or canvas curtain around the cutting, filing or drilling work area to prevent metal filings or other contaminates from entering Information Services and/or Central Office equipment.

4. When extensive cutting, filing or drilling activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be utilized to prevent metal filings or other contaminates from entering Information Services and/or Central Office equipment.

3. COMPLIANCE WITH LAWS, RULES AND ORDINANCES

3.1. Permits And Rights-of-Way

3.1.1 AT&T will provide the right-of-way, permits and authority for installation of equipment where the Installation Supplier is restricted from obtaining such right-of-way, permits, etc.

3.2. Laws, Rules And Ordinances

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

3.2.2 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.
3.2.3 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.

3.2.4 In the job start meeting, the Installation Supplier shall discuss with the AT&T Representative any hazardous materials existing in the Technical Space and/or hazardous materials to be used on the job and handled per the requirements of Section V.

4. EQUIPMENT

4.1. Cross-Connections

4.1.1 AT&T personnel will normally be responsible for installing/removing cross-connect terminations before, during and following all installation activities.

4.1.2 If the Installation Supplier is instructed to install cross-connections as part of the installation activity, the cross-connect termination lists shall be furnished by AT&T.

4.2. General Cleaning

4.2.1 The Installation Supplier shall perform general cleaning of the installed equipment and storage areas (e.g., cleaning floors of debris, packing material, etc.) daily during the entire installation period and at job completion for all types of installations.

4.2.2 The Installation Supplier shall ensure that all equipment is free of dust and foreign substances before being brought into an equipment area.

4.2.3 Cleaning shall be scheduled and performed consistent with local requirements. The frequency of required cleaning is affected by the type of ventilation and the presence of filtering systems. The Installation Supplier shall post the Safety Data Sheet (SDS) for chemicals used in cleaning operation.

Warning-1: All cleaners and polishes used on Information Services or Central Office equipment shall be silicone free.

Warning-2: Spray cleaners shall not be used unless specifically authorized by AT&T.

4.3. Test Equipment

4.3.1 The Installation Supplier shall use properly calibrated test equipment.

4.3.2 Test equipment owned by AT&T for equipment maintenance will not be available for installation purposes except in specific cases where prior arrangements are made with AT&T.

4.3.3 Any test equipment and/or spare equipment provided, as part of the job is the responsibility of the Installation Supplier. In most instances, the test equipment will not be turned over to AT&T until the associated equipment installation is completed. However, upon request, AT&T personnel may have access to the test equipment to permit the checking of circuit features or to allow the testing of added equipment to which test circuits can access.
4.4. Installation Supplier Inventory and Inspections

4.4.1 The Installation Supplier shall make a visual inspection of all equipment and apparatus shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent its proper installation, maintenance and/or operation. The Installation Supplier shall notify AT&T Representative verbally as soon as practical and in writing within 72 hours of the verbal notification for resolution when damaged or defective equipment is discovered.

4.4.2 The Installation Supplier shall inventory all equipment and material shipped to the job site prior to job start. Equipment and material received after job start shall be inventoried as well. Questions and/or shortages shall be directed to the appropriate AT&T Representative as specified in the job documentation.

4.4.3 All equipment reused from another job site and equipment relocated within the same job site shall be upgraded by the Installation Supplier to meet current ATT-TP-76300 requirements (e.g. replace mechanical lugs and parallel taps with crimp type lugs and H-taps, remove old stenciling, replace aluminum lugs with UL approved copper lugs, etc.). Information on equipment drawings rated Manufacturer Discontinued (MD) or Addition and Maintenance (A&M) shall be superseded by the latest apparatus and wiring figures, drawings and requirements.

[END OF SECTION]
SECTION C-- INSTALLER SKILL LEVEL ASSESSMENT

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TABLE C-1 – SUMMARY OF CHANGES IN SECTION C

<table>
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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section provides criteria for qualifying the Installation Supplier and their personnel to perform installation activities.

1.1.4 AT&T reserves the right to verify the Suppliers and their installer’s skill level, and review the Installation Supplier’s qualification process.

1.1.5 Changes to this issue of Section C are summarized in Table C-1.
2. SUPPLIER AND INSTALLER SKILL LEVEL REQUIREMENTS

2.1. Assessment of Supplier Qualifications

2.1.1 The Supplier’s qualifications are categorized as Tier 1 and Tier 2 as defined below. The Supplier’s rating level determines the type of work the Supplier can perform.

2.1.2 A Tier 1 Supplier is qualified to work in an AT&T Carrier Communications Space in the system technology category that they have been approved in by the appropriate AT&T Engineering, LFO, and Quality organizations for the geographical region that approved them. The system technology categories that a Supplier can be qualified to work in are listed below.

a) Common Systems – Cable racking, Iron work, Equipment frames (bay frame), MDF, FDF, and IDF COSMIC, Lighting, Building System grounding, Bay AC outlets, Etc.

b) Switch – Switch installation to include secondary power distribution to the switch frames

c) Transport – Transport equipment installation including secondary power distribution to the Transport Frames in any environment, and primary power distribution to the Transport Frames in cases where either of the following criteria are applicable:

1. Secondary power distribution does not exist (e.g. network sites less than 1200 square feet or a Distributed Architecture power plant located within eighty (80) feet one way of the equipment it serves), or:

2. A circuit switch (host or remote), or tandem switch does not exist (e.g. a repeater hut or customer premise containing only transport equipment)

d) Power Equipment – All primary power work including power frame, equipment (includes Power Plants, Converter Plants, Ring Plants, Inverter Plants, Battery Plants, Engine Generator Plants, BDFBs), installation and connection to all primary equipment and frames.

e) AC Installation Matrix

<table>
<thead>
<tr>
<th>Who does work on load side of AC panel*</th>
<th>CRE</th>
<th>Tier 1 Supplier</th>
<th>Power Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSC to AC receptacles and NE aisle lights</td>
<td>2**</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lighting Panel to NE aisle lights</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lighting Panel to building lights</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>PDSC (w/o network power load) to AC receptacles and NE aisle lights</td>
<td>N/A</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>PDSC (w/ network power load)</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>PPDSC to load</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>General purpose power panel to building receptacles</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*An AC panel may be defined as:

**Power Service Cabinet (PSC)** is a general purpose AC panel that can be used for "Test" receptacles; convenience receptacles; lighting circuits and other general AC loads. These
AC panels are generally, but not necessarily, connected to "essential" power which has standby engine backup.

**Power Distribution Service Cabinet (PDSC)** is a dedicated AC panel to distribute "essential" AC power to DC plant rectifiers; UPS; AC Maintenance Bypass; and other power equipment.

**Protected Power Distribution Service Cabinet (PPDSC)** is used to distribute UPS or Inverter "protected" power to AC loads that cannot tolerate an interruption. Never use an AC panel containing critical network loads for aisle lighting or receptacle service.

**Indicator that defines who can perform the work function on the first column of the chart above:**
1. Level 4 installer (experienced with the installation of AC wiring) performs the work or licensed electrician.
2. Licensed electrician or CRE (per local agreement).

**Notes:**
- Network Power includes "essential" AC power to DC plant rectifiers; UPS; AC Maintenance Bypass; and other power equipment.
- Installation Supplier is responsible to get work done. May use Level 4 installer (experienced with the installation of AC wiring), CRE suggested licensed electrician, Tier 1 Power Supplier or CRE (per local agreement).
- See Figure C-1 for Carrier Communications Space Demarcation Between AC Building Power And Communications Power

**f) SPDU Modification Matrix**

Modifications to Secondary Power Distribution Units (SPDUs) such as BDFBs shall only be made by the Tier 1 authorized supplier type as indicated in the table below:

<table>
<thead>
<tr>
<th>Type of Modification (additions, removals, or replacements)</th>
<th>Tier 1 Supplier Authorized to Perform Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug-in Circuit Breakers</td>
<td>Transport or Power</td>
</tr>
<tr>
<td>Plug-in Fuse Block</td>
<td>Transport or Power</td>
</tr>
<tr>
<td>Plug-in (Bullet) Disconnect Switch</td>
<td>Transport or Power</td>
</tr>
<tr>
<td>Bolted Fused Disconnect Switch (e.g. replace two single space TPS with one dual space TPL)</td>
<td>*Transport or Power</td>
</tr>
<tr>
<td>Panel, Bus Bar, Shunt</td>
<td>Power</td>
</tr>
<tr>
<td>Adding / Splitting Primary Loads</td>
<td>Power</td>
</tr>
<tr>
<td>Transition Secondary Loads to a different SPDU</td>
<td>Power</td>
</tr>
</tbody>
</table>

*Transport vendors changing out “Bolted Fused Disconnect Switches” shall follow the process in APEX document ATT-JA-000-004-380, OTV SPDU Bolt on Fuse Block Replacement Process to comply with the Power work approval process.

2.1.3 **Tier 2 Approved Suppliers:** "AT&T Collocation Approved Installation Suppliers - These suppliers have been approved to perform collocation installation work for CLECs in all AT&T Incumbent central offices in the Collocator's Physical footprint (Caged Collocation area and/or in the "footprint of the bay" in Cageless Collocation. This category of approval does not include the Tier 2 supplier's access to common areas, installation of cabling outside of the cage or the "footprint of the bay" in cageless collocation, virtual collocation, the MDF or the
Power Board/BDFB Carrier Communications Space areas. Tier 2 Suppliers can only coordinate a JSA/MOP for work within a Collocator's footprint. In addition, the JSA/MOP cannot include work scopes that require a Tier 1 Supplier. In order to attain Tier 2 approval a Supplier is required to complete a full day “Train-The-Trainer” training session from the AT&T Network Planning and Engineering Quality organization annually.

2.1.4 Tier 1 Approved Suppliers: A Supplier can request to be considered for approval as an AT&T Approved CO Installation Supplier (Tier 1 Supplier) by applying through AT&T Procurement Contract Management. Selection of new candidates for the Tier 1 approval process is made on an “as needed” basis by AT&T’s telcos based upon the overall AT&T Telco & CLEC job volumes with the goal of maintaining enough total capacity among the Tier 1 Suppliers to handle the volume demand of the AT&T Telcos and CLECs. Once a Supplier is selected for approval trialing by an AT&T Telco, the Supplier is allowed to submit a firm price quote on jobs in the area/region of the AT&T Telco that sponsored the Supplier. The Supplier must successfully complete 5 evaluation jobs in the technology category for which they have been sponsored by the AT&T Telco (Power, Switch, Transmission, Batteries, Engines, etc) each job will be audited by AT&T. The job quality level shall meet AT&T’s defect quality criteria. Once the Supplier has passed the job audits on the 5 jobs, the supplier will be reviewed and, if accepted by the AT&T Telco review team, their company name will be added to the Tier 1 list for the technology category and the AT&T Telco area/region that sponsored the Supplier. A Tier 1 shall maintain an acceptable defect rate in order to retain this approval status. The list for Tier 1 Suppliers is maintained by AT&T Procurement Contract Management.

2.2. Assessment of Installer Qualifications

2.2.1 Installers’ qualifications are categorized as Levels 1 through 4 as defined below. This skill level assessment is based on the installer’s years of experience in specific systems/environments and his/her ability to perform work operations/job activities associated with equipment installation activities.

2.2.2 If the Installation Supplier can demonstrate to AT&T a documented program for qualifying an installer on specific work activities and specific systems, related to the level requirements indicated below, the Installation Supplier’s rating of its personnel will be accepted. The Installation Supplier shall participate in the AT&T supplier verification process, such as a Quality Program.

2.2.3 While the years of experience listed for an individual level is the recommended minimum for that level; advancement from one level to the next shall not be based solely on the installer’s years of experience. The Installation Supplier shall assure and concur that the installer has the appropriate skills and abilities to competently progress to the next skill level before the installer performs work operations/job activities associated with a higher level.

2.2.4 All levels require a complete understanding of the equipment installation requirements and procedures associated with the work operation/job activity being performed. In addition, installers at Levels 3 and 4 require a complete and in-depth understanding of the equipment installation standards and requirements of ATT-TP-76300.
2.2.5 The Installation Supplier shall assess and classify its personnel working on telecommunications equipment by skill level on each of the following systems/environments:

a) Common Systems
b) Switch
c) Transport
d) Power Equipment

2.2.6 All Installation Supplier personnel shall carry in their possession and provide, upon request, a Skill Level Identification Card that provides identification of their skill level in each applicable system(s) for which they are qualified.

2.2.7 Once classified at a specific level on a system/environment, the installer shall perform only work operations/job activities associated with the assigned level unless properly supervised by an installer of the appropriate level.

2.2.8 A Level 3 or 4 installer shall directly supervise Level 1 and 2 installers. The in-charge or job supervisor shall be "on-site" to direct the Level 1 or 2 installers as necessary.

2.3. Skill Level Definition and Activities

2.3.1 Installers at Level 1 shall:

a) Be directly supervised and instructed by an Installation Supplier's manager or Level 3 or 4 installer
b) Be capable of performing addition or removal of non-powered or passive equipment/hardware
c) Not perform Level 2 and above work operations/job activities unless properly supervised
d) Not progress to Level 2 without a minimum of 1-1/2 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.3.2 Installers at Level 2 shall:

a) Have a minimum of 1-1/2 years experience, or documented equivalent proficiency, as determined by the Installation Supplier
b) Be directly supervised and instructed by an Installation Supplier’s manager or Level 3 or 4 installer
c) Be capable of performing the following work operations/job activities:
   1. Addition or removal of non-powered or passive equipment
   2. Addition or removal of wiring and connections (on non-working equipment only and switchboard cable only)
   3. Lead verification
d) Not perform Level 3 or Level 4 work operations/job activities unless properly supervised
e) Not progress to Level 3 without a minimum of 4 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.3.3 Installers at Level 3 shall:

a) Have a minimum of 4 years experience, or equivalent as determined by the Installation Supplier and demonstrated to AT&T in the equipment system/environment (e.g. common systems, switch, transport, power) being worked on.

b) Be capable of performing the following work operations/job activities without supervision or direction:
   1. Addition or removal of common systems equipment/hardware
   2. Addition or removal of wiring and connections (on non-working equipment only)
   3. Lead verification
   4. Analysis of job specifications and drawings
   5. Provide work assignments to crew
   6. Prepare the forms described in Section D and E of ATT-TP-76300
   7. Resolve job specification and/or drawing problems
   8. Correct office record drawings
   9. In-process and final quality inspections
   10. Able to communicate with AT&T on all aspects of the job throughout the duration of the job.

c) Be capable of performing as the Installation Supplier's in-charge person on jobs not specifically restricted to having a Level 4 person in charge as defined later in this section of ATT-TP-76300

d) Not perform Level 4 work operations/job activities unless properly supervised

e) Not progress to Level 4 without a minimum of 6 years experience or equivalent as determined by the Installation Supplier and demonstrated to AT&T in the system/environment (e.g. common systems, switch, transport, power) being worked on.

f) Not perform work operations/job activities on working equipment or circuits.

g) Job site supervision of subcontractor work.

2.3.4 Installers at Level 4 shall:

a) Have a minimum of 6 years experience or equivalent as determined by the Installation Supplier and demonstrated to AT&T in the equipment system/environment (e.g. common systems, switch, transport, power) being worked on.

b) Be capable of performing the same work operations/job activities as a Level 3 installer without supervision or direction.

c) Be capable of performing as the Installation Supplier’s in-charge person.
d) Be capable of performing additions, removals, wiring connections, and modifications on working equipment and circuits

e) Level 4 work operations/job activities may include:
   1. Circuit modifications
   2. Software adds or upgrades
   3. Power transition work
   4. Addition or removal of batteries
   5. Addition or removal of circuits on working power distribution sources
   6. Equipment testing and turn-up
   7. Overseeing volatile work activities
   8. Job-site supervision of subcontractor work.
   9. Additions, modifications, or removals to Power Boards
   10. Additions, modifications, or removals to Engine Generator

2.3.5 Installer at Level 4A shall:

   a) A Skill Level 4A person shall be technically competent and have successfully completed training in the Test and Turn-up procedures for a specific piece of equipment or procedure. This person shall not be considered able to perform all the work operations of the Skill Level 1 through 4 installer.
SECTION D — NETWORK RELIABILITY AND PROTECTION OF SERVICE

TABLE D-1 – SUMMARY OF CHANGES IN SECTION D

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<td>Addition</td>
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1. GENERAL

Installation Supplier = Organization performing the requested work activity.

AT&T Engineer = Person requesting the work activity.

1.1 Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 Network reliability and the protection of service require full coordination and cooperation between the Installation Supplier and AT&T throughout the job. This section delineates the requirements for Job Start Agreement (JSA) and Method of Procedure (MOP), important documents to facilitate job planning and coordination.

1.1.4 Changes in this issue of Section D are summarized in Table D-1.

1.1.5 If an electronic authorization is used to approve the Job Start Agreement (JSA) or Method of Procedure (MOP), a supporting email, that includes the date, TEO number and CLLI, shall also be sent by the signee to indicate that they are the person who approved the document. This email shall be attached to the JSA or MOP and then placed in the job folder at job completion. The name of the individual approving the document shall be included in the signature field of the JSA or MOP along with the date of approval.

1.2 Service Interruptions

1.2.1 The Installation Supplier shall plan all work to minimize service interruptions.

1.2.2 A service interruption is defined as any one of the following conditions:

a) Interrupts, severely impairs or denies service availability to one or more subscribers.

b) Reduces the capacity of multiple access circuits where such reduction seriously impairs completion of offered traffic through an office.

c) Interrupts or seriously impairs the proper functioning of equipment for customer billing.

d) Interrupts or impairs in any way the functioning of national security circuits or emergency service such as 911.

e) Interrupts or reduces power.

f) Interrupts any type of operational support systems.

1.2.3 If an unplanned service interruption occurs, the Installation Supplier shall:

a) Cease all work activity

b) Immediately notify the appropriate personnel listed in the MOP

c) Assist in the restoration of service, at the direction of AT&T personnel
2. JOB START AGREEMENT

2.1 Preparation

2.1.1 A Job Start Agreement (JSA) shall be completed and approved (signed) for every job.

2.1.2 The JSA is used to cover non-volatile (general) work activities.

2.1.3 The Job Start Agreement (JSA) shall document the start and complete dates for the job interval and serves as authorization to start a job.

2.1.4 No work activity shall begin until the following criteria have been met.

   a) Approved AT&T One Ticketing System (AOTS) Change Record (CR), requested by the Installation Supplier. If EJF is used, the AOTS ticket number shall be recorded in the AOTS field provided in the Overview Section.

   b) JSA is approved and signed by both the AT&T representative and the installation supplier.

   c) Current date is the “Actual State Date” or greater and not greater than the “Scheduled Complete Date” on the JSA.

2.1.5 The JSA shall remain current throughout the duration of the job.

2.1.6 The Installation Supplier shall complete and immediately forward the approved (signed) JSA to the AT&T Engineer.

   Note: If used, the EJF system notifies the AT&T Engineer electronically upon submission and completion of this task.

2.1.7 A copy signed by both the AT&T Representative and the Installation Supplier shall be available at the job site throughout the duration of the job.

2.1.8 The Installation Supplier shall negotiate the date of the JSA meeting with the AT&T Representative(s).

2.1.9 The Installation Supplier shall convene the JSA meeting with the AT&T Representative(s). The AT&T Equipment Engineer will be responsible for determining the AT&T Representative(s) for the JSA meeting, at which the job plans will be discussed and the JSA (Figure D-1) approved.

2.1.10 The JSA shall include in the General Job Description the location of the major equipment components being added, modified or removed on the job, (i.e. bay location, shelf with bay location and shelf designation, etc.).

2.1.11 At the JSA meeting, the AT&T Representative(s) and Installation Supplier shall discuss all items listed on the JSA. The JSA shall be completed and approved (signed) by both the AT&T Representative(s) and the Installation Supplier at least five (5) business days prior to the start of the job, unless otherwise negotiated.

2.1.12 At job completion, a copy of all the approved JSAs shall be included in the job folder.

2.2 Revised Job Start Agreement
2.2.1 It is recognized that, during the duration of a job, conditions arise which may have an adverse impact on the scheduled completion date. These conditions may be the responsibility of either the Installation Supplier or the AT&T Equipment Engineer and include, but are not limited to, changes in the original order, damaged equipment, shipping delays, labor, engineering omissions or errors, defective software and service or safety requirements.

2.2.2 As soon as the Installation Supplier determines that the scheduled installation completion date is in jeopardy, the Installation Supplier shall contact the AT&T Equipment Engineer.

2.2.3 When a new installation completion date has been negotiated between the Installation Supplier and the AT&T Equipment Engineer, a revised JSA shall be issued. The specific reason for the new completion date shall be noted on the revised JSA. The revised JSA shall be checked “Revised”, signed, dated and distributed the same as the original JSA.

2.2.4 When a job scope change has been communicated between the Installation Supplier and the AT&T Equipment Engineer, a revised JSA shall be issued. Changes in the job scope specifics shall be noted on the revised JSA along with the new completion date the revised JSA shall be checked “Revised”, signed, dated and distributed the same as the original JSA.

2.3 Post-job Job Start Agreement

2.3.1 After the Job Completion Report (see Section E of ATT-TP-76300) has been issued, the Installation Supplier shall complete a post-job Job Start Agreement if additional or corrective work associated with the original job is required. This post-job JSA shall have the “POST JOB” box checked to indicate that this is a continuation of an existing job.

2.3.2 The Installation Supplier shall forward the signed post-job JSA to the AT&T Equipment Engineer and have it available at the job site.

2.3.3 At completion of the work, all approved copies of the JSA(s) shall be included in the job folder.

3. METHOD OF PROCEDURE

3.1 Introduction

3.1.1 The written Method of Procedure (MOP) is the document used to detail how, when and where work activities are performed including those that pose a significant risk to service (volatile work activities).

3.1.2 A MOP shall be created, approved, executed and completed for all volatile work activities being performed.

3.1.3 AT&T reserves the right to require a MOP for any work deemed by AT&T as volatile work activity.

3.1.4 The initial MOP shall be identified as MOP No. 1 in the MOP No. field. When multiple MOPs are written on a job, the MOPs shall be numbered consecutively.

3.1.6 The Installation Supplier shall not perform any work activity without an approved AOTS Change Record.

3.1.7 AT&T Engineering and Operations Personnel shall comply with AT&T Change Management (AOTS-CM) Process for all work activities deemed volatile.

3.2 Volatile Work Activities

3.2.1 The following is a list of volatile work activities that shall be conducted during the “maintenance window”, as directed by AT&T.

Installing cable over live equipment is not required to be done in the maintenance window unless it meets the criteria below.

a) All activities on live power equipment that includes the addition, rearrangement or removal of power equipment, cable or terminations.

b) All software upgrades and transition activity, including integration of major equipment components, except trunks and service circuits.

c) Backplane work, shelf replacement, processor hardware activity.

d) All relocation, re-cabling or other rearrangements of any currently in-service equipment.

e) All relocation, re-cabling or other rearrangements of site specific equipment that is unique and identified as critical to service.

f) Equipment removals and cable mining jobs that are considered to pose a significant risk to service.

g) All other work operations on building and telecommunications equipment that are considered to pose a significant risk to service.

1. Examples would include but are not limited to:

i. Electrical Switchgear maintenance and repairs, other than infrared testing.

ii. Major Chiller teardowns, where there is no redundancy

iii. Work above live telecommunications equipment, specifically when it involves:
   • Any work with tools
   • Any work that involves parts that may fall

iv. Building structural work that could undermine the safety or support of existing equipment

v. The GFS organization has the final say on when maintenance work activity is required

h) All cutting of installed Fiber Protection System (FPS) that contains fibers.

3.3 MOP Preparation and Use

3.3.1 The MOP requirements are determined by the job documentation (Job Specifications, Drawings etc.), complexity and technology type (e.g., switch, transport, and power).
3.3.2 Unless otherwise authorized by the AT&T Representative, the Installation Supplier shall perform a walk-through at the job site with the AT&T Representative to identify and address specific requirements and potential risks to service.

3.3.3 The Installation Supplier shall list the detailed work steps associated with the volatile work activity in logical sequence.

a) The following work steps shall always be included:

1. Notify the Network Reliability Center (NRC) to document opening and closing ticket numbers and name of person contacted prior to beginning work and when work is completed.
2. Verify that no affected equipment alarm conditions exist.
3. The responsibility (Installation Supplier and/or AT&T) for each work activity.
4. Protection required for the equipment
5. Location and availability of spare fuses/breaker
6. The visual verification that the correct fuse/breaker types and sizes are installed as denoted in the drawing (including preassembled bays), recorded as a specific check in the equipment test record and placed in the job folder and EJF, if applicable.

b) The following also shall be considered when developing a MOP (additional considerations may be necessary for unusual installations):

1. Possible service problems and restoration procedures.
2. The time the various steps will be performed and the equipment to be removed from service, including the number and schedule of circuits to be impacted.
3. The skill level of personnel performing the work outlined on the MOP.
4. Notification to collocators affected by the work activities.
5. Availability of an alternative communication link such as an FX line, etc.

3.3.4 If the Installation Supplier is authorized to perform volatile work activity that is normally performed by AT&T personnel, the responsibility shall be defined in the MOP.

3.3.5 Unless agreed upon by the AT&T Representative, the MOP shall be presented for approval (signatures) at least seven (7) business days before the volatile work activity is to begin.

3.3.6 The MOP shall be presented for approval (signatures) at least three (3) business days before the non-volatile work activity is to begin.

3.3.7 At the discretion of the AT&T Representative, a dry run of the installation activity plan may be held with the Installation Supplier to ensure that procedures described in the MOP match the physical layout of the system to be worked on. As part of the MOP, the Dry Run sections of the form shall be completed and signed by both the Installation Supplier and the AT&T Representative. It is recommended that a dry run be done when there is volatile work activity or work activity for an AT&T personal to perform.
3.3.8 Before any volatile work is performed, all persons involved in the work operation (s) covered by this MOP shall complete the Ask Yourself questions, check each box and sign off at the bottom, then the AT&T Representative shall approve (sign) the form.

3.3.9 No volatile work activity shall begin until both the AT&T Representative and the Installation Supplier have approved (signed) the MOP. A verbal MOP is not acceptable.

3.3.10 A copy of the signed, approved MOP shall be available at the work site and readily accessible to Installation Supplier personnel while work is being performed.

3.3.11 The Installation Supplier shall provide a Level 4 representative on-site to oversee any volatile MOP work performed by the Installation Supplier’s personnel or non-approved subcontractors.

3.3.12 The Installation Supplier shall not deviate from the approved MOP unless authorized in writing by the AT&T Representative. In the case of a change in job scope the MOP shall be amended and approved by the AT&T Representative. The Installation Supplier shall perform a walk-through based on the amended MOP at the job site with the AT&T Representative to identify and address specific requirements and potential risks to service.

3.3.13 The Installation Supplier shall adhere to the Safe-Stop Points (SSP), back-out procedures, and restoration procedures as detailed in the MOP.

Note: A Safe-Stop Point refers to a step in a work activity when all work can be stop without causing a safety issue or potentially causing a network problem.

3.3.14 The Installation Supplier shall stop the MOP activities if conditions are encountered or observed that have affected or will adversely affect service or if external conditions change during the MOP activity such that unanticipated risk is introduced into the Network. (Example - Severe weather or emergency event.).

3.3.15 The MOP shall include adequate testing time after a transition or modification.

3.3.16 The installation vendor prior to working on in-service equipment shall validate with the AT&T representative that no standing alarms are present. An AT&T representative is responsible for clearing any standing alarms before the installation vendor can proceed with planned work activity.

Note: The operation center that monitors the equipment has the final say, with input from the local AT&T representative, as to whether a vendor can proceed with work activity associated with equipment that is in an alarm condition. If approved to work on equipment in an alarm condition, the MOP step shall be updated, dated, noted with the approver’s ATTUID and initialed by the local AT&T representative.

At the conclusion of the work activity the installation vendor and AT&T representative shall validate that no standing alarms exist with respect to the equipment that was worked on. The installation vendor and the AT&T representative shall work together to clear any standing alarm(s).

Testing of local alarms (e.g. visual and audible) and remote alarms (e.g. Dantel and
Westronic) with external AT&T monitoring systems (e.g. NMA) is the responsibility of the AT&T representative.

Example:

- With respect to terminating to a SPDU (e.g. BDFB), the AT&T representative should test alarms at the same time they are inserting the pilot and main fuse.
- With respect to new discrete alarms associated with a network element, the AT&T representative should test alarms as part of their test and turn up procedure.

3.3.17 After completing each detailed step, the Installation Supplier shall date, time and initial the step, and if on-site coverage is required, have the AT&T Representative initial and date each step.

3.3.18 At job completion, a copy of all the approved MOP(s), including all the required pages, shall be placed in the job folder.

4. CRITICAL POWER MOPS

4.1 Critical Power MOP

4.1.1 A critical Power MOP shall be provided for the following work activities:

a) Transitions associated with power plant replacements
b) Battery string replacements in single battery string power plants
c) Primary power rearrangements on BDFBs
d) All DC primary transition work
e) All AC work that affects the DC power plant including standby engines
f) Power plant capacity expansions
g) Shunt replacement
h) Primary bus extension/expansion
i) Other documented regional requirements
j) Whenever an Energized Electrical work Permit is required (see Section D, 4.1.11)

4.1.2 Critical Power MOP shall adhere to the requirements as listed in Section 3 as well as those in the following paragraphs.

4.1.3 Unless agreed upon by the AT&T Representative, the MOP shall be presented for signatures at least ten (10) business days before the volatile work activity is to begin for all of the Critical Power Jobs defined above.

4.1.4 In addition to the signatures required in 3.3.9, no Critical Power MOP volatile work activity shall begin until the appropriate AT&T Power Maintenance Engineer, AT&T Operations, other AT&T Representatives, and the Installation Supplier have signed the MOP. A verbal MOP is not acceptable.
4.1.5 A dry run of the installation activity plan shall be conducted with the AT&T Representative and the Installation Supplier to ensure that procedures described in the Critical Power MOP match the physical layout of the system to be worked on.

4.1.6 The Dry Run form shall be completed and signed by both the Installation Supplier and the AT&T Representative.

4.1.7 The Installation Supplier shall adhere to the Safe-Stop Points (SSP), back-out procedures, and restoration procedures as detailed in the MOP. The Safe-Stop Points shall be clearly identified in the detailed steps of the MOP.

4.1.8 The Critical Power MOP shall include detailed steps to validate the integrity of the power plant bonding and grounding before any work activity begins.

   a) The Installation Supplier shall conduct a visual inspection per ATT-TP76403 Section 3, paragraph 3.3.2 Figure 3-1.

   b) The Installation Supplier shall report all discrepancies (via a JIM where applicable) to the Power Engineer for resolution before proceeding with work activities.

4.1.9 Steps shall be identified on Critical Power MOPs that require an AT&T Representative to be on site and shall observe the Vendor while work is being done. The AT&T employee will monitor Critical Power MOP compliance and the completion of these steps as the work progresses.

4.1.10 After completing each detailed step, the Installation Supplier shall date, time and initial the step and have the AT&T Representative initial each step.

4.1.11 The Energized Electrical Work Permit (“EEWP”) section of a Critical Power MOP shall be completed before working on energized circuits or other equipment with greater than 50Vac or nominal 140Vdc, unless the exceptions at either a), b), c), or d) apply. “Working on” means intentionally contacting electrical conductors or circuit parts with any part of the body or with tools, probes, or test equipment.

   a) An EEWP is not required for a qualified person doing testing, troubleshooting, or voltage measuring, using appropriate safe work practices and Personal Protective Equipment (PPE).

   b) An EEWP is not required for work on circuits used for communications services, e.g., POTS, ADSL, HDSL, ISDN, which can be handled safely bare-handed - see Section B, Subsection 1.6.6(c)).

   c) An EEWP is not required to insert or remove a plug-in cord with an energized receptacle (e.g., all standard types of locking, non-locking, and pin and sleeve IEC-320, IEC-309, NEMA, and California Standard 50A input plugs and output receptacles). The appliance, equipment, or rack PDU outlet strip shall be installed with its breaker in the open (off) position.

   d) An EEWP is not required for a qualified person to insert or remove a branch circuit plug-in breaker unit (aka bus plug) with an energized UL857 compliant track busway (e.g., Starline T5 Series or similar) or modular power distribution unit (e.g., Schneider Modular
PDU or similar). The plug-in breaker unit must be engineered to work with the track busway and installed with the breaker in the open (off) position per manufacturer's instructions. These products are 'finger-safe' and unloaded plug-in units may be installed into a live busway per the UL857 Standard. Their design inherently reduces the likelihood and severity of an Arc Flash (AF) event. However, appropriate safe work practices and PPE shall be used when inserting or removing plug-in breaker units with an energized busway.

e) **Note**: The term “Permit” is used here to follow NFPA 70E® terminology. This is not a "permit" in the traditional sense of a written approval from an Authority Having Jurisdiction (AHJ) or other governmental body. Rather, this permit is a written communication between AT&T and the Installation Supplier, authorizing the latter to perform the work while electrically energized, following procedures specified in the EEWP.

4.1.12 When the Energized Electrical Work Permit (“EEWP”) section of a Critical Power MOP is required by 4.1.11, provide the information identified on Figure D-2.
FIGURE D-1 – JOB START AGREEMENT
A reproducible Job Start Agreement form is provided on the following page.
JOB START AGREEMENT

Check One: □ Original □ Revised □ Post Job

CRITICAL POWER JOB

This document establishes a firm work schedule for the start and completion of the job and authorizes the Installation Supplier to begin work. A MOP shall be issued before any Volatile Work Activity begins.

JOB INFORMATION:
CLLI __________________________ City __________________________ State ________________
TEO No. _______________________
Equipment Engineer __________________________ Installation Supplier _______________________

FIRM SCHEDULE FOR WORK TO BE DONE AT THIS JOB SITE:
Actual Start Date __________________ Scheduled Completion Date __________________
Daily Work Schedule: Start Time __________________ Stop Time __________________

JOB DESCRIPTION:

REASON FOR REVISION:

Work shall not begin on this project until the designated AT&T Representative properly authorizes this Job Start Agreement and the following items have been discussed:

- Arrangements for building access
- On-site coverage
- Equipment to be installed, removed, and/or modified
- In-Service equipment affected, requiring a MOP before work begins
- Building and/or equipment protection during installation
- Cable penetrations (complete Cable Penetration Reporting Log)
- Storage of equipment, material, and tools
- Environmental permits, notifications, and floor drilling training
- Alarm installation, cross-connection leads, and testing responsibility
- Target walk-through date (before or on completion date)
- Problem resolution contacts (immediate supervisor):
  - Manager (AT&T) __________________________ Tel. No. __________________________ Pager No. __________________________
  - NOC/STC/TTC __________________________ Tel. No. __________________________ Pager No. __________________________
  - Manager (Supplier) __________________________ Tel. No. __________________________ Pager No. __________________________

If a service interruption occurs, the Installation Supplier shall:

1. Stop all work operations immediately.
2. Notify local Network Equipment Space and/or ASC personnel of details immediately.
3. Do not replace fuses or restore breakers without the direction of AT&T.
4. Provide a written report to AT&T as directed.

Other pertinent factors unique to this project: _______________________________________________________

☐ Check box if the Job Start Agreement includes attachments.

Agreement has been reached on all items checked above. No deviations from this agreement will be allowed without the approval of the designated AT&T Representative.

*AT&T Rep. Signature/Title & Date  *Installation Supplier Signature/Title & Date

Other Signature (As required)/Title & Date  Other Signature (As required)/Title & Date

Installation Supplier shall distribute this completed form to:
☐ AT&T Equipment Eng.  ☐ Yellow wallet
☐ AT&T Power Maintenance Engineer*
*ONLY on Critical Power Jobs
FIGURE D-2 – METHOD OF PROCEDURE
Reproducible MOP forms are provided on the following pages.
METHOD OF PROCEDURE

MOP No. __________________

JOB INFORMATION:

CLLI __________________ City __________________ State ________________
TEO No. __________________
Installation Supplier __________________

MOP AUTHOR: ______
Skill Level __________________ Telephone __________________

GENERAL MOP DESCRIPTION:

DETAILED MOP SCHEDULE:

Start Date End Date Shift/Work Hours

AFFECTED COLLOCATORS NOTIFIED:

Yes N/A

Detailed list of equipment to be Added (A) / Removed (R) / Modified (M):
Where Volatile Work Activity is to be performed

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>RR/Bay/PBD</th>
<th>Shelf/Panel</th>
<th>Fuse Pos.</th>
<th>Load A,B,C</th>
<th>A/R/M</th>
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List of all Handbooks, Technical Documents, Bulletins, Flashes, and Warnings related to work operations under this MOP:

<table>
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<tr>
<th>Title</th>
<th>Issue</th>
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MOP No. _________________

TEO No. ____________________________

If a service interruption occurs, the Installation Supplier shall:

1. Cease all work operations immediately.
2. Local Network Equipment Space and/or NRC personnel shall be notified of outage details immediately.
3. No fuses or breakers shall be replaced or restored without the direction of AT&T.
4. Provide a written report to AT&T as directed.

List sequence for notification of service interruption or degradation

<table>
<thead>
<tr>
<th>Name/Center (Network Reliability Center (Required))</th>
<th>Phone</th>
<th>Pager</th>
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<tbody>
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Network Reliability Center

| Primary | 1-866-596-0129 |

Transport IOF

| SE       | 1-888-950-2225  | Brentwood, TN |
| MW       | 1-800-382-8282  | Chicago, IL   |
| SW       | 1-800-354-0444  | Kansas City, MO |
| W        | 1-800-662-0266  | Sacramento, CA |

Transport Access

| SE       | 1-877-363-2490 Opt 5 | Charlotte, NC |
| MW       | 1-877-363-2490 Opt 3 | Chicago, IL   |
| SW       | 1-877-363-2490 Opt 4 | Irving, TX    |
| UVerse   | 1-877-363-2490 Opt 1 | Irving, TX    |
| NESDSLAM | 1-877-363-2490 Opt 2 | Irving, TX    |

Mobility

| Mobility NRC (MNRC) | 1-800-638-2822 | Atlanta, GA |

Installation Supplier Personnel working under this MOP

<table>
<thead>
<tr>
<th>Name</th>
<th>Skill Level</th>
<th>Emergency No.</th>
<th>Name</th>
<th>Skill Level</th>
<th>Emergency No.</th>
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</table>
The Installation Supplier shall not deviate from the approved MOP unless authorized by the AT&T Representative. The approved MOP shall be filed in the job folder. Copies can be made for further distribution if requested. Asterisk (*) denotes mandatory signatures on all MOP's, (**) denotes mandatory signatures on all Critical Power MOP's. The Installation Supplier shall determine from AT&T Representative whether additional signatures are required. All work shall be completed in accordance with all AT&T requirements.

**MOP APPROVAL**

<table>
<thead>
<tr>
<th>Title</th>
<th>Print Name</th>
<th>Phone/Pager No.</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>*AT&amp;T Rep.</td>
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<tr>
<td>*Installation Supplier</td>
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<tr>
<td>**AT&amp;T Eng.</td>
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<td>**AT&amp;T PowerRep.</td>
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<tr>
<td>AT&amp;T Maint. Eng.</td>
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<tr>
<td>AT&amp;T Site Manager</td>
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<td>Other as Required</td>
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</table>
METHOD OF PROCEDURE

MOP No. _________________

TEO No. ______________________________________

When AT&T requires this page, it shall be completed and included with the previous required pages of the MOP.

DRY RUN - Required  ☐ Yes  ☐ No

A Step-by-Step “Dry Run” of the Volatile Work Activities listed in the “Detailed Steps” portion of this MOP has been performed by the following representative(s):

The Installation Supplier’s personnel who will be performing the work activities:

Name: ____________________________ Date: ________________

Name: ____________________________ Date: ________________

Name: ____________________________ Date: ________________

Name: ____________________________ Date: ________________

AT&T Representative and Installation Supplier responsible for the equipment/system being worked on:

*AT&T Rep.
Signature: ____________________________ Date: ________________

*Installation Supplier Signature: ____________________________ Date: ________________

☐ Yes  ☐ No  ☐ N/A

(If there were changes as a result of the “Dry Run” they incorporated into a revised, signed, and approved MOP?)
METHOD OF PROCEDURE

MOP No. _________________

ASK YOURSELF QUESTIONS

BEFORE ANY CRITICAL WORK IS PERFORMED, ALL PERSONS INVOLVED IN THE WORK OPERATION(S) COVERED BY THIS MOP SHALL COMPLETE THE ASK YOURSELF QUESTIONS.

AFFIRM YOU HAVE COMPLETED THE ASK YOURSELF QUESTIONS BY CHECKING THE BOXES BELOW AND SIGN OFF AT THE BOTTOM.

Check Box

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<th>Yes</th>
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</table>
5. IS THIS THE RIGHT TIME TO DO THIS WORK?
• Anticipate customer impact of possible network failure. Is the time right for the customer (i.e. if the customer is Sony and they have a big new game release tomorrow, working on their service tonight may not be the best plan)?
• Provide for improved communication of Change Management/Network Events (i.e. is there a hurricane coming up the east coast – if so, it is probably best to delay planned maintenance until after the storm clears).
• Ensure scheduled work meets AY Handbook/other maintenance window requirements.
• Ensure technical support resources are available.

6. AM I TRAINED AND QUALIFIED TO DO THIS WORK?
• Feel comfortable that the training you have received or your prior experience will support the work you will be doing.
• Perform a procedural review of the technical documentation to assure a solid understanding of the work to be performed.

7. ARE THE WORK ORDERS, MOPS, AND SUPPORTING DOCUMENTATION CURRENT AND ERROR FREE?
• Verify you have the most recent document (e.g. vendor documentation, methods and procedures).
• Read through the documentation at least once, verifying the contents, prior to beginning the work.
• Verify that the procedure has been certified in the appropriate environment.

8. DO I HAVE EVERYTHING I NEED TO QUICKLY AND SAFELY RESTORE SERVICE IF SOMETHING GOES WRONG?
• Know who to contact in the event something goes wrong.
• Have the tools available on the job site that may be required to restore service.
• Verify the availability and locations of spare fuses, back-up power and circuit packs, back-up disk or tape.
• Review the SMOP, each step required is listed and will provide a good idea of the proper tools needed.

9. HAVE I WALKED THROUGH THE PROCEDURE?
• Complete a walk through at the start of each shift for which work is to be performed and whenever personnel changes occur.
• Understand the procedures and your responsibilities.
• Ensure the procedure to be performed makes sense (sequence of steps, completeness, testing, safety, etc.).

10. HAVE I MADE SURE THE PROCEDURE CONTAINS PROPER CLOSURE INCLUDING OBTAINING CLEARANCE AND RELEASE FROM THE APPROPRIATE WORK CENTER?
• Make sure you follow the correct procedure and use the proper tools to close the work.
• Validate that the clearance is made or the release for the appropriate work center is done so there is no system or job impact upon closure.
*AT&T Rep.
Signature: ___________________________ Date: ______________

*Installation
Supplier Signature: ___________________________ Date: ______________

*Installation
Supplier Signature: ___________________________ Date: ______________

*Installation
Supplier Signature: ___________________________ Date: ______________

*Installation
Supplier Signature: ___________________________ Date: ______________
METHOD OF PROCEDURE

THE DETAILED STEPS OF THE WORK OPERATION SHALL BE LISTED AND COMPLETED SEQUENTIALLY:

For all removals, all AT&T TP requirements including the following shall be adhered to:

1. The Installation Supplier shall verify, via detailed steps in the removal MOP that the AT&T Representative has made the equipment busy and removed all associated fuses, patch cords, cross-connections, etc. before any removal is started.

2. The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed.

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Description of Volatile Work Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PREVENT PLANT OPERATING ERRORS (POEs) - “at&amp;t” CUSTOMERS EXPECT 100% RELIABLE SERVICE ** AVOID POEs &amp; OUTAGES ** Do not Rush or Perform ANY Action that MIGHT cause a POE Outage on this job. No job is so urgent that we cannot take time to perform our work safely and in a manner to prevent errors.</td>
</tr>
</tbody>
</table>
* (SSP) Safe Stop Point

** If on-site coverage provided

Use additional pages if required to list detailed steps. MOP shall also include relevant attachments.

Are there attachments to this MOP:   Yes ☐  No ☐
METHOD OF PROCEDURE

MOP No. _________________

ENERGIZED ELECTRICAL WORK PERMIT – Required □ Yes □ No

<table>
<thead>
<tr>
<th>AT&amp;T Order No. (TEO):</th>
<th>□ Yes □ No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Supplier Order No.:</th>
<th>□ Yes □ No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CLLI Code (8):</th>
<th>□ Yes □ No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Installation Company:</th>
<th>□ Yes □ No</th>
</tr>
</thead>
</table>

## PART I: TO BE COMPLETED BY THE INSTALLATION SUPPLIER SUPERVISOR

<table>
<thead>
<tr>
<th>Description of circuit(s) / equipment to be worked on:</th>
<th>See Detailed list of equipment to be added / Removed / Modified Where Volatile Work Activity is to be performed section of the MOP.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Description of work to be done:</th>
<th>See General MOP Description and Step-by-Step Volatile Work Activities listed in the Detailed Steps portion of the MOP.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Justification of why the circuit(s) / equipment cannot be de-energized or the work deferred until the next scheduled outage:</th>
<th>Select one or both and provide explanation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Additional hazards or increased risk</td>
<td></td>
</tr>
<tr>
<td>□ Infeasibility</td>
<td></td>
</tr>
<tr>
<td>Explanation:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of Installation Supplier Supervisor and Date</th>
<th>See Electronic Job Folder</th>
</tr>
</thead>
</table>

## PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK

<table>
<thead>
<tr>
<th>Detailed description of job procedures to be used:</th>
<th>See Step-by-Step Volatile Work Activities listed in the Detailed Steps portion of the MOP.</th>
</tr>
</thead>
</table>

| Description of safe work practices to be employed: | |
|---------------------------------------------------||

| Results of the shock and arc flash risk assessment (e.g., per the Arc Flash assessment equipment label): | Voltage to which personnel will be exposed | V |
|-----------------------------------------------------------------|---------------------------------|
| Restricted Approach Boundary | |
| Limited Approach Boundary | |
| Arc Flash Boundary | |

<table>
<thead>
<tr>
<th>Available incident energy at the working distance or arc flash PPE category</th>
<th>cal/cm²</th>
<th>@ _____ inches</th>
</tr>
</thead>
</table>
### Shock and arc flash

Personal protective equipment (PPE) necessary to safely perform the assigned task (not already listed in ATT-TP-76300 section B paragraph 1.2.18.(b)):

<table>
<thead>
<tr>
<th>Means employed to restrict the access of unqualified persons from the work area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of completion of a job briefing, including discussion of any job-related hazards</td>
</tr>
<tr>
<td>See Job Start Agreement</td>
</tr>
</tbody>
</table>

Do you agree the above-described work can be done safely?
- [ ] Yes
- [ ] No (return to Installation Supplier Supervisor)

**Electrically Qualified Person**
- Name: ____________________________ Date: __________

**Electrically Qualified Person**
- Name: ____________________________ Date: __________

### PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED

See Critical Power MOP signature page (when included as part of the EJF Critical Power MOP).

<table>
<thead>
<tr>
<th>Installation Supplier Supervisor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>____________________________</td>
<td>__________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AT&amp;T TFS Representative</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>____________________________</td>
<td>__________</td>
</tr>
</tbody>
</table>
SECTION E -- JOB DOCUMENTATION

CONTENTS

1. GENERAL .............................................................................................................................. E-2
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   1.2. General Requirements .............................................................................................. E-2

2. ELECTRONIC JOB FOLDER ............................................................................................ E-2
   2.1. General ....................................................................................................................... E-3

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8. JOB COMPLETION REPORT ........................................................................................... E-10
   8.1. Purpose ....................................................................................................................... E-10
   8.2. Job Completion Requirements .................................................................................. E-10
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TABLE E-1 – SUMMARY OF CHANGES IN SECTION E

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/28/2017</td>
<td>Entire Document</td>
<td>Modification</td>
<td>N/A; August 2017 TP76300 Rewrite</td>
</tr>
<tr>
<td>11/02/2018</td>
<td>Figure E-4</td>
<td>Modification</td>
<td>ATT-TP-76300-419</td>
</tr>
<tr>
<td>11/02/2018</td>
<td>7.2</td>
<td>Modification</td>
<td>ATT-TP-76300-420</td>
</tr>
<tr>
<td>11/02/2018</td>
<td>7.1.1, 7.1.2</td>
<td>Modification</td>
<td>ATT-TP-76300-421</td>
</tr>
<tr>
<td>12/03/2018</td>
<td>7.1.2</td>
<td>Modification</td>
<td>ATT-TP-76300-422</td>
</tr>
</tbody>
</table>
1. **GENERAL**

Installation Supplier = Organization performing the requested work activity.

AT&T Engineer = Person requesting the work activity.

1.1. **Introduction**

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the preparation and use of required documentation of the job.

1.1.4 Changes in this issue of Section E of ATT-TP-76300 are summarized in Table E-1.

1.2. **General Requirements**

1.2.1 The Installation Supplier shall use the current version of all forms, unless AT&T authorizes the use of surplus stock forms.

1.2.2 The Installation Supplier shall fill out any required forms in their entirety.

1.2.3 The Installation Supplier shall fill out any required forms accurately.

1.2.4 The Installation Supplier shall ensure the AT&T Representative signs any required forms where a signature is listed or note on the document from the Installation Supplier stating the AT&T Representative refused to sign it. The AT&T Engineer shall be notified when a refusal to sign a form occurs. Certain tasks cannot proceed without concurrence from the AT&T Representative.

1.2.5 The Domestic Record & Information Management (RIM) retention policy for job sack/folder (paper or electronic) is, active records are still being used plus 20 years (ACT+20).

2. **ELECTRONIC JOB FOLDER**

The use of the Electronic Job Folder (EJF) application to store the job documentation is required unless directed by AT&T to utilize another application or process. AT&T Suppliers
which are not required to use EJF shall store all job documentation in an on-site job folder (e.g. Yellow Wallet) and sign it over to the AT&T Representative at the end of job.

EJF requirements also apply to the on-site job folder. Hard copies of the required documents are placed inside the on-site job folder. Forms are provided at the end of this section and on the Technical Publications and NEBS site at https://ebiznet.sbc.com/sbcnebs/.

2.1. General

2.1.1 The Installation Supplier shall create a job folder within Electronic Job Folder (EJF) to store all pertinent job documentation electronically.

2.1.2 The Installation Supplier shall use the templates within EJF to create required documents such as the JSA, MOP(s), and JCR.

2.1.3 The Installation Supplier shall ensure that the documents in part 2.1.2 are approved by an AT&T Representative or appropriate party.

2.1.4 The Installation Supplier shall upload an electronic copy of other pertinent job documentation, such as Detail Specifications, EIU, Test Records, and Office Drawings (i.e. Tab/DB, Floor Plan, Framemate, etc…) into EJF.

2.1.5 The EJF is the property of AT&T and shall be archived by the AT&T Engineer upon completion of the job.

2.1.6 A job folder is not required for Trade Vendors performing work activity outside the equipment installation areas.

2.1.7 An electronic signature or approval with respect to an EJF form is equivalent to a physical signature.

2.1.8 Documents that cannot be electronically signed within EJF shall be physically signed, scanned and uploaded into EJF by the supplier.

2.2. Documents Availability

Required documents shall be available to AT&T within either the Electronic Job Folder (EJF) application or an on-site job folder (e.g. Yellow Wallet) before various work activities may occur. See the table below for the most common documents required and when they shall be available for review.

<table>
<thead>
<tr>
<th>Document Type</th>
<th>When documents need to be in EJF or the On-Site Job Folder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prior to the vendor starting any work.</td>
</tr>
<tr>
<td>Job Start Agreement (JSA)</td>
<td>X</td>
</tr>
<tr>
<td>Document Type</td>
<td>When documents need to be in EJF or the On-Site Job Folder</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Prior to the vendor starting any work.</td>
</tr>
<tr>
<td></td>
<td>Prior to work being done on the power planet controller.</td>
</tr>
<tr>
<td></td>
<td>Prior to any work that requires a detailed MOP.</td>
</tr>
<tr>
<td></td>
<td>Prior to issuing an advance JCR.</td>
</tr>
<tr>
<td></td>
<td>Prior to issuing the JCR.</td>
</tr>
<tr>
<td></td>
<td>Prior to and after a post JSA.</td>
</tr>
<tr>
<td>Telephone Equipment Order (TEO)</td>
<td>X</td>
</tr>
<tr>
<td>Detailed Specification</td>
<td>X</td>
</tr>
<tr>
<td>Waiver document</td>
<td>X</td>
</tr>
<tr>
<td>Equipment Inventory Update Form (EIU)</td>
<td>X</td>
</tr>
<tr>
<td>Technical Requirements Document (e.g., M.R. or T.R.)</td>
<td>X</td>
</tr>
<tr>
<td>Floor Plan</td>
<td>X</td>
</tr>
<tr>
<td>Out of band assignments (Conexus CO, COWAN, NSDnet, etc…)</td>
<td>X</td>
</tr>
<tr>
<td>Engineer Records (Tab/db, DSX/FOX, Framemate etc…)</td>
<td>X</td>
</tr>
<tr>
<td>Detailed MOP</td>
<td>X</td>
</tr>
<tr>
<td>Cable Penetration Reporting Log</td>
<td>X</td>
</tr>
<tr>
<td>BDFB Demand Worksheet</td>
<td>X</td>
</tr>
<tr>
<td>Power Plant Controller/Monitor Backup Configuration</td>
<td>X</td>
</tr>
<tr>
<td>Document Type</td>
<td>When documents need to be in EJF or the On-Site Job Folder</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Prior to work being done on the power planet controller.</td>
</tr>
<tr>
<td></td>
<td>Prior to any work that requires a detailed MOP.</td>
</tr>
<tr>
<td></td>
<td>Prior to issuing an advance JCR.</td>
</tr>
<tr>
<td></td>
<td>Prior to issuing the JCR.</td>
</tr>
<tr>
<td></td>
<td>Prior to and after a post JSA.</td>
</tr>
<tr>
<td>Job Information Memorandum (JIM)</td>
<td>X U U</td>
</tr>
<tr>
<td>Test Records</td>
<td>X U U</td>
</tr>
<tr>
<td>Material Disposition Report (MDR)</td>
<td>X U U</td>
</tr>
<tr>
<td>Marked Up Drawings</td>
<td>X U U</td>
</tr>
<tr>
<td>Advance - Job Completion Report (Advance JCR)</td>
<td>X</td>
</tr>
<tr>
<td>Job Completion Report</td>
<td>X</td>
</tr>
<tr>
<td>Post - Job Start Agreement (Post JSA)</td>
<td>X</td>
</tr>
</tbody>
</table>

X = Initial document upload.
U = Updated document uploaded, when required.

3. CABLE PENETRATION REPORTING LOG

3.1. General

3.1.1 The Installation Supplier shall complete the Cable Penetration Reporting Log (Figure E-2) to document the cable penetration activity.

3.1.2 At the Job Start Agreement meeting or MOP, the Installation Supplier shall provide a list of the cable penetrations to be opened during the job. Contact the COLD Engineer (Space Planner) if unable to determine the cable hole or wall opening designation. Stenciling the designation, if not present, shall be added as a work activity on the current job.

3.1.3 The Installation Supplier shall record all cable penetrations that have been accessed during that day.
3.1.4 The Cable Penetration Reporting Log shall be placed in the job folder at the completion of the job.

4. POWER DOCUMENTATION

4.1. BDFB Load Demand Worksheet

4.1.1 The Installation Supplier shall record SPDU / BDFB load readings and spare fuse positions on the Load Demand Worksheet all jobs that add a secondary power load to a SPDU (e.g. BDFB, mini BDFB, or bay Fuse and Alarm Panel (FAP)). The Load Demand Worksheet is located on both the TDocs website and in the EJF system.

4.1.2 The Installation Supplier shall file a copy of all BDFB Load Demand worksheets in EJF. If EJF is not utilized a copy of document shall be:
   1. Left in the on site job folder.
   2. Forwarded to AT&T Engineer.
   3. Forwarded to the AT&T Capacity Manager / Planner

4.1.3 The Installation Supplier shall not terminate new secondary power circuits in a SPDU (BDFB, mini-BDFB, or bay FAP) with a measured load on the primary circuit plus the L1 drain of all new and future equipment associated with a fuse position greater than 45% of its over-current protection device rating (e.g., a new circuit may not be terminated in a panel protected by a 600A fuse with an existing 271A or greater load).

4.2. Power Plant Controller/Monitor Backup Configuration

4.2.1 The purpose of the backup configuration is to provide a means for quick restoration in the event power plant controller / monitor programming is corrupted.

4.2.2 At formal Job Acceptance / Completion walk-through, the Installation Supplier shall provide, on a CD or other locally acceptable electronic media, a copy of the power plant controller and/or monitor configuration on any project that modifies the power plant controller and/or monitor configuration.
   a) CD shall be labeled with CLLI, Frame ID of controller / monitor, model, “BACKUP CONFIGURATION”, and date.
   b) Format shall be ASCII or other locally acceptable format that is recognized by the controller / monitor.

5. JOB INFORMATION MEMORANDUM

5.1. General

5.1.1 The Installation Supplier shall use the Job Information Memorandum (JIM) as a notification for additional information and record purposes.

5.1.2 The JIM (Figure E-3) shall be used for those occasions when formal communications between the AT&T Equipment Engineer and Installation Supplier are necessary. A copy of all
JIM forms shall be placed in the job folder. These communications may include but are not limited to the following:

a) Additional material
b) Additional engineering
c) A change in the TEO or detail specification
d) Additional information
e) Request for additional Installation Supplier effort
f) Request for disposition of AT&T material
g) Document verbal agreements between the Installation Supplier and AT&T

5.1.3 The Installation Supplier shall not use a "JIM" form to request from the AT&T Engineer any variances from the requirements outlined in AT&T Standards.

5.1.4 The Installation Supplier shall obtain proper approval for waivers as delineated in the Waiver Process and place a copy of all approved waivers in the job folder.

5.1.5 A JIM shall not be used to approve the cost of additional work activity. Note: Approval of additional costs (e.g. material or service) is done via the appropriate ordering system (e.g. VIPS, Manual VRF or equivalent)

6. TEST RECORD

6.1. Equipment Tests

6.1.1 As an integral part of the installation, the Installation Supplier shall perform tests, in accordance with the AT&T testing requirements, as stated in ATT-TP-76900, to:

a) The Calibrated Tools Report shall include all devices used on the job that require calibration.

b) Test and verify all features and functions of the equipment provided, rearranged and/or modified to ensure that it is properly powered and it will operate properly when placed in service.

c) In every case, including preassembled bays, the supplier shall visually check that the fuse/breaker size is correct based on AT&T drawings each time a fuse/breaker is installed and the fuse/breaker position is designated correctly. The required verification is to explicitly look at the fuse/breaker itself and make sure the fuse/breaker designation matches the fuse/breaker type and size denoted in the drawing. The fuse/breaker itself shall be visually verified to be the correct size again at the time a supplier performs the test and turn up of an installed equipment shelf. The visual verification that the correct fuses are installed shall be recorded as a specific check in the equipment test record and placed in the job folder. Record and initial each fuse/breaker as verified in the test records with the type and size of the fuse/breaker installed in each position assigned for the job.
d) Work activity removed per APEX document ATT-NOTICE-000-005-865, Fiber Inspection, Cleaning and Testing Process Change. (Applies to jobs approved by AT&T on 06/26/2017 and later.)

e) Work activity removed per APEX document ATT-NOTICE-000-005-865, Fiber Inspection, Cleaning and Testing Process Change. (Applies to jobs approved by AT&T on 06/26/2017 and later.)

f) In situations of pre-provisioned or empty chassis/shelf installations where common plug-in modules are not provided as part of the installation, discrete or serial alarms (both local and remote) shall be wired and tested as per this section. Other remote alarm protocols, such as TL1 or SNMP cannot be fully tested to the Network Reliability Center (NRC) without the common plug-in modules, therefore, any and all cabling required in the TEO for these alarm types shall be verified for correct and complete continuity from the network element to the appropriate termination point.

g) The results of all remote alarm tests shall be recorded on the Remote Alarm Test Record, (Figure E-7).

h) The Remote Alarm Test Record shall be placed in the job folder at the completion of the job.

6.2. Preparation and Distribution

6.2.1 The Installation Supplier shall maintain and complete a Test Record (Figure E-4) of the tests and inspections performed during the installation. All final test results shall be recorded on the Test Record as the tests are completed.

6.2.2 If the equipment is determined to be free of trouble, the Installation Supplier shall record the letters “NTF” indicating No Trouble Found, in the “Trouble Found” column and enter initials and date in the “Tested By” column to validate that the test was performed and completed satisfactorily.

6.2.3 The approved Test Record shall be placed in the job folder.

7. MATERIAL DISPOSITION RECORD

7.1. General

7.1.1 The Material Disposition Record (MDR) shall be used to record the transfer of tangible items to AT&T or other 3rd party. Items turned over shall be listed on the MDR (Figure E-5) by the Installation Supplier and accepted and signed for by the AT&T Representative or other appropriate party.

Example of 3rd or other appropriate parties:

- The person or person representing the organization authorized by AT&T to take possession of AT&T material.
- The driver the picks up the material to be transported to another location.

7.1.2 Removed equipment classified as one of the following shall be reported on a separate MDR.
a) reuse
b) salvage (e.g., scrap metal recycling)
c) allocated for surplus sales
d) hazardous or regulated material.
e) floor covering material containing asbestos generated during installation (e.g., drilling).
   Create an individual MDR for this material.

Material shall be turned over, sent, or picked up and delivered to an approved AT&T facility
per the AT&T Engineer’s instructions.

Note: A completed and submitted Negative Exposure Assessment (NEA) form is used in lieu
of filling out a MDR form for debris associated with NEA drilling, cutting, and lifting
procedures.

7.1.3 The Installation Supplier shall be liable for those items that have not been turned over to
AT&T.

7.1.4 Copies of all MDRs shall be either be uploaded into job folder in EJF (when used) or left in
the job folder which is signed over to the AT&T representative upon completion of the job.

7.1.5 Completed documentation which is uploaded or posted in the EJF job folder are not required
to be listed on the MDR form.

7.2. Purpose

7.2.1 Examples of items turned over to the AT&T representative which are documented on the
MDR.

a) Paper work
   1. Marked drawings
   2. Corrected equipment order
   3. Corrected specifications
   4. Marked drawings
   5. Office and equipment drawings
   6. Handbooks and pamphlets
   7. Generic documentation

b) Material
   1. Material ordered for the AT&T representative.
   2. Excess or spare material purchased by AT&T
   3. Equipment not installed (listed on the spec but not installed)
   4. Spare circuit packs / plug-ins
   5. Test Sets / accessories
6. Hand tools
7. Maintenance Kits
8. Fuses and P tags.

c) Examples of items documented on the MDR associated with material removed from the installation site (e.g., scrap metal):

1. Bays
2. Equipment Shelves
3. Plug-In’s
4. Scrap cable (e.g. raw, jumper wire, assembly, etc.)
5. Iron work and hardware

7.2.2 Only one type of item shall be listed per line on the MDR.

7.2.3 MDRs shall be signed by the person that is taking custody of the items list listed on it or validates the disposal of the items (e.g., AT&T representative, 3rd party vendor that picked up material to be transported, Implementation Engineer, etc.).

7.2.4 Generic material (non-scrap metal) destined for landfill does not require a MDR. Examples:

a) wood, paper, and plastic material
b) wax cord
c) fiber cable and jumpers
d) cable sheaths
e) firestopping material

8. JOB COMPLETION REPORT

8.1. Purpose

8.1.1 The properly authorized Job Completion Report (Figure E-6) serves as notification from the Installation Supplier that the job has been completed.

8.2. Job Completion Requirements

If job completion requirements cannot be meet, contact the AT&T Engineer for instructions. An advance JCR may be in order while waivers are considered.

8.2.1 The Installation Supplier shall consider the job complete when all items described below have been complied with:

a) All equipment (i.e., bays, frames, circuits, etc.) specified in the detail specification(s) has been completely wired, adjusted, tightened, labeled or stenciled, tested or removed and is ready to be turned over to AT&T without exception.
b) An Installation Supplier quality performance audit of both the Detail Specification and the installation has been completed; results of the audits documented in the job folder, and documentation that all defects and/or discrepancies have been corrected. This includes when the defect was corrected and who corrected the defect.

c) Spare parts (e.g., circuit packs, fuses, etc.) have been turned over to AT&T and are in good working condition.

   Note: Circuit packs shall be stored in the original protective shipping cartons to reduce the possibility of ESD damage.

d) Damage to buildings and grounds (e.g., walls, floors, driveways, fences, etc.) have been corrected.

e) Correction of Installation Supplier caused defects or damage to existing equipment.

f) Removal of temporary floor, wall and column protection placed by Installation Supplier.

g) Removal of Installation Supplier’s installation tools, surplus/excess equipment, excess material, trash and all other property.

h) All associated installation documentation, along with the detail specification(s) and the TEO, has been turned over to the AT&T Representative in the job folder uploaded into EJF.

i) All removed or equipment not installed and/or material has been disposed of per detail specification(s) or per the AT&T Engineer’s written instructions.

j) Copies of all Job Start Agreements, MOPs, JIMs, Marked Prints, MDRs and Job Completion Reports, etc., have been distributed and/or uploaded into EJF as required.

k) The Installation Supplier shall notify the AT&T Representative a minimum of 3 days prior to test and acceptance.

l) All infrastructure (electrical, mechanical, and building construction) specified in the drawings has been completed and is ready for equipment placement without exception.

m) Appropriate AT&T databases have been updated and validated.

n) The Installation Supplier shall electronically submit job completions using the QAS Job Completion Reporting Tool to the AT&T Installation Quality organization on a daily basis, no later than the third calendar day of the next month, and meet all the requirements as stated in Section E, 8.2.1, sub-paragraphs a-m.

8.3. Job Completion Report Procedure

8.3.1 The Installation Supplier shall follow these job completion steps in order, unless already provided via a mechanized system:

a) Prepare and sign the Job Completion Report.

b) Per 8.2.1 (m) List the job as complete on the Excel spreadsheet that is a list of jobs that were completed the previous month and forward to the Regional Quality Organization.
c) Notify the AT&T Engineer and AT&T Representative, as determined at the JSA meeting, of the completion of installation and request a job completion walk-through meeting at the job site, prior to the scheduled complete date of the job. The Installation Supplier shall provide a Job Completion Report at the start of the job completion walk-through meeting.

d) The AT&T Engineer or AT&T Representative and the Installation Supplier shall conduct a formal job completion walk-through during which a complete review of all details of the project will be performed. The intent of this review is to verify all work items outlined in the job specification were completed and installed according to ATT-TP-76300 and all equipment added and/or modified is both operational and functional.

e) Upon the completion of the walk-through, the AT&T Engineer or AT&T Representative will either note the job as “Complete” or “Not Complete” and require the Installation Supplier to correct all defects or deviations from the specification as noted in the job completion walk-through. The job will not be noted as “Complete” until it is properly installed.

f) When the AT&T Engineer or AT&T Representative determines that the job has been completed, they shall sign the Job Completion Report.

g) The Installation Supplier shall distribute the Job Completion Report as indicated on the form.

h) The lead installer, responsible for ensuring zero defects at job completion, shall be identified on the Job Completion Report.

i) If a second individual reviewed the completed job for zero defects, that individual shall be identified on the Job Completion Report.
ATTENTION AT&T CENTRAL OFFICE PERSONNEL – Retain this wallet with all its contents (Documents, Drawings, Etc.) at the job site for 180 days after completion.

OFFICE:                  CITY/STATE:  
TEO NO:                  PROJECT NO:   
SUPPLIER:                SUPPLIER ORDER NO:  
AT&T EQUIPMENT ENGR:    
JOB COMPLETION DATE:    COMPLETION WALK-THROUGH DATE:  

JOB DESCRIPTION:

The following items shall be included in job folder upon completion when applicable (please √ appropriate box):

□ Job Start Agreement (JSA)  □ Material Disposition Record (MDR)  MDR # ____________ listing office drawings and tangible items left in C.O.
□ Method of Procedure (MOP)                           MDR # ____________ listing corrected drawings distributed per SPEC/Equipment Engineer
□ Copy of SPEC  
□ Copy of Drawings  
□ Test Record  
□ Job Completion Report  □ BDFB Load Demand Worksheet  
□ Storage Battery Charge Report  □ DC Distribution Worksheet  
□ Cable Penetration Reporting Log  □ Remote Alarm Test Record  
□ Internal Audit Documentation  □ New BDFB WORKSHEET  
□ Other – JIM, EIU, ETC:  
□ NEA Floor Drilling Form  
□ TEO  

SUPPLIER:                AT&T REP:  
Signature:                Signature (Ensure all required documentation is enclosed)  
DATE:                    DATE:  

THIS WALLET IS THE PROPERTY OF AT&T WHEN TURNED OVER TO THE AT&T REPRESENTATIVE AT THE TIME OF JOB COMPLETION.
FIGURE E-2 – CABLE PENETRATION REPORTING LOG

A reproducible copy of the Cable Penetration Reporting Log form is provided on the following page.
JOB INFORMATION:

CLLI ________________________________ City ________________________ State_________________

TEO No ____________________________

Installation Supplier ____________________________

CABLE PENETRATION REPORTING LOG:

List all affected cable penetrations to be closed as required in ATT-TP-76300:

<table>
<thead>
<tr>
<th>CABLE PENETRATION LOCATION/ID</th>
<th>DATE OPENED</th>
<th>DATE CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
FIGURE E-3 – JOB INFORMATION MEMORANDUM

A reproducible copy of the Job Information Memorandum (JIM) form is provided on the next page.
### JOB INFORMATION:

<table>
<thead>
<tr>
<th>CLLI</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEO No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation Supplier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**JIM NO.**

<table>
<thead>
<tr>
<th>TO</th>
<th>FROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDR.</td>
<td>ADDR.</td>
</tr>
<tr>
<td>CITY</td>
<td>CITY</td>
</tr>
<tr>
<td>PHONE</td>
<td>PHONE</td>
</tr>
</tbody>
</table>

### JOB DESCRIPTION

SUBJECT

DETAILS

---

**ORIGINATOR**

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
</tr>
</thead>
</table>

**SIGNATURE**

| NAME | TITLE |

**RESPONSE**

**NAME**

**SIGNATURE**

Distribution: Job Folder, AT&T Equipment Engineer
FIGURE E-4 - TEST & FUSE/BREAKER VERIFICATION RECORD

A reproducible copy of the Test Record form is provided on the following pages, E-16 through E-18.
A reproducible copy of the Test Record form is also provided at:
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm

A reproducible copy of the Fuse/Breaker Record form is provided at:
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm
**JOB INFORMATION**

TEO ____________

CLLI ____________

CITY ____________ STATE ____________

**TEST COMPLIANCE AND VALIDATION**

<table>
<thead>
<tr>
<th>ATT REP</th>
<th>SUPPLIER (Mgr or Level 3/4)</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

All tests were conducted per ATT-TP-76900 requirements

Final results of all tests listed were "No Trouble Found" (NTF)

All tests required for this job were conducted as prescribed

**TESTS PERFORMED**

<table>
<thead>
<tr>
<th>BAY</th>
<th>SHELF</th>
<th>PORT</th>
<th>CIRCUIT</th>
<th>EQUIPMENT TESTED</th>
<th>TEST DESCRIPTION</th>
<th>TROUBLE FOUND</th>
<th>TEST EQUIP</th>
<th>Results Submitted</th>
<th>ATT</th>
<th>SUPPLIER</th>
<th>DATE mm/dd/yy</th>
</tr>
</thead>
<tbody>
<tr>
<td>112.1</td>
<td>1A</td>
<td>13</td>
<td></td>
<td>Power Cabling</td>
<td>Continuity</td>
<td>NTF</td>
<td>Ohm</td>
<td>NA</td>
<td>PWL</td>
<td>JAC</td>
<td>01/22/12</td>
</tr>
<tr>
<td>112.1</td>
<td>1A</td>
<td>1-48</td>
<td></td>
<td>Fiber Jumpers</td>
<td>Loss</td>
<td>Fiber Tester</td>
<td>Yes</td>
<td></td>
<td>JAC</td>
<td>01/24/12</td>
<td></td>
</tr>
</tbody>
</table>
FUSE/BREAKER VERIFICATION RECORD

JOB INFORMATION:

CLLI __________________ City ____________________________ State ______
TEO No. __________________________
Equipment Engineer __________________________
Installation Supplier __________________________

VERIFY ALL FUSES/BREAKERS INSTALLED OR TURNED UP

<table>
<thead>
<tr>
<th>BAY SHELF PANEL</th>
<th>FUSE/BREAKER POSITION</th>
<th>FUSE/BREAKER TYPE (TPA, GMT, etc.)</th>
<th>FUSE/BREAKER SIZE</th>
<th>TESTED BY &amp; DATE</th>
<th>VERIFIED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

* “N/A” shall be used in the verify column if the installation supplier is not present when the fuse is placed to energize the equipment.
## CALIBRATED DEVICES USED ON JOB

<table>
<thead>
<tr>
<th>TOOL TYPE</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Serial Number</th>
<th>Calibration Due Date (mm/yy)</th>
<th>Self Calibrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimper</td>
<td>Burndy</td>
<td>BRN-123</td>
<td>BU-23A546</td>
<td>4/14</td>
<td></td>
</tr>
<tr>
<td>Fiber Tester</td>
<td>Noyes</td>
<td>FBR-556</td>
<td>N-876H67</td>
<td>NA</td>
<td>X</td>
</tr>
</tbody>
</table>
FIGURE E-5 – MATERIAL DISPOSITION RECORD

A reproducible copy of the Material Disposition Record form is provided on the following page.
JOB INFORMATION:

CLLI ________________________ City _______________________________ State_________________
TEO No __________________________
Equipment Engineer _______________________________________
Installation Supplier ________________________________________

MDR Number: ___________________ Page: ______ of ______

TO:
Location: _________________________________
Attention: _________________________________________
Address: _____________________________________
City, State, ZIP: ____________________________________

FROM:
Address: _____________________________________
City, State, ZIP: ____________________________________

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Material Name and Description</th>
<th>Corrected Drawing Number</th>
<th>Detailed Spec/P.O. #</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Office Drawings Remarks:
_______________________________________________________

Equipment Manuals
______________________________________________________________

Ckt Packs/Plug-ins
______________________________________________________________

Corrected Dwgs Yes No Job Completion Date: _____________
Test Set/Accessories
Supplier Signature: _____________________________ Date: _____________
Other (Explain in Remarks)

Distribute to:
Equipment Engineer
AT&T Representative: _____________________________ Date: _____________
Job Folder

Received:
Shipment from Job Site
Equipment Engineer: _____________________________ Date: _____________
FIGURE E-6 – JOB COMPLETION REPORT

A reproducible copy of the Job Completion Report form is provided on the following page.
JOB INFORMATION:

Advance [ ] Final [ ]

CLLI ________________________ City _______________________________ State______________

TEO No __________________________   Equipment Engineer ________________________________________

Installation Supplier _______________________________________

After proper authorization, this document serves as notification from the Installation Supplier of job completion.

Actual Job Completion Date: ________________

Project Description

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

The following individuals were present and participated in the final job review:

Name        Title
________________________________ ____________________________________________
________________________________ ____________________________________________
________________________________ ____________________________________________
________________________________ ____________________________________________
________________________________ ____________________________________________

YES / NO All equipment ordered in the above specification has been provided and/or installed, without exception, in accordance with the current ATT-TP-76300 and is ready for service. (NOTE: Even if there are exceptions, this job is subject to AT&T quality audits.)

If NO is circled, list the exceptions below, and reschedule the job completion by issuing a revised Job Start Agreement.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Installation Supplier Representative (Sig)   Title    Date
_______________________________________________________  _________________________  ________

AT&T Representative (Sig)   Title    Date
________________________________________    _________________________  ________

This completed form (whether YES or NO is circled) shall be distributed to:

AT&T Equipment Engineer, Job Folder
FIGURE E-7 – REMOTE ALARM TEST RECORD REPORT

A reproducible copy of the Remote Alarm Test Record Report form is provided on the following page.
## JOB INFORMATION:

<table>
<thead>
<tr>
<th>CLLI</th>
<th>City</th>
<th>State</th>
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</table>

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<tr>
<th>TEO No</th>
<th>Equipment Engineer</th>
<th>Installation Supplier</th>
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</table>

### LIST ALL REMOTE ALARM TESTS PERFORMED

<table>
<thead>
<tr>
<th>Date</th>
<th>EQUIP. TYPE</th>
<th>R.R. / BAY SHELF</th>
<th>ALARM DESCRIP</th>
<th>DISPLAY #</th>
<th>ALARM TYPE</th>
<th>TESTED BY</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Disp #:</td>
<td>□ Discrete/TBOS □ TL1 Msg.</td>
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<td>Pt #:</td>
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</tbody>
</table>

### ATTACHMENTS

**INSTALLATION SUPPLIER:** The above alarms have been tested from the network element to the NOC and all trouble found has been cleared.

<table>
<thead>
<tr>
<th>SUPPLIER'S SIGNATURE</th>
<th>DATE</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

**ACCEPTANCE:** The approved test record shall be filed in the job folder. Copies can be made for further distribution if requested. At the completion / acceptance walk-through, the above list of test(s) was verified to be a complete list of tests required for this job.

<table>
<thead>
<tr>
<th>AT&amp;T REPRESENTATIVE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
SECTION F -- FIRE STOPPING

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### TABLE F-1 – SUMMARY OF CHANGES IN SECTION F

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/02/2015</td>
<td>Contact Information (pg. F-23)</td>
<td>Modification</td>
<td>N/A</td>
</tr>
<tr>
<td>01/16/2018</td>
<td>Entire Document</td>
<td>Modification</td>
<td>N/A; Section Rewrite</td>
</tr>
<tr>
<td>03/04/2019</td>
<td>Entire Document</td>
<td>Modification</td>
<td>N/A; Section Rewrite</td>
</tr>
</tbody>
</table>
1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the general requirements for opening and closing through-penetrations in floors and fire rated walls and protection of cable runs.

1.1.4 3M fire and smoke stopping procedures in this document describe previously used methods. Paragraphs are presented solely for purposes of assuring those remaining openings are in compliance to those methods. No new applications of 3M fire stopping systems shall be applied.

1.1.5 All fire stopping installed in AT&T equipment buildings shall be with UL Listed Systems installed in strict accordance to the manufacturer’s installation instructions.

1.1.6 Changes in this issue of Section F are summarized in Table F-1.

2. REQUIREMENTS

2.1. General

2.1.1 Smoke and fire stopping is required at all through-penetrations in floors and fire rated walls.

A: Through-penetrations in non-fire rated walls shall not be fire stopped.

B: The Installation Supplier shall contact the AT&T Equipment Engineer for questions regarding the fire rating of a specific wall. This information shall be documented on a JIM and a copy left in the job folder or job folder on site.

2.1.2 Fire-stopping products made by different manufacturers shall not be used in the same cable hole or through-penetration. The exception to this requirement applies to smoke stopping at the interior of cable bundles. Existing fire stopping putty between cable layers that are not accessible and where new putty pads cannot be applied may remain in place even though the product is of another manufacturer.

2.1.3 When the Installation Supplier opens a cable hole, the Installation Supplier shall close, and fire stop the cable hole in accordance with this section and in accordance to UL certified fire stop system drawings.

2.1.4 The Installation Supplier shall comply with the following fire stop management considerations:

a) The Installation Supplier shall permanently close through penetrations at the end of each workday or at the completion of an installation or removal operation, whichever occurs first.
b) The Installation Supplier shall update the Cable Penetration Reporting Log (see Section E).

c) The installation Supplier shall not leave the premises while a through-penetration is open.

d) Unframed cable holes in hollow walls shall be referred to the AT&T Equipment Engineer for upgrading so holes are framed on all four sides. Any supporting documentation regarding this issue shall be left in the job folder.

2.1.5 All penetrations shall be closed with Hilti fire stop materials and smoke stop putty in accordance to Hilti and UL Listed Fire Stop systems. Exceptions to this policy will be limited to the following:

a) Existing penetrations with other manufacturers’ UL certified fire stopping systems may continue to be fire and smoke stopped with existing systems until those penetrations are opened in the future.

b) Cable penetration opened for inspection and immediately closed with no cable add or removal.

c) Closure of penetration during course of project when work in a penetration has not been completed. Final closure of penetration will be fire and smoke stopped with Hilti fire stop system.

d) Cable penetrations previously closed using other fire stopping system shall have all existing materials removed and replaced with Hilti materials. Smoke stop putty of another manufacturer that is not accessible internal to the opening or between cable bundles may be left in place.

2.1.6 If technical assistance is required for Non-Standard cable hole penetrations, the installation supplier shall complete the Request for Technical Assistance form at the end of this Section and forward as indicated on the form. When this form is used, a copy of the response from ATT or Hilti, Inc. shall be left in job folder at job completion. Additionally, the cable hole shall be stenciled or labeled with the following information beneath the face of cable hole:

FIRESTOPPED PER HILTI UL-WXYZ OR HILTI DRAWING NUMBER 1234567x DATED 00/00/0000

2.1.7 Conduits and pipes shall not be added to through-penetrations containing network interconnection cables. Conduit and pipes shall be run through a separate opening, which shall be fire stopped with approved intumescent products. Refer to paragraphs 4.7 to 4.10 of this section for more information

2.1.8 Through-penetration covers shall be removed before installing new cable and removing dead cable. Cable(s) and conduit shall not be pushed or pulled through an opening without the removal of the cable hole covers.

2.1.9 The Installation Supplier shall provide adequate protection for open cable holes to protect personnel and equipment where there is danger of material or personnel falling through the cable opening. This may include barricades, warning signs and mechanical protection.

2.1.10 The Installation Supplier shall ensure that all surfaces are clean and free of dust, grease, oil, loose materials, rust, or other substances, prior to applying intumescent putty or caulk.
2.1.11 The Installation Supplier shall ensure that fire stopping products are prepared and used in accordance with the manufacturer's documentation before installation.

2.1.12 The edges of cut intumescent composite sheets and cable hole cover plates shall be deburred and free of sharp corners.
   a) The corners of composite sheets and cable hole covers shall be rounded to an 1/8-inch minimum radius.

2.1.13 The cover plate and intumescent composite sheets shall not extend beyond the edge of the corners of the cable hole sheathings at floor openings.

2.1.14 Multipiece cable hole covers shall be spliced together in the following manner:
   a) A 2-inch-wide 28-gauge galvanized steel splice strip shall be used to join the two pieces together. A splice strip shall not be multi-piece. It shall be of one continuous length.
   b) The splice strips shall be secured with ¼ inch by ½ inch sheet metal screws spaced at a maximum of 3 inches apart starting from each end.
   c) 1-¼ inch fender washers shall be used under the screw heads located on the outer edge of the cable hole perimeter.
   d) Intumescent putty shall be placed under the splice strip filling the seam between adjacent pieces of composite sheets and adjacent pieces of covers at floor openings
   e) Multiple small pieces shall not be spliced together to form one large piece.

2.1.15 Refer to figure F-50 for general guidelines for fire stopping adjacent wall building constructions.

2.1.16 Cable rack pans shall not be installed on internal cable rack sections running through fire rated surfaces such as walls. The cable rack pans shall end just at the opening of the penetration and continue on the other side where cable leaves the penetration. Cables shall be secured with cord to the cable rack at nearest external cross straps to penetration opening where cable enters and exits.

2.2. Cabling and cable capacity requirements

2.2.1 The general requirements for cables, cable routing, cable diversity, cable protection, cable pileup, and cable rack loading, etc. are set in section J of TP76300.

3. SMOKE STOPPING

3.1. Smoke Stoppage Associated with Cable Installation

3.1.1 During cable installation, smoke stopping shall be achieved by filling the interior voids between the cables being installed with approved non-hardening intumescent putty as described below and shown in the appropriate figures in this section to the point of not permitting air flow to be detected through penetration.
   a) Smoke stopping is required on both sides of hollow wall penetrations that are not equipped with metallic sleeves or are not framed on all four sides.
b) Smoke stopping for solid wall and four sided framed hollow wall applications shall be applied on the side of the wall providing the greatest ease of installation, preferably the network equipment side.

c) The ends of all conduits, pipes, tubing, etc. used for routing cable and wire through fire rated walls and floors that do not terminate in an enclosure on one side of the assembly, shall be sealed with a minimum of 1/4" depth of intumescent putty or 1" minimum depth of Hilti fire block material.

d) Smoke stopping shall be applied to all cables restored to cable racks after cable removal/mining activity.

e) To limit the air flow from between cable bundles and around cable racks, putty shall be applied as well as possible around these areas.

3.1.2 Mini-coax cables shall be bundled together and treated as a single cable. They shall be fire stopped as follows:

a) Each individual coax cable shall not be individually wrapped with an intumescent putty pad.

b) Intumescent putty or caulk shall be placed into the middle of the cable bundle to fill all the void space between the coax cables.

c) The banded mini-coax bundle shall be treated as a single cable and fire stopped per requirements found in the rest of Section F.

3.1.3 After installing cables and applying smoke stopping material between the cables, the Installation Supplier shall tightly band cables together to compress the cable bundle and effectively join smoke stopping material to form an airtight seal. (See Figure F-2).

a) Cable bands shall be a 1/4-inch or larger nylon cable tie (preferred) or a minimum of 4 strands of 9-ply wax fiber cord.

b) Cable bands shall be placed 1 ½ to 2 inches above the top cable hole cover and shall be visible for inspection when the last securing strap is more than six inches from the cable hole cover.

1. Cable bands shall be placed 1 ½ to 2 inches below the bottom side cable hole opening and shall be visible for inspection when the first securing strap is more than six inches from the cable hole opening.

2. The locking head of the cable tie shall be positioned at the side or rear of the cable rack.

3. Cable protection practices may require wrapping some cable types with protective sheeting such as fiber paper before they are banded together. Refer to Section J of this document.

3.2. Smoke Stopping For Cable Holes Closed With Hilti Products

3.2.1 Cable openings and cable bundles shall be smoke stopped as follows;

a) A single layer of minimum 1-inch wide putty pad material shall be firmly applied across the face of opening where cables will rest against the building surface. This layer of material
shall be minimally as wide as the opening's cable rack(s) and extend 1 inch above/from the building surface. The portion of material extending above/from the building surface shall be pressed into the cable curvatures as cable is placed across the face of the opening in their final installed position.

b) A single layer of minimum 1-inch wide putty pad material shall be firmly applied across each layer of cable in a manner that fills the voids between the cables to form an air tight seal.

c) All layered smoke stopping material shall extend a minimum of 1 inch into floor and wall openings. Adjacent segments of layered material shall overlap a minimum of $\frac{1}{4}$ inch

4. FIRE STOPPING

4.1. General

4.1.1 Non-metallic pipe and tubing installed with cables shall be wrapped with a layer of intumescent wrap strip that is a minimum of 1-3/4 inches wide. Wrap strips to be located where pipe/tubing exits holes through floors and on both sides of walls.

4.1.2 Wrap strips shall be held in place using two strands of 9 ply cord, or aluminum tape unless otherwise specified herein.

4.2. Continuous Slots Under Office Distributing Frames

4.2.1 The closing of continuous slots under office distributing frames, regardless of depth, may be accomplished in the following manner. See Figure F-9.

a) Work from below with covers in place. Use mineral wool batting of 3 or 4 inches thickness and cut 2 inches oversized to ensure a tight fit. Force mineral wool batting into the slot and press up against the covers to tightly pack all voids between vertical bundles of stub cables.

b) Insert mineral wool batting so that there are no vertical joints except at the stub cable. No bottom plates are required with this method.

c) Mineral wool batting installed over an equipment area shall be wrapped in aluminum foil to minimize dusting problems. Cutting and wrapping should be done in an area other than the telephone equipment area.

d) Smoke stop all spaces between the cable and cover plate with intumescent putty.

e) Eye protection and dust masks shall be worn by the installer for this operation.

4.3. Partially Occupied Cable Slots and Large Floor Openings

4.3.1 The occupied portion of cable slots shall be isolated from unoccupied portions and from portions fire stopped with another media by installing a steel partition between the ceiling and floor surfaces similar to the one as shown in Figure F-6A. Partitions are not required if the occupied and unoccupied portion(s) of a slot are fire stopped in the same manner with the same fire stopping products.

a) Partitions shall be made from a minimum of 16-gauge painted or galvanized sheet metal.
b) There shall be zero to 1/4 inch of clearance between the partition and the sides of the cable hole for ease of installation. The partition shall be fastened to ceiling cover plates or to the building surface at a minimum of two locations at the lower end and shall be fastened at a minimum of one location at the upper end. The use of multi-piece partitions is acceptable. Multi-piece partitions shall be fastened together with a minimum of two fasteners in a manner that assures the pieces will react as a single rigid piece when subjected to pressure.

c) A ½ inch bead of intumescent putty shall be installed around the perimeter of partitions at their interface with building surfaces, slot covers and cable hole sheathings to form an airtight seal.

d) Partitions shall also be used to segment cable holes when opening is fire stopped with different technologies (mineral wool, blocks, composite sheets, etc).

4.3.2 Figure F-6B shall be used as a reference when it is necessary to segment large openings into smaller openings to enable more effective cable management and/or fire stopping. In such cases partitions shall be fabricated from a minimum of 16 gauge (0.06) painted or galvanized steel and a minimum of 11 gauge steel shall be used for hole covers. The actual partitioning configuration used is dependent on floor/wall location and hole usage.

a) At this time, the 15-inch front-to-back maximum size of a cable opening shown in Figure F-6B is applicable to holes fire stopped with Hilti fire blocks. It is relative to cable pileup allowances on miscellaneous cable racks.

b) Wall cable holes greater than 2,496 square inches (17.3 sq. ft.) in size require partitioning into smaller openings when fire stopped with Hilti Fire Blocks. The longest allowable dimension comprising the 2,496 square inches is 52 inches. Reference UL Design WL-8014. An RFTA may also be requested.

4.4. Fire Stopping Small Rectangular Floor Openings Under Office Distributing Frames

4.4.1 The closing of occupied small rectangular openings up to 4 x 10-inches in size shall be accomplished in the following manner. Refer to Figure F-10.

a) Provide a temporary method of containment on one side (top or bottom, preferably the bottom) so that material can be packed against it.

b) Pack all voids around the cables at the perimeter of the cable bundle to the full depth of the opening with mineral wool batting

c) Install a layer of intumescent putty over the mineral wool batting at the top of the hole to a minimum depth of 1 inch.

4.5. Fire Stopping Using Hilti Products

4.5.1 The fire stopping of large through penetrations using Hilti FS-657 or CFS-BL Fire Blocks shall be in accordance with Figures F-30 to F-33 and F-45 to F-47 as covered below and in 4.14.2. Putty pads may/should be applied to building surfaces to assist with fire block installation when necessary or desirable.
a) A single layer of minimum 1-inch wide putty pad material shall be firmly applied around the perimeter of the cable bundle and pressed into the curvatures formed by adjacent cables. Adjacent segments of layered material shall overlap a minimum of ¼ inch.

b) Layered putty material shall extend a minimum of 1 inch into cable openings. This layer of fire protection material becomes the smoke stopping element of subsequent cable layers.

c) **Note:** The Hilti FS657 or CFS-BL Fire Block may be used for this application. The existing FS657 has a clear plastic sheet for shipping purposes that must be removed before installation. The CFS-BL Block has a branded color label with product name and UL designation on the 8" x 5" surface. This label does not have to be removed prior to installation. The installer has the option of removing the CFS-BL label depending on preference. Fire blocks shall be cut to the cable bundle’s shape and to minimize the potential for air gaps. The blocks shall be installed in an overlapping (staggered) fashion to completely fill the remaining interior void of the through penetration. Blocks shall overlap a minimum of 1/4”.

d) Fire blocks shall be installed flush with the top of floor/wall building surface and extend 5-inches into the opening for miscellaneous holes and 8-inches into the opening for power and fiber cable only holes. On a single cable rack with mixed cabling (secondary power and switchboard cabling), the blocks shall extend 5-inches into the opening. Fire block installation shall equal wall thickness for power and fiber only holes in walls measuring 5 to 8-inches thick. Blocks may extend below the ceiling in the floor applications and beyond wall surfaces when covers are not required. Exception: When Fire Blocks are installed in conjunction with the Z-frame per section 4.18, Fire Blocks installed 5" deep regardless of cable type.

e) Air leaks in the fire block installation shall be sealed at the top by wedging CP-617 putty pad or CP-618 putty stick material into detected air passages. There shall be no spaces between fire blocks.

f) A ½-inch (min.) dome or minimum 1-inch wide layer of putty shall be applied around the cable bundle and other penetrating items at their interface with the fire blocks. This perimeter of putty material is required at both sides of wall openings.

g) A 1-inch wide strip of putty pad or a 1/4-inch bead of putty material shall be applied around the top perimeter of the cable hole sheathing at floor openings as indicated in Figure F-30.

h) Large floor openings shall be covered with a minimum 11 gauge steel cover that is cut to approximate the shape of the installed cable bundle. The gap between the installed cable and the steel cable hole cover shall be 1/2-inch ± 1/4-inch.

i) In some AT&T offices, optional quick-release fasteners for floor top cover will require a thinner steel sheet to be used. The cover for these floor penetrations shall be 20 gauge steel. Only penetrations equipped with quick-release fasteners shall use the thinner covers.

j) A 1-inch minimum dome of putty shall be applied around the entire perimeter of the cable bundle at its interface with the steel cover plate, cable rack and cable hole sheathing. This dome of putty shall overlap onto the steel cable hole surfaces a minimum of 1/2-inch.
k) Fasteners shall be located within 2-inches of cable hole corners and spaced no more than 8-inches apart.

4.5.2 **Note:** Hilti now offers the CFS-BL Fire Block which allows for extended spaces before supporting wire mesh or metal cover plates are required. Please note the separate spacing limitations of the FS657 vs CFS-BL Fire Blocks. Wall openings completely or partially filled with the Hilti FS 657 Fire Block having more than 4-inches of space between the penetrants, such as cable, cable racking, raceways and conduits, and the wall opening shall be equipped with wire mesh or sheet metal retention covers on both sides of the opening. Wall openings filled entirely with the Hilti CFS-BL Fire Block may have up to 12” of space between penetrants and wall opening before supporting wire mesh or metal cover plates are required. Wire mesh shall be used when the distance (depth) between the wall surface and installed fire blocks does not exceed 1/2” on either side of the opening. Sheet metal covers shall be used when the distance (depth) between the wall surface and installed fire blocks exceeds 1/2-inch on either side of the opening. For walls 8-inches or less thick, wire mesh covers may be used if the fire blocks are installed in the 8-inch direction.

a) Installed wall hole covers shall be no closer than 1 inch or more than 2-1/2 inches away from the hole penetrants.

b) Mesh covers shall be fabricated from #16 gauge galvanized 2-inch square (max.) wire mesh.

c) Sheet metal covers for wall openings shall be fabricated from #20 gauge (min.) galvanized steel.

d) Wall covers shall be fastened to the building surface with 1/4-inch fasteners with 1-1/2” fender washers installed under the fasteners head. Cover fasteners shall be appropriate for the building surface they are installed in.

e) Fasteners shall be located within 2-inches of cable hole corners and spaced no more than 8-inches apart.

f) Cable hole covers shall extend a minimum of 3” beyond the opening of cable holes in walls.

g) Wall holes shall be closed with one type of cable hole cover. Wall holes shall not have wire mesh on one side and a steel cover plate on the other side.

**Note:** Hilti’s strut system for supporting solid covers at wall openings may be used where space permits. Refer to figure F-49 for general strut system application guidelines.

4.5.3 Wire mesh or cover plate over Hilti FS657 Fire Blocks will not be required in max. 24” x 12” wall openings when T-Separator bar and Z-frame system is used as shown in Figure 33. The T-bar will provide the necessary resistance for fire hose stream requirement when fire block height does not exceed 6 inches above or below T-bar and wall opening height does not exceed 12 inches. Hilti Z-frame shall be secured around perimeter of wall penetration and T-bar secured with two rotating latches over face of the T-bar. T-bar may be screw fastened to Z-frame but makes future movement of T-bar more difficult when adding or removing cables.

**Note:** When max 12” x 24” opening is filled entirely with new Hilti CFS-BL Fire Block, a T-Separator Bar is not required.
4.6  Fire Stopping Circular Openings Using Hilti Products

4.6.1 Circular openings shall be fire stopped in accordance with Figures F-34 to F-44, F-51, F-58, and F-59.

a) Mineral wool batting shall be tightly packed into the opening at the required minimum depth.

b) Fire blocks, caulk and putty shall be installed at the required locations and minimum depth.

c) Plastic pipe and sleeves shall be equipped with the required number of wrap strip layers or proper size of collar assembly.

d) Steel sleeves installed in hollow walls shall comply with the construction elements indicated in the relevant Figure reference.

e) Speed Sleeves installed in walls/floors shall comply with the accompanying installation instructions and as indicated in the relevant Figure reference (Figure F-58 and F-59).

f) Fire stop plugs (figure F-51) shall not be used in void openings unless the opening is equipped with a metallic sleeve.

g) Fire stop plugs (figure F-51) shall be sealed with a 1/2” minimum dome of CP-618 putty stick.

h) Fire stop drop-in device installed in floors shall comply with the accompanying installation instructions and as indicated in the relevant Figure reference (Figure F-61).

4.7  Replacement of Hilti Fire Stop Blocks

4.7.1 Hilti FS-657 and CFS-BL Fire Blocks shall be examined for suitability of reuse whenever cable penetrations in walls and floors are opened. The blocks shall be in one piece, compressible and pliable without tears, breaks, cracks, flaking, powdering, or signs of wear. Fire blocks showing any unacceptable conditions stated shall be removed and replaced with new block. Blocks cut to fit openings are not considered unacceptable blocks.

4.7.2 Hilti FS-657 and CFS-BL Fire Blocks have a usable life expectancy of 25 years. After 25 years in service the old blocks shall be removed and replaced with new blocks. The examination and replacement of blocks should only occur when cable penetration is opened as a part of a cable project in the office. Blocks with fewer than 5 years of life remaining shall be replaced. Any block that is not dated shall be assumed to have been placed into service January 2005.

4.7.3 The Installation Supplier shall hand mark any new installed block with the month and year of installation with a black permanent marker pen.

a) Blocks shall be installed so the markings are clearly visible.

4.7.4 Cable penetrations may have fire blocks of different installation dates.

4.7.5 Fire blocks in penetrations of buildings that have been through a fire event shall be examined for damage, discoloration, charring, burns, intumescent expansion and replaced if any of these signs are discovered.

4.8  Fire Stopping Large Wall Openings with Hilti Board
4.8.1 Alternative method to fire stopping large through penetrations in walls using a combination of Hilti CFS-BL Fire Blocks and Hilti CP 675T fire stop boards shall be in accordance with Figure F-31(b) or Figure F-31(c). The alternative method reduces the number of fire stop blocks required for fire stopping large penetrations by replacing fire stop blocks with fire stop boards.

a) Hilti CFS-BL Fire Blocks will be applied to areas of penetration where cables and cable rack pass through wall. Procedures for fire stopping using Hilti CFS-BL fire blocks shall be in accordance to paragraph 4.14. Limit fire blocks above cables to no more than three rows to avoid wire mesh requirement. Fire Blocks can be installed 5 inches deep regardless of cable type when Fire Block/CP675T method is used.

b) Hilti CP 675T fire stop boards shall be applied to areas of penetration away from cable and cable rack area.

c) The area between fire stop blocks and fire stop board shall be separated horizontally by a Hilti CP 675 T-Separator Bar fastened to the back lip of Hilti CP 675 Z-Frame. The Hilti Z-frame lengths are installed to two vertical sides and top edge of the penetration secured to studs or directly to wall if concrete or masonry. Hilti CP 619T putty, 1" wide by 1/8" thick, shall be applied to inside of Z-frame between the wall and Z-frame.

d) One Hilti CP 675T fire stop board shall be cut to fit opening (within ¼") and inserted into opening until flush with back lip of Z-Frame. Hilti CP 619T putty is applied to inside perimeter of Z-frame edge prior to inserting interior board. An additional Hilti CP 675T board cut to fit opening (within ¼") is inserted flush with wall assembly over the previous interior board. Distance holders attached to interior board keeps outside board flush with wall.

e) Rotate latches across board placed on Z-frame to secure board and slide T-bar latches up to secure board. Finish by applying Hilti CP 619T putty to perimeter of board for smoke stop.

4.8.2 Wall openings 24" x 12" or smaller may also be fire stopped in accordance to Figure F-33 with Hilti FS-675 Fire Block and Hilti T-Separator Bar. This system will be a fire block only application. Fire stopping to this system does not require outer wire mesh if installed in accordance to Figure F-33. The installation requires Z-frame secured around perimeter of wall opening and Hilti T-Separator Bar secured to Z-Frame.

4.8.3 Note: When max 12" x 24" opening is filled entirely with new Hilti CFS-BL Fire Block, a T-Separator Bar is not required.

4.9. Fiber Optic Cable Troughs Using Hilti Products

4.9.1 Fiber optic cable troughs shall not be run through floor penetrations. Where they presently exist, the installation supplier shall complete the Request for Technical Assistance form at the end of this section on the form.

4.10. Optional Quick-Release Top Cover Floor Openings

4.10.1 Quick-release hardware used to secure top covers to floor penetration sheathing may be substituted for cap-screws where required by the AT&T Equipment Engineer and the penetration has been identified for high activity. Because of the greater cost for installing the
hardware, only authorized penetrations shall be equipped with quick-release feature. Quick-release feature allows cover to be removed and replaced without tools. Kits are available from Hilti.

a) Quick-release feature is not recommended for general applications because of higher initial cost for materials and labor and the risks for metal shavings being introduced into the equipment space. The shavings are generated from the drilling of sheathing to install inserts.

b) Where quick-release feature is required, every precaution shall be taken to avoid metal shavings from falling down cable hole or to embed into cable bundle. The area directly under sheathing shall be sealed with flame resistant plastic sheet taped to side of opening and around cables. The plastic sheet shall be formed to capture all shavings. A ball of clay or tacky putty shall be placed directly under top of sheathing in the area to be drilled to capture metal chips and shavings.

5. FIRE STOP LABEL REQUIREMENTS

5.1. Fire Stop Labels

5.1.1 The AT&T approved cable hole labels (Figure F-7) shall be completed and affixed to an opening’s cover plate and cable hole sheathing, building surface or cables upon completion of the fire stopping activity in a manner that will cause the label(s) to tear when the cable hole cover is removed. The label is not required when drop in ceiling plates are utilized.

a) On wall openings closed with Hilti products, two labelsshall be applied across the fire stop board, or when fire stop blocks are installed, two labels across wire mesh or solid cover plate. The labels shall be affixed to the building surface and fire stop material/cover on front and rear of the cable opening (a total of 4 labels per opening). The labels shall be placed one on right and the other on left side of the fire stop board, wire mesh or solid cover plate of front and rear opening locations. For applications with fire blocks and Hilti Z-Frame or fire stop board/block combination with Hilti Z-Frame, labels shall be applied on the working side only of the cable hole closure across a rotating Z-frame latch retaining block, board or T-bar. One label on right side and another label on left side of opening are required. The label shall be applied so a latch, fire stop material and Z-frame surface are all contacted.

b) At floor openings closed with Hilti products, a label shall be applied on each side of the steel cover plate (sides paralleling cable growth).

c) All existing closed and/or open cable hole labels (as shown in Figure F-7 or similar) shall be removed in their entirety before affixing new labels.

d) While a cable hole is open, the AT&T approved open cable hole label, (Figure F-7A), shall be completed and affixed to the cable hole opening. This label shall remain in plain view until such time the hole is permanently fire stopped.

e) For any situations where the cable hole label requirements cannot be met as noted in the above paragraphs, then the fire stop labels shall be placed across and affixed to the cables as shown in Figure F-8.
f) When a cable penetration is opened for inspection or survey reasons, duplicates of the original labels shall be affixed over the top originals and a single additional label with the inspection date and company shall be applied to the fire stopping cover. The intent of this procedure is to maintain an audit trail of the last installation effort while documenting the inspection effort.

6. CORPORATE REAL ESTATE / REAL ESTATE OPERATION – BUILDING INFRASTRUCTURE / CONSTRUCTION FIRE STOPPING AND SMOKE CONTAINMENT

6.1. Scope

6.1.1 AT&T Practice Fire and Smoke Containment System AT&T Practice CRE-07-84-13-ATP-001 shall be implemented for all building infrastructure and construction fire stopping and smoke containment. This Practice provides requirements for the selection, installation and maintenance of through-penetration, membrane-penetration, and building joint/top-of-wall firestop and smoke containment systems in fire-resistance-rated assemblies where Corporate Real Estate (CRE) Real Estate Operations (REO) manages building penetrations.

6.1.2 This Practice applies to all new and existing AT&T Enterprise (Domestic, International) owned, operated, or leased telecommunications equipment buildings and non-telecommunications equipment buildings.

6.1.3 Any variances, exceptions, and technical questions to the Practice must be submitted to and approved by REO Programs and Standards Fire Protection and Life Safety Fire2@att.com.

6.1.4 To obtain a copy of the Practice contact the CRE/REO Project Manager.
REQUEST FOR TECHNICAL ASSISTANCE RESPONSE
FIRE STOPPING NON-STANDARD THROUGH-PENETRATION ASSEMBLY
TELECOMMUNICATIONS FACILITIES

Author's RFTA Ref. No.
Date _______ Telco Job Ref. No. _______ Office CLLI _______ Floor ______
Office Address ___________________________ Cable Hole Desig. _________
AT&T LEC Eqpt. Engr. ________________________ Phone __________________
Submitted By: ____________________________ Company: __________________
Phone: ___________________ FAX: ____________ Response Needed By: ______

Building Surface Construction: Floor ___ Wall ___ Thickness ______ F Rating (if known) ___ hr.
Framed/Hollow Wall _____ Concrete/Block Wall _______
Size of Opening __________  Describe Hole Lining/Sheathing If Any: ________________________

Use of Space on Both Sides Of Opening: Side A: ______________ Side B: ______________

Penetrating Apparatus (include cable bundle size if applicable): ________________________

Function of Fire Stop: Permanent Closing _____ Re-enterable Closing _____

The problem/situation (By Installation Contractor):

Proposed resolution (By Hilti/AT&T Approval Team):

Send Request To:
Hilti Fire Protection Engineering Team
Ph: 1-800-886-8915   FAX: 918-254-1679   E-mail: gary.mason@hilti.com

*Email picture of application when submitting RFTA form

Approved ___ Denied ___

Questions to AT&T: Keith Lanning, Ph: (770) 329-7193   E-mail: kl1825@att.com

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<td>F-14</td>
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<td>FIRE STOPPING NON-METALLIC PIPE UP TO 4” DIAMETER IN A 6” MAX DIAMETER CIRCULAR OPENING IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-2002)</td>
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<td>12” x 24”</td>
<td>Floor</td>
<td>Cable/Void</td>
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<td></td>
<td>Wall</td>
<td>Cable/Void</td>
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<td>Very Large Rectangular</td>
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<td>Floor</td>
<td>Cable/Void</td>
<td>F-48</td>
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<td>Wall</td>
<td>Cable/Void</td>
<td>F-31B, C</td>
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<td>Floor/Wall</td>
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<td>Wall</td>
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<td>Circular</td>
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<td>Solid Floor/Wall</td>
<td>Non-met. Pipe</td>
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<td></td>
<td>Non-met. Pipe</td>
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<td>Metallic Pipe</td>
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<td>Hollow Wall</td>
<td>Single ENT</td>
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<td>Void</td>
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<td>Cable</td>
<td>F-41, 58</td>
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<td>Cable</td>
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<td>Metallic Pipe</td>
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<tr>
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<td></td>
<td></td>
<td>Cable/Void</td>
<td>F-44</td>
</tr>
</tbody>
</table>
FIGURE F-1 – TYPICAL WATERPROOFING OF LARGE HOLES IN FLOORS

INTUMESCENT CAULK OR NON-HARDENING GASKET COMPOUND SUCH AS PERMATEX NO. 2

INTERIOR FACE OF CABLE HOLE

SHEATHING, FRAME OR STEEL COVER ANCHORING HOLE
FIGURE F-2 – APPLICATION OF CABLE BANDING FOR SMOKE STOPPING

- Initial installation
- Subsequent installation
- Min. 1/4" wide
- Min. 4 strands of woven setting cord
- Smoke stopping puts at interior voids
- ±2" from cable hole cover
- Cable band - to cable back stringer or around entire bundle which ever is more appropriate and convenient for protection of new installation integrity.
FIGURE F-3 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING SUPPORT STIRRUPS (UL FB-3004 METHOD)
FIGURE F-4 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING MODIFIED CEILING PLATE SUPPORT (UL FB-3004 EJ)
FIGURE F-5 – METHOD OF PROTECTING EXPOSED INTUMESCENT COVERS AT FLOOR OPENINGS
FIGURE F-6A – PARTITIONING CABLE SLOT IN FLOOR

- Multi-piece/adjustable partition
- Single piece partition

- Shown with upper lip folded over lower flange of hole sheeting
- Shown with upper lip folded under lower flange of hole sheeting
- Ceiling cover plate
- 1/4" fasteners min. diameter (typical)
- Shown separating adjacent openings, interior firmly packed with mineral wool batting
FIGURE F-6B – SEGMENTING LARGE FLOOR OPENINGS INTO SMALLER ONES

NOTE 1. SINGLE PIECE PARTITION MAY BE USED WITH FLOORS UP TO 12-INCHES DEEP. MIN. 1/4-INCH FASTENERS USED THROUGHOUT ASSEMBLY.

NOTE 2. FASTENERS OF TWO PIECE PARTITION TO BE LOCATED BELOW FIRESTOP MEMBER AT EACH END OF PARTITION AND IN APPROX. 8 CONTIGUOUS.
FIGURE F-7 – TYPICAL FIRE STOP LABELS

AT&T EQUIPMENT ENGINEER

THIS CABLE HOLE OPENED BY:

SUPPLIER NAME: _____________________________________________
TEO #: ___________ DATE/TIME OPENED: ___________
SUPPLIER CONTACT NUMBER: ________________________________

Open Cable Hole Label
(Black Characters on Green Background)
(A)

AT&T EQUIPMENT ENGINEER

THIS CABLE HOLE HAS BEEN PROPERLY FIRE STOPPED IN
ACCORDANCE WITH ATT-TP-76300

SUPPLIER’S NAME: _____________________________________________
TEO #: ___________ DATE CLOSED: ___________
SUPPLIER CONTACT NUMBER: ________________________________

Closed Cable Hole Label
(Black Characters on Orange Background)
(B)
FIGURE F-8– APPLICATION OF FIRE STOP LABELS

LABELS APPLIED ACROSS CABLE BUNDLE PRIOR TO SEALING BLOCK INSTALLATION. CONTRACTOR AND JOB INFORMATION NOT COVERED BY PUTTY.
FIGURE F-9 – FIRE STOPPING CONTINUOUS SLOTS UNDER OFFICE DISTRIBUTING FRAMES
FIGURE F-10 – FIRE STOPPING SMALL RECTANGULAR OPENINGS UNDER OFFICE DISTRIBUTING FRAMES
FIGURE F-11 – FIRE STOPPING LARGE FLOOR OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL FB-3004)
FIGURE F-12 – FIRE STOPPING LARGE WALL OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL CAJ-4003)
FIGURE F-15 – FIRE STOPPING ADC RACEWAY IN LARGE WALL OPENINGS USING INTUMESCENT COMPOSITE SHEETS (UL WL-6002)

1. **MPP+ Moldable Putty Pad**
   1A. Interior of raceway lined with single 4" wide strip of MPP+ putty pad. A 4" wide strip to overlap top of raceway sides 1/2" and extend a minimum 1" from the wall surface.
   
   1B. A single strip of 2" wide MPP+ putty pad formed across top of 1/2" maximum cable pileup. Putty strip to extend a minimum 1" from wall surface.

2. **CS-195+ Composite Sheet**
   Installed per standard fastening and opening overlap requirements. Fixed and removable portion of cable hole cover cut to fit contour of raceway and installed cable. Space between covers and raceway to be +1/2" to allow insertion of FS-195+ Warp/Strip around perimeter of raceway.

3. **FS-195+ Wrap/Strip**
   3A. Apply a single layer of FS-195+ Wrap Strip across the top of cable bundle. This layer of wrap strip to be relocated to top of cable bundle as additional cable is installed.
   
   3B. Raceway and installed cable enclosed by a single layer of FS-195+ Wrap Strip. Wrap strip to overlap top of either side of raceway and extend a minimum of 1" from wall surface.

4. **MPS-2+ Putty Stix**
   4A. A min. 1/4" bead of bulk putty to be installed around perimeter of FS-195+ Wrap/Strip to seal opening. Putty to be wedged into space between composite sheet and wrap strip so that wrap strip is held against raceway and installed cable. Putty to overlap composite sheet a minimum 1/4".
   
   4B. Additional putty to be applied around the exposed side of wrap strip to seal all gaps and spaces between wrap strip and raceway and to plug interior of raceway support channels.

5. **3MM Diameter Fiber Optic Cables**
   Maximum of 960 jumper cables per raceway (approximately 3/4 visual fill). Cables to be installed and layered with a single layer of 2" wide MPP+ pad for every 1/2" of cable pileup until pileup nears 3/4 visual fill. Install 1 layer of FS-195+ Wrap/Strip at the top of cable pileup.
FIGURE F-16 – FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 6" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-3021)

FIGURE F-17 – FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 4" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS 2" OR LESS BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)
FIGURE F-18 - FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 4" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS MORE THAN 2" BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)

TABLE F-18

<table>
<thead>
<tr>
<th>PVC Diameter</th>
<th>ENT Size</th>
<th>SQ. or Rectangle</th>
<th>No. of Wrap Strip Layers</th>
</tr>
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<tbody>
<tr>
<td>1/2 to 2&quot;</td>
<td>&lt;1-1/2&quot;</td>
<td>&lt;3 Sq. In.</td>
<td>1</td>
</tr>
<tr>
<td>2-1/2 to 3&quot;</td>
<td>1-1/2 to 2&quot;</td>
<td>3 to 7 Sq. In.</td>
<td>2</td>
</tr>
<tr>
<td>3-1/4 to 4&quot;</td>
<td>Bundles of &lt;2&quot;</td>
<td>&gt;7 Sq. to 12-1/2 Sq. In.</td>
<td>3</td>
</tr>
<tr>
<td>6&quot;</td>
<td>(7 max.)</td>
<td>13 to 28 Sq. In.</td>
<td>2 Stacks of 3</td>
</tr>
<tr>
<td>8&quot;</td>
<td></td>
<td>&gt;28 Sq. In.</td>
<td>2 Stacks of 4</td>
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FIGURE F-19 – FIRE STOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 7" MAX. DIAMETER CIRCULAR OPENING IN SOLID/HOLLOW FLOORS AND WALLS (UL CAJ-2001, CAJ-2226, WL-2092)
FIGURE F-20 - FIRE STOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 6" MAX. DIAMETER CIRCULAR OPENING IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-2002)
FIGURE F-21 – FIRE STOPPING METALLIC PIPE IN CIRCULAR OPENING OF CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-1027)

MINERAL WOOL BATTING
1" MINIMUM DEPTH
TIGHTLY PACKED INTO OPENINGS WITH ANNULAR SPACES GREATER THAN 3/4"

1-1/2" MAX.

METALLIC RACEWAY

INTUMESCENT PUTTY
1" MINIMUM DEPTH AT PERIMETER OF OPENING

(Both Sides Of Walls)
FIGURE F-22 – FIRE STOPPING FLEXIBLE NON-METALLIC TUBING IN CIRCULAR OPENINGS OF CONCRETE/MASSONRY FLOORS AND WALLS (UL CAJ-2028 & CAJ-2029)

(A) SINGLE RUN OF TUBING UP TO 2" IN DIAMETER (BOTH SIDES OF WALLS)

(B) MULTIPLE RUNS OF TUBING UP TO 2" IN DIAMETER IN A SINGLE OPENING

(C) ASSEMBLY OF WRAP STRIPS ACCORDING TO NUMBER OF INSTALLED RACEWAYS

SEE FIG. F-18 FOR WRAP STRIP DETAILS (BOTH SIDES OF WALLS)

SEE FIG. F-18 FOR WRAP STRIP DETAILS (BOTH SIDES OF WALLS)
FIGURE F-23 – FIRE STOPPING CABLE IN CIRCULAR OPENINGS OF HOLLOW WALLS
(UL WL-3031)

NOTE 1. SLEEVE TO BE 1" DIAMETER MINIMUM OR NO. 28 GAUGE ALUMINUM SHEET.
STEEL SLEEVE TO EXTEND 1/2" MINIMUM INTO WALL SURFACE.
STEEL SLEEVE TO HAVE 2 MINIMUM 2-1/4" SLITS ALONG 1-1/2" LENGTH.
SLITS TO BE ENLARGED WITH SLIT FLEXIBLE TIES TO FIT 5/8" WALL AND ULTIMATE TIES AT END.

NOTE 2. TIES TO BE 1/2" MINIMUM DIAMETER.
SLEEVE TO Interface WITH MOLDING SURFACE.
CABLE TIES TO BE 5/8" WALL CLEARANCE.
LABELS TO BE FIRE RATING OF WALL.
FIGURE F-24 – FIRE STOPPING 2" MAX. DIAMETER NON-METALLIC PIPE IN HOLLOW WALLS (UL WL-2097)

NOTE 1: SLEEVE TO BE 2" MAXIMUM DIAMETER WITH NO 0.028 GAUGE GALVANIZED SHEET STEEL SLEEVE TO EXTEND 1/2" MINIMUM BEYOND WALL SURFACE. SHEET STEEL SLEEVE TO HAVE 2" MINIMUM OVERLAP ALONG ITS LATERAL LENGTH AND BE EXTERIRED WITH CAULK PROTECTIVE SUCH AS BUT FLEXIBLE TIN-PLATE AT BOTH ENDS.

FIGURE F-25 – FIRE STOPPING METALLIC PIPE IN HOLLOW WALLS (UL WL-1001, WL-1032)

METALLIC RACEWAY

INTERSSEMENT PUTTY FULL THICKNESS OF WALL COVERING(S)

1/2" MAXIMUM ANNUAL SPACE

5/8" WALLBOARD NUMBER OF LAYERS FOR FIRE RATING OF WALL
FIGURE F-26 – FIRE STOPPING VOID CIRCULAR OPENINGS IN FLOORS AND WALLS (UL WL-3031 EJ)

VOID CIRCULAR OPENING IN CONCRETE, MASONRY FLOOR AND WALLS

VOID CIRCULAR OPENING IN FRAMED WALLS

MATERIALS AND DIMENSIONS:
- MINERAL WOOL BATTLING
- 1" MINIMUM DEPTH OF INTERMEDIATE BATTLING (WITH SLEEVE) OR INTERMEDIATE WALL (WITH SLEEVE)
- 1/2" MINIMUM DEPTH OF INTERMEDIATE BATTLING (WITH SLEEVE) OR INTERMEDIATE WALL (WITH SLEEVE)
- CIR25 HD SAG CALK
- WALLBOARD LINER
- FIRE RATING OF WALL
- CLOSURE PLACED AT TOP FOR OPTIONAL METALLIC SLEEVE APPLICATIONS

REQUIRED AT BOTH SIDES OF WALL OPENINGS
THIS SPACE IS RESERVED FOR FUTURE FIGURES F27 – F29
F-30 – FIRE STOPPING LARGE FLOOR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)

- INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE AND CABLE BUNDLE
- STEEL COVER PLATE
- CABLE TIE
- CABLE TIE
- CABLE RACK

PUTTY SEAL FOR STEEL COVER PLATE

1/4" FASTENER

#1 GAUGE STEEL COVER

STAGGERED F-657 FIRE BLOCKS

PUTTY SEALING AIR GAPS AS REQUIRED

1" DOME OF INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE

1/2" MIN. DOME OF INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE

STEEL COVER PLATE

CABLE HOLE SHE-THICK
F-31A – FIRE STOPPING LARGE WALL OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)

- #16 GAUGE x 2" (MIN.) GALVANIZED WIRE MESH OR #20 GAUGE (MIN.) SHEET STEEL COVER AT ANGULAR SPACES EXCEEDING 4-INCHES

1/4" FASTENERS AND FENDER WASHERS SPACED 8" (MAX.) ON CENTER

-PUTTY SEALING AIR LEAKS AS REQUIRED

2-1/2" MAX.

1/2" DOWE OF INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE AND CABLE BACK ON BOTH SIDES OF WALL
FIGURE F-31B – FIRE STOPPING LARGE WALL OPENINGS USING HILTI FIRE STOP BOARD AND BLOCKS (UL WJ-4049)

1" WIDE STRIP OF PUTTY AROUND BOARD AND BLOCKS

ROTATING LATCH

HILTI CP 675 Z-FRAME

APPROX. 8" C/C

T SEPARATOR BAR LATCH

INNER CP 675T BOARD

APPROX. 12" C/C

HILTI CP 675 T-SEPARATOR BAR

CP 675T FIRE STOP BOARD (OUTER)

CP 675T FIRE STOP BOARD (INNER)

1" STRIP OF PUTTY BETWEEN BOARD AND Z-FRAME

DISTANCE HOLDER

T-SEPARATOR BAR

FS-657 FIRE BLOCKS

MIN. 1" DEEP PUTTY SEAL AROUND CABLE BUNDLE

CABLE RACK

HILTI CP 675T FIRE STOP BOARD AND Z-FRAME

APPROX. 8" C/C

APPROX. 12" C/C
FIGURE F-31C – FIRE STOPPING LARGE WALL OPENINGS USING HILTI FIRE STOP BOARD AND BLOCKS (UL WJ-4050)
FIGURE F-32 – FIRE STOPPING NON-METALLIC PIPE AND TUBING IN RECTANGULAR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)
FIGURE F-33 – FIRE STOPPING WALL OPENINGS MAX. 12" X 24" WITHOUT MESH OR COVER PLATE WHEN USING T-BAR (HILTI UL SYSTEM W-L-4049 CONFIG. C)

T-separator bar installed without screw fastening to Z-frame to accommodate future move. Rotating latches positioned across T-bar face to prevent T-bar dislodging. Wire mesh or cover plate not required on either side of penetration when T-bar is installed. Maximum height of Hilti FS-657 blocks cannot exceed 6 inches above or below T-bar and maximum opening height cannot exceed 12".
FIGURE F-34 – FIRE STOPPING CABLE IN 6” MAX. DIA. OPENING IN SOLID FLOORS AND WALLS

(A)
(CAJ-3095)

(B)
(CAJ-3152)

(C)
Conduit Dead-Ended Within Equipment Area
FIGURE F-35 – FIRE STOPPING CABLE IN 4” MAX. DIAMETER OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE (CAJ-3084)
FIGURE F-36 – FIRE STOPPING CABLE IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE EXTENDING BEYOND BUILDING SURFACE (CAJ-3084 EJ)

FIGURE F-37 – FIRE STOPPING NONMETALLIC PIPE 7" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – SMALL ANNULAR SPACE (CAJ-2109)
FIGURE F-38 – FIRE STOPPING NON-METALLIC PIPE IN 6” MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-2294)

FIGURE F-39 – FIRE STOPPING METALLIC PIPE IN 6” MAX. DIA OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-1276)
FIGURE F-40 – FIRE STOPPING ENT IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS (CAJ-3084 EJ)

ENDS OF TUBING TO BE SEALED WITH 1/4" MINIMUM DEPTH OF PUTTY UNLESS THEY ARE TERMINATED IN A RELATIVELY AIR TIGHT AND NORMALLY CLOSED ENCLOSURE

MINERAL WOOL DAM

FS-ONE SEALANT 2" MINIMUM DEPTH

REQUIRED AT BOTH SIDES OF WALL OPENINGS

FIGURE F-41 – FIRE STOPPING CABLE IN 4" MAX. DIA. OPENING IN HOLLOW WALLS (WL-3111, WL-3112)

NOTE 1: SLEEVE TO BE 4" MINIMUM DIAMETER BUT OR NO LARGER THAN ALLOWED SHEET STEEL AND EXTEND A MINIMUM OF 1/2" BEYOND WALL SURFACE

SHEET STEEL SLEEVE TO HAVE A 2" MINIMUM WALL THICKNESS AND EXTEND A MINIMUM OF 2" BEYOND WALL SURFACE

ENT SLEEVE TO BE PERMANENTLY CASTED INTO OPENING ABOUT TO BE SAME THICKNESS OF WALL AND COVERING

METALLIC SLEEVE SEE NOTE 1

INTERIORMENT PUTTY

1/4" MINIMUM DEPTH OF PUTTY AROUND SLEEVE AT INTERFACETWALL AND SURFACE

SMOKE TIE

INTERIORMENT PUTTY

1/4" MINIMUM DEPTH AT DIAMETER OF CABLE HOLE

CABLE TIE

5/8" WALLBOARD NUMBER OF LAYERS DEPENDING ON RATINGS OF WALL
FIGURE F-42 – FIRE STOPPING NON-METALLIC PIPE IN 4" MAX. DIA. OPENING IN HOLLOW WALLS (WL-2075)

NOTE 1. SLEEVE TO BE 1" MINIMUM DIAMETER EILT OR NO. 28 GAUGE SHEET STEEL SLEEVE TO EXTEND 1" MINIMUM BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A MINIMUM 2" OVERLAP ALONG ITS UPRIGHT LENGTH AND BE ENDED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TINNING AT BOTH ENDS.

ENTRY SLEEVE TO BE PERMANENTLY GROOVED INTO OPENING—at ope nning as thick as wallboard covering.

FIGURE F-43 – FIRE STOPPING METALLIC RACEWAYS IN HOLLOW WALLS (EJ)

NOTE 1. SLEEVE TO BE 1" MINIMUM DIAMETER EILT OR NO. 28 GAUGE SHEET STEEL SLEEVE TO EXTEND 1" MINIMUM BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A MINIMUM 2" OVERLAP ALONG ITS UPRIGHT LENGTH AND BE ENDED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TINNING AT BOTH ENDS.

ENTRY SLEEVE TO BE PERMANENTLY GROOVED INTO OPENING—at ope nning as thick as wallboard covering.
FIGURE F-44 – FIRE STOPPING VOID CIRCULAR OPENINGS IN FLOORS AND WALLS

(A) 1" MAX. HOLE

SLEEVE OPTIMAL

F-107 FIRE FLOOR – SINGLE HOLE
(1/2" LAYER THIN SEALING
BOTH SIDES OF WALL OPENING)

CAL-0056

(B) 1/2" MIN. F-ONE SEAL-IT
BOTH SIDES OF WALL OPENING

MINERAL WOOL MATTING

4" MIN. THICK

CAL-0070

(C) 3/4" MIN. CP-918 HOLE
BOTH SIDES OF WALL OPENING

MINERAL WOOL MATTING

CAL-0058

(D) 4/16" MIN. CP-941
HOLE 4-1/2" DEEP

HOLE 6" DEEP

MINERAL WOOL MATTING

CP-825

(E) HAVING WITHIN 18" UPPER OPENING
4'-5" DEEP TO A HOLE MIN 6" DEEP BOTH

EX-28525N
INSTALLATION REQUIREMENTS

Section F, ATT-TP-76300
Revised March, 2019

NOTE 1.
SLEEVE TO BE 1" MINIMUM THICKNESS ON NO. 28 GAUGE SHEET STEEL
SLEEVE TO EXTEND MINIMUM OF 1/2" BEYOND WALL SURFACE.
SHEET STEEL SLEEVE TO HAVE 2" OVERLAP ALONG ITS LENGTH.
INSERT SLEEVE TO BE PERMANENTLY Attach INTO OPENING ABOUT TO BE AS
THE WALL IS ATTACHED TOกลย.
FIGURE F-45 – FIRE STOPPING LARGE POWER CABLE ONLY OPENINGS IN FLOORS USING INTUMESCENT FIRE BLOCKS (CBJ-4026)

![Diagram showing installation requirements for fire stopping large power cable only openings in floors using intumescent fire blocks.]

- **Cable Rac**
- **Cable Tie**
- **Smoke Stop**
- **Layer of Putty Pad**
- **1" Dome of Intumescent Putty at Perimeter of Cable Bundle**
- **1/2" Min. Dome of Intumescent Putty at Perimeter of Cable Bundle**
- **Steel Cover Plate**
- **Cable Hole Sheathing**
- **FS-657 Fire Blocks**
- **8" Min. Depth in Floors**
- **+3" Thick, 5" Min. Depth in Floors 5" or Less Thick**
FIGURE F-46 – FIRE STOPPING LARGE FIBER CABLE ONLY OPENINGS IN FLOORS USING INTUMESCENT FIRE BLOCKS (CBJ-4026)

1" DOME OF INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE

1/2" MIN. DOME OF INTUMESCENT PUTTY AT PERIMETER OF CABLE BUNDLE

STEEL COVER PLATE

CABLE HOLE SHE-THING

LAYER OF PUTTY PADD

FS-657 FIRE BLOCKS
MIN. 8" DEPTH IN FLOORS
+5" THICK. MIN. 5" DEPTH IN FLOORS 5" OR LESS THICK.

CABLE TIE

CABLE TIE

SMOKESTOP
FIGURE F-47 – TYPICAL ORIENTATION OF HILTI FIRE BLOCKS AT VARIOUS WALL CONSTRUCTIONS

(A)
Concrete and Solid Filled Block Constructions
FIGURE F-47 – Continued

B) Hollow Wall Constructions

- Any size rectangular opening
- Void and where annular space exceeds 4 inches
- MISC. CABLE: POWER OR FIBER CABLE ONLY
- ANY TENET CABLE
- MISC. CABLE (ALTERNATIVE)
- WIRE MESH COVERS
- SHEET STEEL COVERS

1/2" MAX
6" MAX
1/2" MAX
1/2" MAX
+1/2" ON EITHER SIDE OF OPENING
UP TO 9"
FIGURE F-48 – TYPICAL COVER JUNCTIONING AT LARGE WALL OPENINGS

(A) Solid Covers

- #20 GAUGE SHEET METAL COVER
- GALVANIZED OR GRAY PAINTED FINISH
- 1/4” SHEET METAL SCREWS
  3” MAX. SPACING
- COVER JUNCTION STRIP
  MIN. 2” WIDE x #28 GAUGE
  GALV. SHEET METAL
- 1” MIN. TO 2-1/2” MAX.

(B) Mesh Covers

- #16 GAUGE x 2” SQUARE
  GALVANIZED WIRE MESH
- 1” MIN. 2-1/2” MAX.
- 2 WRAPS OF WIRE MESH MATERIAL
  TO HOLD ADJACENT PIECES TOGETHER
- 4” MAX.
FIGURE F-49 – GENERAL APPLICATION OF HILTI STRUT COVER SUPPORTS (SINGLE HOLES ONLY)

(A) Void Cable Holes

(B) Occupied Cable Holes
FIGURE F-50 – GENERAL APPLICATION OF FIRE STOPS AT ADJACENT BUILDING WALLS
FIGURE F-51 – FIRE STOPPING CIRCULAR OPENINGS UP TO 4” IN DIA. IN FLOORS/WALLS USING HILTI CP-658T FIRE STOP PLUGS (CAJ-0097 and CAJ-3216)
FIGURE F-52 – FIRE STOPPING ADC RACEWAY THROUGH WALLS
(UL W-L-6017)

FIGURE F-53 – FIRE STOPPING METAL PIPE/STEEL CONDUIT THROUGH FLOORS
(UL F-A-2213, F-B-1026)
SECTION G -- FLOOR DRILLING AND CUTTING/LIFTING PROCEDURES

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   1.2 Requirements .....................................................................................................................G-4

2. TRAINING .........................................................................................................................G-5
   2.1 General .............................................................................................................................G-5

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   3.1 General .............................................................................................................................G-6
   3.2 Floor Drilling Procedure .................................................................................................G-8

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TABLE G-1 – SUMMARY OF CHANGES IN SECTION G

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
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<tr>
<td>06/14/2016</td>
<td>Entire document</td>
<td>Modification</td>
<td>N/A; 2016 TP Rewrite Section G</td>
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<tr>
<td>04/03/2017</td>
<td>Table 1.1.8</td>
<td>Modification</td>
<td>ATT-TP-76300-374</td>
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1. GENERAL

1.1 Introduction

1.1.1 The Installation Supplier, AT&T Employees, or Contractors 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 installation specifications.

1.1.2 The Installation Supplier, AT&T Employees, or Contractors 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.

1.1.3 This section covers requirements for floor drilling and cutting/lifting procedures within AT&T owned property and the installation of AT&T equipment at customer or leased locations. These procedures shall be used to penetrate all floors whether bare concrete, wood, or covered. Where resilient vinyl floor coverings including floor tile or sheet/rolled goods (such as linoleum) that contain asbestos or are presumed to contain asbestos are present, drilling may be restricted per Table 1.1.8. Should a floor covering material suspected to contain asbestos other than the above be encountered (such as asphalt planking), it shall be sampled and analyzed to establish content or otherwise presumed to be asbestos. Disturbance of materials other than floor tile or sheet/rolled goods (such as linoleum) containing asbestos or presumed to contain asbestos shall be conducted by a licensed asbestos professional.

1.1.4 These procedures shall be used whenever drilling into flooring of any kind and especially when the presence of ACM is suspected at a customer location and the legal property owner cannot provide written documentation verifying the absence of ACM at the proposed disturbance site.

1.1.5 The use of this procedure within schools shall be reviewed and approved by:

AT&T EH&S Asbestos & Lead Manager
Email: DL-EHSIndustrialHygiene@att.com
314-606-5313

1.1.6 Drilling through confirmed NON-Asbestos (see 1.2.1) flooring or bare concrete: The following procedures shall be followed by the Installation Supplier, AT&T Employee, or Contractor within AT&T owned and leased property for Drilling in Concrete and Non-Asbestos Containing Flooring

   a) To facilitate dust control, the Installation Supplier, AT&T Employee, or Contractor shall drill bare concrete and non-asbestos containing flooring in the same manner as the asbestos floor covering material; i.e., by utilizing debris encapsulant.

   b) The debris and the encapsulant, after being cleaned up with a wet cloth or paper towel, may be disposed of as ordinary trash.

   c) If a vacuum is used to clean up concrete dust remaining in the holes, it shall be a High Efficiency Particulate Air (HEPA) vacuum cleaner.

1.1.7 The procedures described here apply as indicated in table 1.1.8
<table>
<thead>
<tr>
<th>State</th>
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<th>Use Cutting/Lifting Procedure</th>
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</table>
### 1.1.8 Table: State By State Requirements For Using The Procedures Described In This Section

<table>
<thead>
<tr>
<th>State</th>
<th>Use Drilling Procedure</th>
<th>Use Cutting/ Lifting Procedure</th>
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<tbody>
<tr>
<td>South Carolina</td>
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<td>Wyoming</td>
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</table>

¹. In these states, if the covering is asbestos containing, the drilling or cutting/lifting procedure is NOT allowed to be performed by installation contractors. A licensed asbestos abatement contractor shall remove the covering or drill the hole per this practice. If the tile can be verified to not contain asbestos through sampling of the material or record of previous sampling, the drilling or cutting/lifting should be conducted per this section to control dust.

². In these states the procedure is allowed to be performed by installation contractors, but the debris shall be handled and disposed as an asbestos containing waste. The AT&T Equipment Engineer shall contact AT&T’s Resource Recovery Center, 800-KNOW-EHS, prompt 4. The RRC will assist with arranging a pick-up or instruct on alternate proper disposal method.

³. Hole drilling in the state of Oklahoma shall be limited to vinyl floor tile only. This procedure shall not be used to drill other substances such as rolled or sheet floor coverings (e.g. linoleum) in these states. In Oklahoma the Installation Supplier, AT&T Employee, or Contractor shall contact the AT&T Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris if the material is not floor tile.

### 1.2 Requirements

1.2.1 AT&T presumes all tile and sheet/rolled vinyl flooring to contain asbestos unless verified otherwise through sampling of the material. The Installation Supplier, AT&T Employee, or Contractor shall receive written documentation from AT&T or by the legal property owner verifying the absence of ACM when the Installation Supplier, AT&T Employee, or Contractor uses this practice in states where asbestos disturbance is not allowed and cuts/drills in non-asbestos containing floors.

1.2.2 States indicated in table 1.1.8, where drilling and cutting/lifting are prohibited due to licensing requirements applies only to floor coverings that actually contain asbestos. If the material can be verified to contain no asbestos (per 1.2.1 above), the Installation Supplier, AT&T Employee, or Contractor can perform the drilling or cutting/lifting process as outlined in this practice.
1.2.3 In states that require a licensed asbestos abatement contractor (see table 1.1.8), only an AT&T approved abatement contractor may be used to conduct the drilling or lifting cutting. To determine which abatement contractors are approved in a state requiring a licensed abatement contractor, the Installation Supplier, AT&T Employee, or Contractor or the Network Engineer should contact:

AT&T EH&S Asbestos & Lead Manager  
Email: DL-EHSIndustrialHygiene@att.com  
314-606-5313

1.2.4 Installation Suppliers, AT&T Employees, or Contractors who perform this process on non-asbestos floors only, need not be trained in the Negative Exposure Assessment (NEA) floor covering drilling procedures.

1.2.5 The Installation Supplier, AT&T Employee, or Contractor shall adhere to all federal, state and local regulations regarding waste material in addition to AT&T installation requirements.

1.2.6 The Installation Supplier, AT&T Employee, or Contractor shall coordinate with the AT&T Representative before any activity related to hazardous material/waste is started.

1.2.7 Installation Suppliers, AT&T Employees, or Contractors shall follow the Negative Exposure Assessment (NEA) floor covering drilling procedures when drilling in floors and the Negative Exposure Assessment (NEA) cutting/lifting procedures when cutting/lifting floor coverings.

1.2.8 In the event of any of the following occurrences, the Installation Supplier, AT&T Employee, or Contractor shall immediately contact the AT&T representative who will contact the appropriate AT&T organization:

<table>
<thead>
<tr>
<th>Type of Occurrence</th>
<th>AT&amp;T Equipment Engineer will contact…</th>
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</thead>
<tbody>
<tr>
<td>Regulatory agency inspector visit to site</td>
<td>AT&amp;T EH&amp;S (1-800-KNOW-EHS) (1-800-566-9347)</td>
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<tr>
<td>Accidental exposure to suspected asbestos</td>
<td>AT&amp;T EH&amp;S (1-800-KNOW-EHS) (1-800-566-9347)</td>
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<tr>
<td>Accidental release of suspected asbestos to the environment, or encountering material that can not be drilled, cut or lifted by NEA methods.</td>
<td>AT&amp;T EH&amp;S (1-800-KNOW-EHS) (1-800-566-9347)</td>
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2. TRAINING

2.1 General

2.1.1 Installation Suppliers, AT&T Employees, or Contractors who perform these procedures on suspected/presumed/confirmed asbestos floor coverings shall be trained in the NEA floor drilling procedures or the NEA cutting/lifting procedures by a primary trainer authorized by the NEA Management Center.
2.1.2 Untrained Installation Suppliers, AT&T Employees, or Contractors shall not drill in or cut/lift suspected/presumed/confirmed asbestos containing floor coverings.

2.1.3 Training shall include, at a minimum:
   a) Annual Asbestos Awareness training; and either b or c below or both b & c.
   b) Annual floor covering drilling procedure training and hands-on training of the NEA floor covering drilling procedure.
   c) Annual floor covering cutting/lifting procedure training and hands-on training of the NEA floor covering cutting/lifting procedure.

2.1.4 The Installation Supplier, AT&T Employee, or Contractor shall obtain the training from an appropriate trainer.

**Important Note Regarding Qualified Trainers:**

**Primary trainer(s)** shall attend an annual refresher-training course administered by a Core training provider. Only Core Trainers and Primary Trainers shall conduct NEA drilling or cutting/lifting procedure training.

**Core Trainers** are trainers approved by AT&T to conduct Asbestos Awareness and NEA Floor Covering Drilling and Cutting/Lifting Procedures training. The list of Core trainers is available by contacting the NEA Management Center. Core trainers shall provide independent “Train the Trainer” courses valid for one year from the date the course is successfully completed.

**Primary Trainers** – Trainers who have attended the “Train the Trainer” course conducted by Core Trainers shall be considered “Primary Trainers.” Primary trainers are qualified to train and certify persons within their organization who will perform drilling or cutting/lifting of floor coverings using the NEA procedures. Primary trainers are also qualified to perform drilling themselves. Primary Trainers shall be qualified to conduct training for a period of one year from the date of training by Core Trainers.

2.1.5 Training shall be valid for a period of one year from the completion of training.

2.1.6 Training shall be documented on a Training Attendance Form (Figure G-1) and submitted to the NEA Management Center. Alternatively, an approved electronic method utilizing a provided NEA data entry method may be used. The Training Attendance Form shall be submitted to the NEA Management Center prior to the trainees performing work practices addressed in this section.

2.1.7 The Training Attendance form shall contain a signature of a certified primary trainer, verifying that the training was conducted in accordance with this section. The form may be faxed or e-mailed to the NEA Management Center (address listed on form).

3. **DRILLING HOLES IN FLOORS**

3.1 **General**
3.1.1 The Installation Supplier, AT&T Employee, or Contractor shall use the NEA floor drilling procedure to drill in asbestos-containing or suspected asbestos-containing vinyl floor coverings as allowed per Table 1.1.8.

3.1.2 Records of the asbestos content in flooring materials may be available for review. To access these records, the Installation Supplier, AT&T Employee, or Contractor may call the following numbers to determine if the floor to be drilled can be verified to contain no asbestos:

<table>
<thead>
<tr>
<th>Region</th>
<th>Contacts</th>
</tr>
</thead>
</table>
| Southwest Region- including Texas, Missouri, Oklahoma, Kansas, and Arkansas | • The Dallas Market Area - 214-464-8071  
• The Houston Market Area - 713-567-7396  
• San Antonio and the rest of Texas - 210-351-8312  
• Missouri, Oklahoma, Kansas, and Arkansas - 314-331-7268 |
| Midwest - Illinois, Indiana, Michigan, Ohio, and Wisconsin | Parsons Environmental - 251-243-9845 |
| California, & Mountain States including Nevada, Utah, New Mexico, Colorado, & Arizona | Parsons Environmental - 251-243-9845 |
| Southeast Region including Georgia, Alabama, Mississippi, Louisiana, Kentucky, Tennessee, North Carolina, South Carolina, & Florida | Parsons Environmental - 251-243-9845 |
| States Not Listed and Legacy T locations | Contact the Building Manager |
| Questions | AT&T EH&S Asbestos & Lead Manager  
Email: DL-EHSIndustrialHygiene@att.com  
314-606-5313 |

Unless verification is received from one of these sources that the floor covering is NOT asbestos-containing, the material shall be presumed to be asbestos-containing and treated as such.

3.1.3 Hole drilling in the state of Oklahoma shall be limited to vinyl floor tile only. This procedure shall not be used to drill other substances such as rolled or sheet floor coverings (e.g. linoleum) in this state. In Oklahoma the installation supplier, AT&T Employee, or Contractor shall contact the AT&T Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris if the material is not floor tile.
3.1.4 The Installation Supplier, AT&T Employees, or Contractors shall use manual stops on drills to control the depth of the hole when drilling anchor holes. Tape or other types of non-mechanical stops are not permitted.

3.2 Floor Drilling Procedure

3.2.1 The following procedures shall be followed by the Installation Supplier, AT&T Employees, or Contractors for solid-bit floor drilling in asbestos containing vinyl floor coverings (drilling holes one-inch in diameter or less).

3.2.2 The following equipment and supplies are required for these procedures:
   a) LPEC (shaving cream or shaving gel)
   b) Waterproof marker pen
   c) Appropriately sized drill with mechanical depth stop
   d) Silicone caulk
   e) Wet paper towels
   f) Sealable plastic freezer bags – one gallon size or larger

3.2.3 Complete the Negative Exposure Assessment (NEA) form (Figure G-3). The completed form shall be maintained on-site until all drilling activities have been completed. Page 5 of the completed form shall be sent or faxed to the NEA Management Center within two days of completion of the drilling activities. If the drilling activity lasts for numerous days, the form shall be faxed within two days of the last day of drilling. The NEA form shall accurately reflect the date range when the drilling activity occurred.

   The immediate area shall be clear of all people who have not completed the Asbestos Floor Covering Drilling training course.

3.2.4 The following equipment and supplies are required for this procedure: Impact drill with masonry bit, shaving cream, wet paper towels, marking pen, plastic sealable bags.

3.2.5 Mark the location where the hole is to be drilled. Tear a small hole in the center of the wet paper towel; place the hole over the marked location where the hole is to be drilled. Position the drill on the marked location bit on the location of the hole to be drilled and apply an ample amount of debris encapsulant (LEPEC, shaving cream or shaving gel), covering a minimum of two inches in diameter and one inch deep around the drill bit.

   a) Drill at slow speed until a hole is drilled into the concrete substrate to the required depth. Any drill bit being used to drill anchor holes shall utilize a mechanical drill stop. The drill stop shall be adjusted to drill to the exact depth required to set the anchor correctly. Tape on a drill bit shall not be used as a depth gauge; only mechanical drill stops shall be used for a depth gauge.

   b) All drill bits are subject to breakage during use, which can cause loss of balance and control. Never apply pressure in any direction except directly in line with the bit. Never force tool by applying excessive feed pressure. Always use a sharp bit (a dull bit requires...
the use of excessive pressure). Keep hands away from drilling area. Always wear eye protection, which complies with current ANSI standard Z87.1

c) Stop the drilling and retract the bit slowly without disturbing the debris, concrete and encapsulant around the hole. Wipe the drill bit with a wet paper towel and place into a sealable plastic bag. Fold the corners of the wet paper towel over the mound of shaving cream which is covering the drilled hole; pick up the towel containing the encapsulant and debris, place into the plastic bag.

d) Wipe the floor around the hole with a wet paper towel, holding it flat against the floor with the palm of the hand. Wipe once in an S-pattern and place towel into the plastic bag. The towel shall not be reused.

e) Wipe the floor again in an S-pattern, at right angles to the direction that you wiped the first time. Place the used towel into the plastic bag. The towel shall not be reused.

f) Continue wiping in alternating S-patterns until you cannot see or feel any dust or debris. The towels shall not be reused. Place all used towels into a sealable plastic bag and seal.

g) Place the sealed bag into another bag and seal it also.

h) Vacuum cleaners, of any type, shall NOT be used by the Installation Supplier, AT&T Employees, or Contractors to clean up asbestos containing or presumed asbestos containing material.

i) High Efficiency Particulate Air (HEPA) vacuum cleaners may be used to clean up non-asbestos concrete dust remaining in the holes after the procedure outlined above has been completed.

j) Dispose of the double-bagged debris into the outside dumpster unless 1.1.8 indicates the material shall be disposed of by contacting the RRC. If disposing in dumpster, do not label the bag or include any paper work. Each day’s debris shall be disposed of at the end of that day. If table 1.1.8 indicates to dispose of debris by contacting the RRC, the Installation Supplier, AT&T Employee, or Contractor should coordinate with the AT&T Equipment Engineer or site manager to contact the RRC at 1- 800-KNOW-EHS, prompt 4 to arrange for proper disposal.

3.2.6 The following procedures shall be followed by the Installation Supplier, AT&T Employee, or Contractor for Drilling in Other Asbestos-Containing Material:

a) If it is unknown whether the floor covering material contains asbestos, it shall be presumed to contain asbestos.

b) If the Installation Supplier, AT&T Employee, or Contractor encounters an asbestos-containing floor covering other than resilient vinyl floor tile or a sheet/rolled product such as linoleum the Installation Supplier, AT&T Employee, or Contractor shall contact the AT&T Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris.

4. CUTTING/LIFTING FLOOR COVERINGS
4.1 General

4.1.1 These procedures are to be used for lifting pieces of intact or substantially-intact asbestos containing floor coverings in preparation for drilling through or into a concrete slab or otherwise drilling holes in excess of one-inch in diameter. Each operation consists of the removal of enough floor covering to core drill one hole. A maximum of one square foot of floor tile may be removed each day unless specific authorization given by AT&T EH&S Technical Support Manager. Contact the AT&T EH&S Asbestos & Lead Manager by email at DL-EHSIndustrialHygiene@att.com or by phone at 314-606-5313 for authorization.

4.1.2 The Installation Supplier, AT&T Employee, or Contractor shall not penetrate asbestos floor covering with a power coring tool. That would be considered mechanical chipping, which is prohibited by the OSHA asbestos regulations.

4.1.3 These procedures shall also be used as a dust control practice when cutting/lifting non-asbestos containing flooring.

4.1.4 The Installation Supplier, AT&T Employee, or Contractor shall use the NEA cutting/lifting procedures as specified in table 1.1.8.

4.1.5 Records of the asbestos content in flooring materials may be available for review. To access these records, the Installation Supplier, AT&T Employee, or Contractor should call the numbers listed in table 3.1.2. Unless verification is received from one of these sources that the floor covering is NOT asbestos-containing, the material shall be presumed to be asbestos-containing and treated as such.

4.1.6 Cutting/lifting in the State of Oklahoma shall be limited to vinyl floor tile only. This procedure shall NOT be used to cut/lift other substances such as rolled or sheet floor coverings (e.g. Linoleum) in Oklahoma. In Oklahoma the Installation Supplier, AT&T Employee, or Contractor shall contact the AT&T Equipment Engineer to arrange for a licensed asbestos abatement contractor to remove the asbestos-containing materials and properly dispose of the debris if the material is not floor tile.

4.1.7 The following equipment and supplies are required for these procedures:

a) Bottle with soapy water or shaving cream (see 4.1.8)

b) Waterproof marker pen

c) Chisels or hole punch and hammer (see 4.1.9)

d) Heavy-bladed scraper

e) Silicone caulk

f) Wet paper towels

g) Sealable plastic freezer bags – one gallon size or larger

4.1.8 Use of chemical mastic removers is discouraged because of potential flammability and toxicity hazards. If the mastic cannot be removed with soapy water, use mastic remover in accordance with the Safety Data Sheet (SDS) and manufacturer’s instructions for the product. Soapy water will work better than shaving cream.
4.1.9 A chisel with a large (~2" wide) blade works best for cutting the covering when that much area is required to be lifted and one with a smaller blade works best for lifting the covering and for removing the mastic. A hole punch may also be used to cut and lift the covering, but a small chisel is still required to remove mastic. The chisels and hole punches shall be kept as sharp as possible.

4.1.10 The Installation Supplier, AT&T Employee, or Contractor shall not use any type of vacuum cleaner to pick up debris. An ordinary shop vacuum will not capture microscopic asbestos fibers and OSHA regulations do not allow their use.

4.1.11 The following procedures describe the use of a chisel or hole punch to cut through the covering. The choice of tool is left to the discretion for the installer and may depend on the covering being removed and where the hole is to be drilled relative to the edges of the covering. The procedures also differ slightly depending on the location of the hole, as defined below.

4.1.12 The installer shall endeavor to minimize breakage of the remaining flooring material surrounding the piece being removed.

4.2 Cutting/Lifting Procedures

4.2.1 These procedures do not describe the actual drilling operation. If vibration from the drilling causes pieces of floor covering to come loose,

a) Stop the core drilling temporarily and vacate all persons who have not been trained on using these procedures from the immediate area;

b) Wet the material, then pick up the loose pieces of material and put them in sealable plastic bags;

c) Clean the mastic from the exposed concrete as described in these procedures.

4.2.2 Complete the Negative Exposure Assessment (NEA) form (Figure G-2) or electronic version thereof. The completed form or an electronic version of the form shall be maintained on-site until all cutting/lifting activities have been completed. If not submitted electronically, the signature page of the completed form shall be sent or faxed to the NEA Management Center within two days of completion of the cutting/lifting activities. Place the completed NEA form in the job folder at the job site. The NEA form shall accurately reflect the date range when the activity occurred.

4.2.3 The immediate area shall be clear of all persons who have not completed the Asbestos Floor Covering Cutting/Lifting training course.

4.2.4 Waste material generated by these procedures shall be disposed of in accordance with instructions provided in 4.2.12.

4.2.5 Place the bit on the location where the hole through the slab will be drilled. With the marking pen, draw a circle or square on the floor covering around the bit at least a half-inch larger than the diameter of the bit.

4.2.6 Apply a bead of shaving cream or amended (soapy) water over the lines.
4.2.7 Using a chisel or hole punch, cut through the floor covering through the shaving cream or amended water. It is not important to cut exactly on the lines.

4.2.8 Pry the piece of floor covering off the concrete with the heavy-bladed scraper, tapping the end of the scraper handle with the hammer. The piece should be removed intact when possible, however should the piece break – this is not a problem.

4.2.9 Wet the mastic on the back of the floor covering piece and put the piece of floor covering in a sealable plastic bag.

4.2.10 Wet the mastic on the concrete with shaving cream or amended water and scrape it off with the small sharp chisel. An asphalt stain may remain on the surface, but there should be no residue – the surface should be smooth to the touch.

4.2.11 Wipe the concrete with wet paper towels until it is clean. Fold the towel over every time you use it. Put the towels in the sealable plastic bag. Seal the exposed edges of covering with the caulk.

4.2.12 When the procedure is complete put the sealed bag into another bag and seal it also. Dispose of the double-bagged debris into the outside dumpster unless table 1.1.8 indicates the material shall be disposed of by contacting the RRC. If disposing in dumpster, do not label the bag or include any paper work. Each day’s debris shall be disposed of at the end of that day. If table 1.1.8 indicates to dispose of by contacting the RRC, the Installation Supplier, AT&T Employee, or Contractor should coordinate with the Equipment Engineer to contact the RRC at 1-800-KNOW-EHS, prompt 4 to arrange for proper disposal.

4.2.13 Subsequent drilling of the concrete shall be completed using wet methods (i.e. shaving cream method as described in Section 3. The drill shall also fit within the area where the covering was removed. If the rotating bit contacts the covering at any time, the procedure shall be stopped and more covering removed per section 4.

5. DOCUMENTATION

5.1 General

5.1.1 The following forms shall be used to document the floor drilling procedures and cutting/lifting procedures described in this section:

a) Training Attendance Form (Figure G-1)

b) Negative Exposure Assessment Form – Cutting/lifting (Figure G-2). This form may be submitted electronically, without a handwritten signature. Submission of this form to the NEA Management Center by e-mail will be considered equivalent to signing and faxing the form.

c) Negative Exposure Assessment Form - Floor drilling (Figure G-3). This form may be submitted electronically, without a handwritten signature. Submission of this form to the NEA Management Center by e-mail will be considered equivalent to signing and faxing the form.

d) Negative Exposure Assessment Form – Notice of Non-Conformance Form (Figure G-4)
5.2 Notice of Non-Conformance

5.2.1 An Installation Supplier, AT&T Employee, or Contractor submitting invalid training or NEA documentation will receive a Notice of Non-Conformance (Figure G-4) which requires the Installation Supplier, AT&T Employee, or Contractor to correct the situation immediately.

5.2.2 Questions and requests for information may be forwarded to the NEA Management Center.

5.2.3 These forms can be found at: https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm
FIGURE G-1 – TRAINING ATTENDANCE FORM
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm

FIGURE G-2 – NEGATIVE EXPOSURE ASSESSMENT FORM
LIFTING PIECES OF ASBESTOS CONTAINING FLOOR COVERING
FOR HOLES LARGER THAN 1-INCH IN DIAMETER
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm

FIGURE G-3 – NEGATIVE EXPOSURE ASSESSMENT FORM
DRILLING HOLES IN ASBESTOS CONTAINING FLOOR COVERINGS
HOLES UP TO 1 INCH IN DIAMETER
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm

FIGURE G-4 – NOTICE OF NON-CONFORMANCE
https://ebiznet.sbc.com/sbcnebs/Content/Forms.htm

[END OF SECTION]
SECTION H -- GROUNDING AND BONDING

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TABLE H-1 – SUMMARY OF CHANGES IN SECTION H

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
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<tr>
<td>05/02/2016</td>
<td>Figure H-1 &amp; H-2</td>
<td>Modification</td>
<td>ATT-TP-76300-332</td>
</tr>
<tr>
<td>05/02/2016</td>
<td>1.2</td>
<td>Addition/ Deletion</td>
<td>ATT-TP-76300-333</td>
</tr>
</tbody>
</table>
1. **GENERAL**

1.1. **Introduction**

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the Grounding and Bonding requirements for Installation Suppliers performing services for AT&T.

1.1.4 Changes in this issue of Section H are summarized in Table H-1.

1.1.5 This section contains workmanship requirements. It is based on the engineering, installation and material requirements for grounding and bonding contained in the following documents:

   a) ATT-TP-76416, Grounding and Bonding Requirements - for Network Facilities

   b) ATT-C-98022-71, SNET Building Ground System; ATT-W-98023-31, Building Ground & Equipment Ground System.

1.1.6 Additional information on Grounding and Bonding (e.g. cabling, connectors, labeling, etc.) can be found in other sections of this document.

1.2. **Definitions**

1.2.1 The following terms are used throughout this section. Note: Where different terms are used for the same object, the AT&T alternative names to which these terms apply are listed in brackets after the term.

   **Alternating Current Equipment Grounding Conductor – (ACEG)** The conductor used to connect the non-current-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor, the grounding electrode conductor, or both, at the service equipment or at the source of a separately derived system.

   **Bonding** - The permanent joining of metallic sub-sections to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

   **American Wire Gauge (AWG)** – Is a standardized wire gauge system used predominantly in North America for the diameters of electrically conducting wire. Also known as the Browne & Sharp wire gauge.

   **Common Bonding Network (CBN)** - A set of interconnected objects that has one or more connections to a ground reference. This network, created by a multitude of connections, helps to ensure that the objects are at essentially the same potential when fault current flows through them. Building steel, water pipes, vertical and horizontal equalizer conductors, metallic raceways, raised floor systems, equipment frames and other conductive objects form a common bonding network when bonded together by intentional and incidental connections. This term is now used throughout this Section in place of “integrated ground plane”.

H-2
Carrier Communications Space Ground Bar (CO GRD bar) - A Carrier Communications Space ground bus bar that references the primary grounding system bus bar through the Vertical Riser. At least one of these bus bars is provided on each floor to permit the grounding of frames and power supplies, as required. Was previously called Floor Ground Bar (FGB)

DC Equipment Grounding Conductor (DCEG) - The conductor that bonds an equipment frame, cabinet or other enclosure to the CO GRD system, engineered to provide an electrical path of sufficient capacity to permit protective devices (e.g. fuses, circuit breakers) to operate effectively and to equalize the potential between equipment. The DCEG conductor may also bond an equipment unit within a frame, cabinet or other enclosure to the CO GRD system.

DC System Grounding Conductor - The conductor used to connect one side of a dc power source to the site's grounding system. Example: In a -48 volt battery-type power plant serving Carrier Communications Space equipment, the conductor between the positive (+) side of the plant and a point on the office grounding system.

Equipment Ground - Deliberately engineered conductors in communication systems and AC and DC power distribution systems to provide electrical paths of sufficient capacity to permit protective devices (e.g. fuses, circuit breakers) to operate effectively and to equalize potential between equipment.

Foreign Object - Any electrically conductive surface that is part of the Common Bonding Network and is within 7 feet of a conductive surface that is part of the Isolated Bonding Network.

Grounded Conductor - A system or circuit conductor that is intentionally grounded. Example: The conductor usually referred to, as the grounded conductor is the neutral conductor in ac circuits and the battery return conductor in dc circuits.

Ground Window - An imaginary, spherical area having a radius of 3 feet. This transition area contains, or is a portion of a bus bar that is the physical interface between the building’s common and isolated bonding network equipment.

Horizontal Equalizers – 1) Conductors of relatively low impedance that interconnect vertical risers in a building that is of a size that requires more than one vertical riser; 2) The grounding wire that extends from the ground reference (COG/OPGP) to equipment areas on the same floor.

Isolated Bonding Network (IBN) - A set of interconnected objects that are referenced to ground at a single point. This network is insulated from contact with any other conductive member not part of the same bonding network. With only one point of ground reference, the possibility that the equipment will be used as a conductive path for transient currents from exterior sources is greatly reduced. This term is now used throughout this Section in place of “isolated ground plane”.

Isolated Ground Plane - (See Isolated Bonding Network)

Listed - Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that
the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.

**Main Ground Bus (MGB)** - A bus bar located within the ground window that provides a physical means of connection between the CO GRD system and the isolated bonding network served by the ground window. Was previously called Ground Window Bar (GWB)

**Office Principal Ground Point (OPGP)** - A bus bar normally located near the AC entrance switchgear. It functions as:

a) the connection point for all main grounding conductors and earth electrodes
b) the point of origin for the Vertical Riser
c) When convenient, the COG for the floor where it is located.

**Raceway** - An enclosed channel designed expressly for holding wires, cables, or bus bars, with additional functions as permitted in the National Electrical Code (NEC).

**Single Point Ground** - A method used to ground a circuit at only one physical point.

**Solidly Grounded** - A method of grounding either a power supply or a frame that uses a grounding conductor connection in which no additional impedance has been intentionally connected in series with the grounding path.

**Vertical Riser (VR)** - This conductor, also called the vertical equalizer, extends ground reference from the office’s primary ground bus to one or more other bus bars in the office. Note: The portion of this conductor that is routed horizontally between the office’s primary ground bus and the first connection to other bus bars in the office is also called the vertical riser.

### 2. GROUNDING SYSTEM CONDUCTORS AND CONNECTIONS

#### 2.1 General Requirements

2.1.1 All equipment shall be bonded to the appropriate grounding network before any other conductors are connected.

2.1.2 The Main Ground Bus (MGB) shall be within 1 floor of the isolated ground bonding network frames it serves.

2.1.3 All Common Bonding Network (CBN) grounding conductors shall be connected to the CBN side of the MGB. All Isolated Bonding Network (IBN) grounding conductors shall be connected to the IBN side of the MGB. See Figure H-5

2.1.4 Grounding conductor connections shall be made so that conductors are dressed in the direction of the main ground reference whenever possible. Increased conductor length and bending radius are more important considerations than the direction of connection. The direction of the bend shall be made for ease of installation and to maintain an acceptable bending radius.

2.1.5 Grounding conductors larger than #1/0 AWG shall be spliced or joined with compression-type H-tap.
2.1.6 Compression-type butt splice (i.e., 180 degree) connectors shall not be used.

2.1.7 The free ends of insulated conductors shall be covered with heat shrink end caps.

2.1.8 H-tap compression connectors on grounding conductors shall be protected using fire-retardant hard-shell or soft-shell covers.

2.1.9 All newly installed grounding conductors covered by this TP and that require insulation shall conform to the insulation colors shown in Table H-2 below. These color standards were first described in AT&T-NOTICE-000-000-415, dated March 20, 2002. Conversion of existing insulation colors purely for the sake of uniformity is not warranted.

<table>
<thead>
<tr>
<th>REGION</th>
<th>NON-RAISED FLOORS</th>
<th>RAISED FLOORS</th>
</tr>
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<tbody>
<tr>
<td>AT&amp;T Midwest</td>
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</tr>
<tr>
<td>AT&amp;T West</td>
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<tr>
<td>AT&amp;T Southeast</td>
<td>Green</td>
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</tr>
</tbody>
</table>

2.2. **Horizontal and Vertical Equalizers**

2.2.1 All vertical and horizontal equalizer conductors shall be routed so that U shaped configurations are avoided.

2.2.2 Vertical and horizontal equalizers shall be run exposed so as to afford visual inspection of the entire system and to provide access for adding connectors.

2.2.3 Cable supports and sleeves provided for routing of horizontal and vertical equalizer conductors shall not be used for routing of any type of cable or conductor other than grounding conductors. Note: Horizontal equalizer conductors may be placed on the same cable brackets used to support other cables if secured to the opposite surface of the brackets.

2.2.4 Horizontal runs shall be supported along the exterior of cable rack stringers or from framing bars by means of clips or similar devices that do not form a closed metallic ring around the conductor. Short runs through walls shall be supported within 2" PVC plastic or other approved non-metallic conduit.

2.2.5 Vertical risers shall be run through floors in core-drilled holes or in 2" PVC plastic or other non-metallic conduit. If a cable hole is adjacent to the column supporting the vertical riser, the cable hole may be used in place of non-metallic conduit as long as a separation is maintained between the vertical riser and other conductors routed through the cable hole.
2.2.6 Vertical risers shall be secured to columns and walls using supports located within 2 feet of the floor, the ceiling, each side of any intervening bus bar, and at an interval of 2 feet (or less) between these points.

2.2.7 The vertical conductor may be supported by cable brackets or similar details fastened to Unistrut or other material that is anchored to a wall or column. An auxiliary support shall be provided on every other floor consisting of either wedge plugs in the top of sleeves or cable support grips suspended from J-bolts secured by anchors in the ceiling.

2.2.8 All cable connections to the vertical riser and horizontal equalizer shall be made with bends towards the COG/OPGP.

3. AC EQUIPMENT GROUNDING

3.1. Feeder and Branch Circuit Equipment Grounding System

3.1.1 For enclosures that require terminations of an Alternating Current Equipment Grounding (ACEG) conductor, the conductor shall be connected to the enclosure by one of the means listed below:
   a) a ground bus bar
   b) a terminal strip
   c) a grounding bushing
   d) a grounding clip
   e) a screw fastener
   f) the enclosure is surface mounted and direct metal-to-metal contact exists between it and the receptacle’s mounting yoke
   g) the receptacle is cover-mounted and the enclosure and cover combination are listed as providing satisfactory ground continuity between the enclosure and the receptacle

Note 1: Grounding clips are normally used only at junction boxes and receptacle enclosures.

Note 2: A screw fastener (machine screw, nut, bolt, stud, etc.) shall be used for no other purpose than to terminate ACEG conductors.

3.1.2 For enclosures that do not require terminations (pull boxes, T’s, etc.) and when ground continuity is maintained via the conduit and bonding type bushings and lock nuts, termination of the ACEG conductor shall not be required.

3.2. Extending ACEG Conductors

3.2.1 Since AC distribution systems are of different ages, it is likely that a system not originally equipped with a separate ACEG conductor will be encountered. It is often not feasible to place an ACEG conductor in the existing upstream feeder conduit or raceway. However, the conduit or raceway may be able to serve as the ACEG conductor. The point from which an ACEG conductor is extended will usually be an enclosure such as a:
a) Distribution panel
b) Pull box
c) Junction box
d) Receptacle box
e) Lighting fixture.

3.2.2 Before any AC distribution system is extended or rearranged from a point in a distribution system not equipped with a separate ACEG conductor, the integrity of the ACEG system upstream from the enclosure shall be verified. This is done by determining whether an acceptable type of conduit or raceway has been used and by verifying the tightness of the fitting(s) used to fasten the conduit or raceway to the enclosure.

3.2.3 For existing distribution systems not equipped with a separate ACEG conductor, only the following types of conduit or raceway shall serve as an ACEG conductor:
   a) Electrical metallic tubing (EMT)
   b) Intermediate metal conduit (IMC)
   c) Rigid metal conduit
   d) Metal raceways listed for grounding.
   Note: If none of the above is present in the upstream feed to the enclosure, no circuit shall be extended from the enclosure until corrective action has been performed.

3.2.4 The ACEG conductors being added shall be terminated to the enclosure by one of the means described above.

3.2.5 If more than two ACEG conductors are being added (typically at a distribution panel), it is preferable to add a ground bus to the panel. This bus may be bonded to the panel using its mounting screws provided the paint is removed from the mounting surface of the panel and NO-OX-ID “A” anti-corrosive compound is applied to the bare metal.

4. COMMUNICATION SYSTEMS & MISCELLANEOUS EQUIPMENT

4.1. Frames, Bays, Cabinets and Units

4.1.1 All frames, bays, cabinets and units shall be properly grounded. Cabinets and relay racks shall be grounded to the aisle grounding conductor per Section K of this practice.

4.1.2 Cabinets with plated rails shall be assembled with one set (left/right) of vertical rails bonded to the cabinet using bonding conductors consisting of #6 AWG green wire and 2 hole connectors and the masked cabinet holes provided by the manufacturer for this purpose. The front and rear uprights are effectively bonded through bolted, plated shelf angles or strain relief bars provided by the manufacturer or OTV when required for equipment mounting requirements (see associated equipment standard drawings). If shelf angles are not used, all vertical rails should be bonded to the cabinet using bonding conductors consisting of #6 AWG green wire and 2 hole connectors. (Note: the equipment chassis mounted to both the front and rear rails IS NOT to be considered as the bonding conductor).
4.1.3 Cabinets with painted vertical rails shall be assembled with each set (left/right) of rails bonded to the cabinet using bonding conductors consisting of #6 AWG green wire and 2 hole connectors and the masked cabinet holes provided by the manufacturer for this purpose.

4.1.4 When a unit in a frame, cabinet or other enclosure requires a separate grounding conductor from the unit, the grounding conductor shall be extended from the unit to one or more of the following:
   a) A crimp type parallel tap to a grounding conductor of equivalent or larger size within the enclosure
   b) The same point of connection on the enclosure metalwork as the framework grounding conductor if of equivalent or larger size
   c) A grounding terminal (wire-wrap, solder, etc.) within the frame or cabinet
   d) A crimp type parallel tap to a grounding conductor of equivalent or larger size outside the enclosure.

4.1.5 The 1" galvanized pipe often used as a means of support between the framework and the auxiliary framing may be used as the lineup grounding conductor for the extension of existing applications only. This method is not allowed for new lineups.

4.1.6 The external chassis ground, if provided on a unit, shall be utilized to ground the unit, except where AT&T standard drawing indicates that the chassis ground connection is not required. If the AT&T standard drawing indicates that a chassis ground is not required, a copy of the drawing shall be left in the job folder.

4.1.7 Frame extensions shall be bonded to the existing frame via the threaded nut and bolt assemblies connecting the two sections. When frame extensions are provisioned with a #6AWG bond, this bond shall also be used.

4.1.8 BDFBs with an insulated or external battery return bus bar shall be grounded with a #1/0 AWG conductor from the framework to the horizontal equalizer or CO ground bar, whichever is closest.

4.1.9 BDFBs with non-insulated battery return bus bar shall be grounded with a 750kcmil conductor from the return bus bar to the horizontal equalizer or CO ground bar, whichever is closest.

4.1.10 A minimum #2/0 AWG main aisle conductor shall be used between the CO GRD bus bar and an area containing a group of bays or miscellaneous units, or an area with more than one lineup of equipment. The #2/0 AWG conductor shall originate at an OPGP or CO GRD bus bar, or from another horizontal equalizer of equal or larger size. Separate #2 AWG conductors serving only one side of an aisle, shall then be branched from this conductor to serve an equipment lineup or individual equipment units. In existing installations, #6 AWG aisle ground conductors shall have a maximum length of 50 feet.

4.2. **Conduits, Raceways, and Other Bonds to the MGB/GWB**

4.2.1 The Main Ground Bus (MGB) shall be within 1 floor of the isolated ground plane frames it serves.

4.2.2 All Common Bonding Network (CBN) grounding conductors shall be connected to the CBN side of the MGB. All Isolated Bonding Network (IBN) grounding conductors shall be connected to the IBN side of the MGB.

4.2.3 Metallic conduits and raceways containing AC circuits serving isolated bonding network equipment shall be routed near the MGB and bonded to the CBN side of the MGB/GWB. The ACEG conductor in the conduit shall also be bonded to the CBN side of the MGB/GWB.
4.2.4 The bond to the MGB/GWB shall be made using a minimum #6 AWG conductor no more than three feet in length. Figure H-3 shows one possible method to bond the conduit and ACEG conductors to the MGB/GWB. A mechanical connector may be used to create a collection point to provide a means to bond ACEG conductors, conduit, raceway and junction box (if used) and the #6 AWG bond to the MGB/GWB.

4.2.5 After bonding to the MGB, conduit within the IBN network may contact isolated bonding network metalwork, but it shall remain insulated from contact with members of the common bonding network.

4.2.6 All metallic conduits and raceways containing AC circuit conductors shall be intentionally bonded together to form an electrically continuous enclosure. Insulating bushings, non-conductive unions, or any similar material or methods shall not be used in metallic conduits or raceways to interrupt their continuity.

4.2.7 Every conductor with continuity to both the common bonding network and the isolated bonding network, such as the shield of a coaxial cable, shall pass through the ground window and be bonded to the MGB/GWB with a conductor no longer than 3 feet.

4.2.8 The MGB may be mounted on cable rack, a column, a wall or any other location that provides adequate cable access.

a) The hardware securing the MGB shall provide electrical insulation from any metallic object to which it is mounted.

b) A #6 AWG bonding lead shall be installed between the MGB and any metallic object to which it is mounted.

4.2.9 All components of an isolated bonding network equipment system shall be referenced (connected) to ground only via the MGB.

4.2.10 When the battery return bus bar of the power plant consists of one or more straight sections of bus bar longer than six feet, the MGB may be established at any point along the bus bar.

a) Battery return conductors serving common bonding network loads shall be terminated on the battery return bus bar within the boundaries of the MGB.

b) Battery return conductors for isolated bonding network loads shall be terminated on the remaining portion(s) of the battery return bus bar.

4.3. Isolated Bonding Network Tests

4.3.1 Each frame or group of frames in the isolated bonding network shall have isolation tests performed in accordance with manufacturer's instructions.

4.3.2 It is an objective that at the completion of new switch (or other IBN equipment) installations, no more than 1 ampere of AC or DC current shall flow on any grounding conductor from IBN equipment as measured at the MGB termination.

a) The installer shall use a clamp-on ammeter to measure the DC and AC amperage on the lead(s) from the equipment Isolated Bonding Network (IBN) to the isolated connection at the MGB. The installer shall record this reading on a Test Record Form and place a copy in the job folder.
b) The vendor shall take corrective action to reduce readings greater than 1 ampere before the equipment is turned over to AT&T unless AT&T approves the higher value.

c) For existing IBN installations, it is recognized that ongoing equipment installation and removal activity by others may cause undetected grounding violations. These grounding violations could cause current flow on conductors between the IBN equipment frames and the MGB to exceed the 1 ampere requirement established for new installations. Accordingly, at the start and completion of all growth additions or modifications involving IBN equipment (i.e. frame, bay, shelf, and circuit pack) the vendor shall measure the AC and DC current on all grounding conductors connected from IBN equipment frames to the MGB. Depending on the manufacturer and size of the IBN installation, there may be multiple conductors.

d) These measurement(s), along with date and time, shall be recorded on a test record at both the beginning and end of the job with the recorded values also given to AT&T. A copy of this test record shall be filed in the job folder. It is recommended that this requirement be made part of the local Method of Procedure (MOP) that describes how this work will be completed.

e) There shall be no change between the current measurements before and after the job completion. This will verify the IBN equipment supplier did not create grounding violations as part of the installation activity. It is recognized that there may be subtle variations in the current measurements due to Carrier Communications Space traffic conditions that exist at the time the job-beginning and job-ending measurements are taken. Therefore, the beginning and ending current measurements may be different but the ending reading shall not increase by more than 5% from the beginning reading.

f) Depending on the beginning and ending current measurements, a variety of actions may be appropriate. A summary of conditions and suggested actions appear in Table H-3 below.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>SUGGESTED ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning reading &lt; 1 ampere</td>
<td>Proceed with job installation</td>
</tr>
<tr>
<td>Ending reading &lt; 1 ampere</td>
<td>Proceed with job close out</td>
</tr>
<tr>
<td>Beginning reading &gt;1 &amp; &lt; 10 amperes</td>
<td>Proceed with job installation.</td>
</tr>
<tr>
<td>Ending reading &gt;1 &amp; &lt; 10 amperes and within 5% of beginning reading</td>
<td>Proceed with job close out</td>
</tr>
<tr>
<td>Ending reading &gt;1 &amp; &lt; 10 amperes and greater than 5% of beginning reading</td>
<td>Vendor shall take corrective action¹</td>
</tr>
<tr>
<td>Beginning reading &gt; 10 amperes</td>
<td>AT&amp;T to take corrective action¹²</td>
</tr>
<tr>
<td>Ending reading &gt; 10 amperes</td>
<td>Vendor shall take corrective action¹</td>
</tr>
</tbody>
</table>

¹ Corrective action includes investigation and modification of facilities as necessary to reduce the beginning current readings to 10 amperes or below or to reduce the ending current readings to within 5% of the beginning reading.
It is an AT&T objective that the timing of growth additions occurs such that the jobs are completed and ready for service at the same time the additional capacity and/or capabilities are needed. If AT&T were to take action to correct bonding and grounding problems and this action caused a delay in the start and completion of the growth addition, this corrective action could prove counter productive. It is therefore advisable that AT&T personnel take preliminary current measurements approximately 3-6 months in advance of the job start in order to correct known problems in advance of the scheduled job start.

4.4. **Insulation for Isolated Bonding Network Equipment**

4.4.1 Insulating material shall be installed between a metallic object that is part of the isolated bonding network and material securing or fastening it to a metallic object that is part of the common bonding network.

4.4.2 Any metal detail extended above isolated bonding network equipment to support an object that is part of the common bonding network shall use insulation material to maintain separation between the two bonding networks.

4.4.3 Conduits that are part of an isolated bonding network shall be insulated from contact with common bonding network objects using two wraps of sheet fiber or bus bar insulators placed at all contact points.

4.5. **Foreign Object Bonds**

4.5.1 Common Bonding Network conductive apparatus located within 7 feet of the Isolated Bonding Network shall be bonded to the MGB/GWB with a No. 6 AWG conductor. Other large conductive objects (not associated with any network) that personnel may contact during their normal work activities while still in contact with an IBN device shall be bonded to the MGB/GWB. The CBN conductive apparatus and objects that shall be bonded include:

a) **Equipment Frames** – One No. 6 AWG is C-tapped or H-tapped to the lineup ground cable over each lineup of frames that are within 7 feet.

b) **Metallic stands, cabinets and desks** - Freestanding items placed in fixed locations such as metallic stands, desks and cabinets shall require bonding. Cabinets that are anchored to the walls or floor shall be bonded as well as all metallic spare circuit pack cabinets.

c) **Ironwork** - Auxiliary framing, cable rack, threaded rods, stanchions, cable hole hardware, and other metallic supports and details shall be considered one unit; therefore, only one bond to the ironwork is required. This bond shall be in a central location over the switch. In the event that different levels of auxiliary framing or cable rack are not interconnected by threaded rod or other metallic details over the isolated ground plane area, each level will be considered a separate unit and will require individual ironwork bonds.

d) **Lighting fixtures** - Lighting fixtures and the associated conduit are considered one unit and, therefore, only one bond to a lighting fixture is required.

e) **Air ducts** - When air ducts are separated by nonmetallic fittings, each section of duct shall be bonded; otherwise, the entire duct system will be considered one unit and only one bond is required.
f) **Metallic raceway or conduit** - This includes conduit providing AC to building equipment and/or IBN equipment areas, and conduit used to run alarm wiring. Each conduit run shall be bonded only once. Two-hole grounding lugs shall be used by installing the Burndy-type GAR-TC Ground Connector, or installing two conduit clamps (refer to Figure K5). If several conduit runs are mechanically connected together, such as at the power distribution cabinet, a conduit box, or via conduit clamps secured to a unistrut support, only the cabinet, box or support requires the bonding connection, not the individual conduit runs.

g) **Building fixtures** - Large volume conductive objects such as air-conditioning units, AC power distribution cabinets, water coolers, water pipes, radiators, door frames and window frames shall be bonded. Doors and doorframes are considered one unit and do not require individual bonds. Pipes shall be grounded per figure K-5. Small items that are not normally touched by personnel or that are generally considered portable do not require bonding. This includes fire extinguishers and holders, light switch and outlet receptacle cover plates, wastepaper baskets, desk lamps, Venetian blinds, signs, dropped ceiling supports, etc.

4.5.2 Based on the specific building configuration and the number of foreign objects that require bonding, one or a combination of the following methods shall be used to accomplish the bonding of foreign objects. For all applications, "daisy chain" connections shall **not** be used:

a) **Collection Bus Bar** - When there are a number of foreign objects to be bonded, a collection bus bar can be used to gather the # 6AWG conductors from the foreign objects. A # 6AWG conductor shall also be used to connect the collection bar to the ground window. This method helps to minimize the number of terminations on the MGB/GWB. See Figure H-1.

b) **Collection Conductor** - This method is similar to the collection bus bar above except a # 6AWG collection conductor will be used to gather the # 6AWG conductors from multiple foreign objects. Each conductor from the foreign objects shall be connected to the collection conductor using compression C-tap or H-tap connectors. The collection conductor can then be terminated on a collection bus bar or directly on the MGB/GWB. See Figure H-2.

c) **Direct Connection** - When there are a limited number of foreign objects to be bonded, a direct connection can be made between the foreign object and the MGB/GWB using a # 6AWG conductor.

5. **RADIO SITES AND EQUIPMENT**

5.1 **Interior Ring Ground System**

5.1.1 The peripheral conductor (also referred to as the "interior ring" or "halo ground") need not be installed as a single continuous conductor. Unnecessary splices shall be avoided, but when installation is simplified by installing the peripheral conductor in segments, and segments are joined by an exothermic weld (preferred) or crimp type parallel connector, such segmentation is permitted.

5.1.2 Routing of the peripheral conductor through metallic objects that form a ring around the conductor, such as metallic conduits or sleeves through walls or floors, shall be avoided whenever possible. Non-metallic material such as PVC conduit is preferred for floor or wall
penetrations. If non-metallic conduit is prohibited by local code, the peripheral conductor shall be bonded to each end of the metallic conduit.

5.1.3 To minimize impedance and incident of arcing, the peripheral conductor shall be installed with a minimum number of bends. Bends shall be made with the greatest practical radius, with a preferred radius of no less than 1 foot. When this is impractical, the minimum radius shall not be less than 6 inches. Use of 90-degree bends to avoid obstructions shall be avoided when lesser bends (e.g., 45 degrees) can be adequately supported.

5.1.4 The peripheral conductor shall be run exposed to allow inspection of the system and to connection of branch conductors. PVC conduit shall not be used for support.

5.1.5 The peripheral conductor shall be located at a height from the floor that allows for convenient bonding of supplementary conductors. For 9'-0" frames, the recommended height is 9'-8".

5.1.6 Supports shall be provided at an interval of between 12 and 18 inches. Extra supports may be provided where the peripheral conductor may be distorted, such as at bonding points. When the peripheral conductor is not located on a wall, it shall be supported from cable racks or auxiliary framing channels.

5.1.7 Supplementary conductors may be supported from cable rack stringers or framing channels using 9-ply waxed polyester twine, cable ties, clamps or clips. If clamp or clip supports are used, a type that does not require drilling of channels and stringers is preferred. All supports shall be placed at an interval of 12 to 18 inches. Removal of paint from the channel or stringer is not required when clamps or clips are used. Scratches in the finish shall not be painted, and clamps or clips shall not be painted. A job-fashioned detail may be used to route the conductor around obstructions at cable rack junctions or other points interfering with the conductor.

5.1.8 To minimize impedance, special attention shall be paid to the direction of turns at all junctions of supplementary and peripheral conductors. At the junction nearest a hatch plate, the supplementary conductor shall turn in the direction of the hatch plate. The other end of the conductor shall turn in the opposite direction, toward a bond between the exterior ring ground and the peripheral conductor more remote from the hatch plate than the connection of the supplementary conductor.

5.1.9 When there is no significant difference in the length of the bond paths to a hatch plate from either end of a supplementary conductor, both ends shall turn in the direction of the hatch plate. When the building is equipped with more than one equipped hatch plate, the end of the supplementary conductor shall turn in the direction of the nearest hatch plate.

5.1.10 If one or more hatch plates are not equipped with waveguides, the supplementary conductor shall turn in the direction of the nearest equipped hatch plate. When coax or waveguide is added to the unequipped hatch plate, a second bond shall be made at the turn, in the opposite direction, to create a bi-directional turn. Note: Where doubt exists as to the correct direction for a turn, a bi-directional arrangement may be used. Universal application of bi-directional bonds is not recommended.

5.2. Unit Bonds

5.2.1 Grounding conductors routed along interior walls and units located next to such walls may be in proximity to other conductors or units mounted on the other side of the wall. When the
peripheral or supplementary conductors that run on either side of a wall are bonded together at both ends, intermediate bonds may be omitted. Bonds to conductors on both sides of a wall shall be made to objects such as conduits or pipes that penetrate the wall.

5.2.2 Bends shall be made with the greatest practical radius. The bend radius shall not be less than 1 foot.

5.2.3 Where unit bond conductors join peripheral or supplementary conductors, they shall turn in the direction of the nearest hatch plate. A single conductor connecting two units to a peripheral or supplementary conductor may be used without regard to the direction of turns.

6. POWER PLANT GROUNDING

6.1. Frames, Cabinets and other Components

6.1.1 All frames, cabinets and other components of a power plant shall be equipped with a minimum #6 AWG to the CO GRD System. This includes frames in a power board line up, rectifier bays, metal battery stands, etc.

6.2. Grounding Conductor

6.2.1 The power plant line up conductor shall be sized to accommodate the maximum expected primary distribution. For 600A distribution, the power plant line up conductor shall be a #1/0 AWG minimum and shall be connected to the nearest:

a) DC System Grounding Conductor (when MGB is part of the power plant battery return)

b) MGB (when MGB is part of the power plant battery return)

c) Horizontal Equalizer of equal or greater size

d) CO GRD or OPGP bus bar DCEG conductors for power plant frames, cabinets and other equipment shall be branched from a power plant lineup conductor. A typical power area grounding arrangement is shown in Figure H-4.

6.2.2 The DC system Grounding Conductor extends from the battery return bus bar to the CO GRD (or OPGP) for all power plants except shared power plants with a remote MGB. The default size for plants over 1200 amps shall be a 750 kcmil conductor. Its minimum size shall be based on the maximum plant capacity specified by the manufacturer.

<table>
<thead>
<tr>
<th>Power Plant Capacity (Amperes)</th>
<th>Minimum Size of System Grounding Conductor</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 200</td>
<td>6 AWG</td>
</tr>
<tr>
<td>201 – 500</td>
<td>2 AWG</td>
</tr>
<tr>
<td>501 – 1199</td>
<td>4/0 AWG</td>
</tr>
<tr>
<td>1200 +</td>
<td>750 kcmil</td>
</tr>
</tbody>
</table>

6.2.3 For any equipment frame, cabinet or other enclosure containing rectifiers, the minimum size for a DCEG conductor shall be #6 AWG. Table H-4 below shall be used to determine the size of the framework ground conductor based on the size of the output rating of the largest rectifier in
the framework. The current limiting or over-current protection feature of rectifiers may not activate until 110% of the rated current output is reached. For example, a 400-ampere rectifier may not shut down until reaching 440 amperes. The conductor size in Table H-4 is based on Table 250-122 from the NEC.

<table>
<thead>
<tr>
<th>Rectifier Output /Inverter Input Rating (DC Amperes)</th>
<th>Rectifier Current Limit (DC Amperes)</th>
<th>DCEG Conductor Size:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100</td>
<td>Up to 110</td>
<td>6 AWG</td>
</tr>
<tr>
<td>200</td>
<td>220</td>
<td>4 AWG</td>
</tr>
<tr>
<td>400</td>
<td>440</td>
<td>2 AWG</td>
</tr>
</tbody>
</table>

6.2.4 The DCEG conductor for any DC-to-AC inverter shall be a minimum #6 AWG.

a) Table H-4 shall be used to determine the minimum size for the DCEG conductor based on the rating or setting of the DC input circuit's over current protective device. This requirement applies to all stand-alone inverters and to all bay-mounted inverters. This DCEG conductor is required in addition to the ACEG conductor for the AC input and/or output circuits.

b) If the inverter is the source of a separately derived system, this conductor shall be required in addition to the Grounding Electrode Conductor.

6.2.5 Power Plants shall be grounded per Figure H-4.
Note: Figure H-1 applies only to Common Bonding Network equipment that is located within 7’ of Isolated Bonding Network equipment. The Foreign Object bond lands on the IBN MGB, is in addition to the equipment frame bond to the CBN.
FIGURE H-2 - Using a Collection Conductor to Bond Foreign Objects

Note: Figure H-2 applies only to Common Bonding Network equipment that is located within 7' of Isolated Bonding Network equipment. The Foreign Object bond lands on the IBN MGB, is in addition to the equipment frame bond to the CBN.
FIGURE H-3 - BONDING OF CONDUIT AND ACEG CONDUCTORS TO MGB/GWB

From AC distribution panel in the Common Bonding Network

#6 AWG

To loads in the Isolated Bonding Network

ACEG conductors

#6 AWG to MGB/GWB

Phase & Neutral Conductors
Figure H-4 Typical Power Plant Grounding Arrangement

- **A** - 750 kcmil
- **B** - #1/0 AWG
- **C** - #2 AWG
- **D** - #4 AWG
- **E** - #6 AWG

- **a)** DC System Grounding Conductor (when MGB is part of the power plant battery return)
- **b)** MGB (when MGB is part of the power plant battery return)
- **c)** Horizontal Equalizer of equal or greater size
- **d)** CO GRD or OPGP bus bar

**DIGITAL SWITCH / TRANSPORT**
**POWER PLANT**
**IBN / CBN LOADS**

**HORIZONTAL EQUALIZER**
**VERTICAL EQUALIZER**
Figure H-5
Sequencing of Conductors along an MGB that is Part of a Power Plant’s Battery Return Bus

- **Battery Return Busbar Above Power Plant**
- **Logic Ground Conductor from Isolated Bonding Network**
- **Framework Ground Conductor from Isolated Bonding Network**
- **Framework Ground Conductor from Isolated Bonding Network Adjacent Floor**
- **Co GRD or OPCP Bus Bar**
- **Power Plant Framework Ground Conductor**
- **Protector Frame Ground Conductor**
- **Foreign Objects**
- **Bond to AC Conduit and ACG Conductor**
- **Return Conductors from Common Bonding Network Loads**
- **Return Conductors from Battery +**
- **Ground Window**

Returns to the battery should only terminate here if all space is exhausted.
SECTION I -- IRONWORK

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   2.3. High Seismic Risk Zone Requirements ................................................................................ I-3
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TABLE I-1 – SUMMARY OF CHANGES IN SECTION I

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
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<tbody>
<tr>
<td>03/11/2016</td>
<td>Entire Document</td>
<td>Modification</td>
<td>N/A; March 2016 TP76300 Rewrite</td>
</tr>
<tr>
<td>01/31/2017</td>
<td>2.4.6</td>
<td>Modification</td>
<td>ATT-TP-76300-368</td>
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<td>05/11/2017</td>
<td>2.4.8</td>
<td>Modification</td>
<td>ATT-TP-76300-376</td>
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<tr>
<td>06/01/2018</td>
<td>2.5.31</td>
<td>Addition</td>
<td>ATT-TP-76300-402</td>
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<td>11/02/2018</td>
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<td>Addition</td>
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<td>2.5.22</td>
<td>Modification</td>
<td>ATT-TP-76300-418</td>
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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the general requirements for the location, assembly and erection of cable and relay racks.

1.1.4 Changes in this issue of Section I are summarized in Table I-1.

1.1.5 This section delineates workmanship requirements. The following Practices provide additional assembly details:

- ATT-TP-76201  Hardware Products and Materials Specifications
- ATT-812-000-713  Anchoring Requirements
- ATT-812-000-715  Equipment Framework and Cable Design Requirements
- ATT-TP-76305  Cable and Wire Installation and Removal Requirements - Cable Racks and Raceways
- ATT-TP-76408  Auxiliary Framing and Bracing Requirements
- ATT-TP-76409  Network Facility - Cable Rack Requirements

2. REQUIREMENTS

2.1. General

2.1.1 All ironwork installation described in this section shall conform to AT&T seismic requirements. Except when noted otherwise, the requirements stated herein apply to all seismic risk zones.

2.1.2 Cut ends of auxiliary framing, cable racks, bolts, etc., shall have sharp or jagged edges removed.

2.1.3 Cut ends and damaged painted surfaces shall be repainted.

2.2. Auxiliary Framing

2.2.1 Auxiliary framing shall be uniform in length, at the correct height, properly located and level.

2.2.2 Compression type splices shall be utilized only in low seismic areas. Through bolt splices can be utilized in both low and high seismic areas. Compression type and through bolt splices shall not be utilized in the same system. If compression type splices are utilized they shall be:

a) staggered at alternate runs between supports, horizontally and vertically

b) Limited to one splice between supports.
2.2.3 Where the ends of low level auxiliary framing (first level above the framework) extends beyond a support, the ends shall be equipped with a rubber finishing cap.

2.2.4 When short sections of auxiliary framing are used below the low level framing, rubber finishing caps shall be installed on the exposed ends.

2.2.5 Superstructure bracing shall be installed within the 30/60 degree slope maximum.

2.2.6 There shall be a minimum 5 inch clearance between the ends (does not include side surfaces) of auxiliary framing and any building structural member or surface (e.g., columns, walls, beams). The purpose of this standard is to prevent the ends of the auxiliary channel from “chiseling” the building structure during a seismic or other event. Building systems that are non-structural (e.g. HVAC ducting) are not included in this standard.

2.2.7 Auxiliary framing shall be supported at intervals not to exceed 6 feet and shall not extend more than 30 inches beyond the last support. Refer to ATT-TP-76408 for more details.

2.2.8 Pipe stanchion floor flange shall be fastened to the floor with a minimum of two 1/4-20 flat head machine screws and associated floor anchors.

2.2.9 Auxiliary framing heights shall be measured from the floor to the bottom of the paired channels.

2.2.10 Auxiliary framing shall be installed in 20-foot lengths whenever possible. Auxiliary framing channels shall be run in pairs of equal length with flat side facing outward.

2.2.11 When through bolt splicing is utilized for auxiliary framing channels, six feet and longer in length, they shall be drilled or punched with splicing holes at both ends before the auxiliary framing is installed into overhead environments.

2.2.12 Holes in auxiliary framing for splice purposes may be enlarged or elongated if, after drilling or punching, the holes do not line up with the splice. When the holes have been enlarged or elongated, flat washers shall be installed on splice bolts. The separation between the ends of spliced auxiliary framing shall not exceed 1/4 inch.

2.2.13 When a square tube floor stanchion system is used, it shall be installed in accordance with instructions given in ATT-TP-76408.

2.2.14 Auxiliary framing splices shall not be made past the last hanger support.

2.2.15 Spliced lengths of auxiliary framing channels that are connected by use of a through bolt splice with a splice plate, as shown in ATT-TP-76408, Figure 3, High Seismic Risk Areas, would be considered a continuous run of auxiliary framing and can be installed and designed to requirements of a continuous run.

2.2.16 The end of the auxiliary framing shall extend at least 3 inches beyond the last point of support. If the distance from the end of the auxiliary framing to the last point of support (e.g.) hanger rod, brace or cable rack attachment, etc.,) is less than 3 inches, a 3/8”-16 or larger bolt shall be installed through the ends of the auxiliary framing.

2.3. **High Seismic Risk Zone Requirements**
2.3.1 Through bolt splices shall be made by use of a splice plate as shown in ATT-TP-76408, Fig 3, High Seismic Risk Areas.

2.3.2 Stiffening clips shall be installed throughout auxiliary framing arrangements no more than 2-foot apart between support rod locations and at the ends of framing runs extending 3-inches or more beyond their last point of support. Stiffening clips may be omitted at locations where an earthquake brace, cable rack, or other clipped fastening, of 1/2 inch or larger, has been located.

2.3.3 Cable racks supported directly by auxiliary framing shall be attached with two J-bolts at each support.

2.3.4 Auxiliary framing supported conduit shall not be extended to wall-mounted switches, lights, outlets, etc. Approved flexible conduit, i.e. LFMC, shall be utilized for this application. For additional criteria see ATT-TP-76300 Section M.

2.4. **Cable Racks**

2.4.1 Where cable racks are directly attached to auxiliary framing, both stringers shall be bolted to the framing at each end of a run:

   a) At intermediate points, only one J-bolt shall be required at each auxiliary framing intersection.

   b) The J-bolts shall be staggered so that adjacent fastenings along the rack can be made on opposite sides of the rack.

   c) When short pairs of auxiliary framing are used to support cable rack extending beyond regular framing, or are used for the support of a frame, two J-bolts shall be used.

2.4.2 Space between ends of cable rack stringer shall not exceed 5/8 inch at splices.

2.4.3 Except for transitions between levels, only one cable rack splice is permitted between any pair of supports and spliced sections are not permitted to extend beyond the last support.

2.4.4 Cable rack should be supported at 5 foot intervals and shall not exceed 6 feet.

2.4.5 Cable rack shall not extend more than 30 inches beyond the last support.

2.4.6 There shall be a minimum 5 inch clearance between cable rack ends (does not include side surfaces) and any building structural member or surface (e.g., columns, walls, beams). This does not include ends of cable racking that are secured or mounted to a wall, column, etc. for support. Only cable rack ends that would result in “chiseling” of the building structure during a seismic or other event. Building systems that are non-structural (e.g. HVAC ducting) are not included in this standard.

2.4.7 Formed fiber tubing shall be placed on all hanger rods directly supporting cable rack from above. The tubes shall be long enough to adequately protect the cabling to the ultimate height of the cable build up.

2.4.8 Cable rack horn and pan shall be installed using the following guidelines:

   a) All junctions shall be overlapped a minimum of 3 inches. The bottom section of “pan” shall not extend more than three inches past the common cross member.
b) Pans shall not extend past the end of the cable rack stringer or closing detail.

c) An overlapping arrangement of pans shall be utilized to avoid cutting of pans. The ends of pans that must be cut in the field shall not have burs or sharp edges. Metallic pan, when used, shall be equipped with edge protection. Both metallic and nonmetallic pan cut in the field shall have a 1/4” radius at their corners (refer to Part 8 and Fig. 22 of ATT-TP-76409).

d) Cable retaining horns on “panned” cable rack shall be installed on both sides of the cable rack on 24-inch centers, except at cable rack intersections where they shall be omitted/removed.

e) Pans on inclined cable racks are not permitted.

f) Installed cable rack horns that are not a straight formed wire design shall not be reused.

g) Horns installed on runs of cable rack shall have a common design, except that, straight formed wire horns may be used when extending existing racks that are equipped with a different horn design

h) Horns shall not be mounted on vertically oriented cable rack below the 7-foot height level.

i) Non-metallic cable pans shall be manufactured of a fire resistant material conforming to UL standard 94 v-0 or v-1 rating.

j) Nonmetallic pan shall be secured at its end points to a cable rack rung if the pan can curl or sag due to lack of applied cable weight. This can be accomplished via use of securing lacing cord. The Installation Supplier is to create a small hole at the end of the pan near the cable rack rung so that the lacing cord may pass through said pan. The pan securing lacing cord and its associated hole are to be created/installed using a method that does not negatively impact the functionality of the pan, the associated cabling, or personnel.

2.4.9 Cable rack shall not be extended through a building structural floor. A raised floor system is not considered to be a “floor”.

2.4.10 Distance between cable rack straps shall not exceed 9 inches. Additional support shall be provided as necessary to keep the cable from sagging.

2.4.11 The ends of cable rack sections shall be protected with rubber finishing caps or closing details.

2.4.12 Cable racks shall not be supported by their cross straps.

2.4.13 Vertical racks on walls or columns shall be supported at the floor and shall have intermediate support with a maximum spacing not to exceed 5 feet.

2.4.14 Cable racks placed on floors shall be fastened with Z-clips on the inside of the rack stringers, at intervals not to exceed 5 feet.

2.4.15 For horizontal cable runs, the cable rack shall be placed with the cross-straps upward. A cable rack with solid bar-type stringers, smaller than 25 inches in width, may be inverted to gain necessary cabling heights due to fixed obstructions. Cable rack with reinforced straps shall not be inverted.

2.4.16 The flat bar of a cable rack turn assembly shall be secured to the cable rack.

2.4.17 Cable rack used for switchboard, fiber optic, and power cable runs shall be constructed of solid rectangular stringers.
2.4.18 Cable rack height shall be the measurement between the top of the cable rack side bar down to the finished floor.

2.5. Frames, Bays, Battery Stands and Equipment Cabinets

2.5.1 All frames taller than 7'-0" shall be top supported by attachment to the office superstructure. Top supports shall be provided along equipment lineups at each location where a primary run of office superstructure crosses the equipment lineup. A minimum of two top supports is required for each group of frames that do not span two runs of primary office superstructure. A frame group, or group of frames is defined as any number of individual frames that are rigidly bolted or otherwise junctioned together to form a structurally continuous unit of frames.

2.5.2 Frames 9'-0" and taller use a one-inch galvanized pipe to supplement adjacent frame junctioning requirements and for alignment and grounding purposes. One-inch pipes shall be clamped to the underside of each frame's top angle at two locations. The V bolts shall be located to the left and right of frame center a minimum 12 inches apart. Any attachments to overhead framing shall be in addition to the pipe supports. One-inch galvanized pipes will be furnished in 20-foot lengths whenever possible. Extra length not used for current fastening of frames shall be left for future frames. A minimum of 15 inches of pipe shall always extend beyond the last frame installed for future growth unless that last frame is at the end of the lineup. The unused length of pipe shall be fastened to the auxiliary framing with frame support hardware above future frames. Where the pipe extends beyond the end of an existing or planned group of frames, it shall be fastened to the auxiliary framing with U bolts. The junction of the pipes shall be bonded in accordance with Section H of ATT-TP-76300.

2.5.3 When the 1 inch galvanized junction pipe extends beyond the end of the frame a rubber finishing cap is required when:

   a) The end of the pipe can be considered a hazard to personnel.
   b) The end of the pipe could cause a service outage.

2.5.4 A frame taller than 7'-0" installed as an individual frame, i.e. not junctioned to any adjacent frames, or installed with spacers on both sides, shall have at least two points of support to the overhead superstructure.

2.5.5 AT&T policy is for deployment of all new equipment located within Legacy Carrier Grade Technical space to be in high seismic frames or cabinets, seven feet tall, and secured per ATT-812-000-713. Frames or cabinets shall be secured on raised floor applications per ATT-TP-76402. All frames in a common lineup are to be junctioned to each adjacent frame.

2.5.6 7 foot frames, bays or cabinets shall not be mechanically connected to any suspended grid system. This includes ceiling suspended and stanchion suspended system. This does not include stubbed up systems supported from the tops of bays or stanchions.

   a) In lineups where 7'-0" or 9'-0" frames are the primary or only support for overhead cable rack, the equipment frame shall be secured to building floor with four anchors and junction to adjacent frames in accordance to paragraph 2.5.1. Cable rack shall not be considered a top support and cannot be relied upon to provide structural support of equipment frames.
2.5.7 Refer to ATT-812-000-713 AT&T Network Equipment Anchoring Requirements for standard anchoring requirements and alternative anchoring solutions due to site conditions and obstructions.

2.5.8 Unequal flange and network bay equipment frames taller than 7'-0" are secured by bracing to overhead auxiliary framing and floor anchored. Two floor anchors shall be placed as close as possible along centerline of uprights.

2.5.9 The uprights of adjacent frames and cabinets shall be joined together per manufacturer's specifications to form a continuous lineup.
   a) Adjacent frames shall to be joined together at the top and bottom.
   b) Adjacent cabinets shall be joined together at the top using through bolts or junctioning plates.

2.5.10 All frames, bays and cabinets to be installed shall be measured from reference points as identified on the floor plan.

2.5.11 Frames and cabinets shall be plumb and aligned to adjacent frames and cabinets to within 1/4 inch.

2.5.12 Frames and cabinets shall be level within 1/16 inch per foot. If shims are required, there shall be no more than a 1-inch shim stack.

2.5.13 If more than 50 holes in the floor are to be drilled for the job, the Installation Supplier shall scan for embedded metallic obstructions before drilling.

2.5.14 If an embedded obstruction (e.g., reinforcing bar) is encountered during floor drilling, drill another hole at an alternate location. For more details refer to ATT-812-000-713.

2.5.15 Frames, bays, cabinets, etc. shall be bolted to the floor using approved floor anchors as specified within ATT-812-000-713.

2.5.16 All end of lineup equipment frames 7 feet in height or taller shall have a minimum 7 foot in height end guard installed.

2.5.17 End guards shall be installed as per manufactures guidelines.

2.5.18 End panels or end shields located within an equipment lineup:
   a) An end guard shall be installed on all frame uprights that are not junctioned to another adjacent frame when personnel/cable protection, equipment bay stability, AC service conduit, etc. is a requirement.
   b) An end shield may be installed on all frame uprights that are not junctioned to another adjacent frame when personnel/cable protection is the only requirement.
   c) An end guard / end shield is not a requirement for frame uprights that are not junctioned to another adjacent frame when the separation between the equipment frames is less than 12 inches in width and there is no need for personnel/cable protection, equipment bay stability, AC service conduit, etc.
2.5.19 End guards, end panels or end shields that do not match the same depth or overall foot print of the adjacent bay framework shall require a transition device (guard rail closing detail) in equipment lineups with track type rolling ladders. This transition device shall be required either on the front, rear or both sides of the end guard, end panel or end shield, whichever is appropriate.

2.5.20 In equipment lineups with track type rolling ladders a transition device shall be used when the depths of the frames are different.

2.5.21 End panels and end shields shall be a minimum of 7 feet in height.

2.5.22 An equipment frame spacer and associated guard base filler are to be used when spacers are required between adjacent equipment frames. The alignment and design (UEF, Network, etc.) of the guard base filler is to match that of its adjacent equipment frame(s) and be a minimum of 7 feet in height. All spacers and base fillers are to be installed as per manufactures guidelines.

2.5.23 Hinged doors or covers of cabinets shall not bind with adjacent covers or doors to such an extent that any cover or door cannot be readily opened without causing the adjacent cover or door to move. In addition, hinged doors shall not come in contact with any working equipment.

2.5.24 Where equipment frames / cabinets shall not be side junctioned, a space of 5 inches minimum shall be provided between the frames / cabinets. Frames / cabinets placed near building walls, columns or other structural members shall have a 5 inch minimum space between the frame / cabinet and the building member.

2.5.25 An equipment frame(s) or cabinet(s) is to be anchored to the floor when hot slid to a temporary location so that its service and/or equipment can be transitioned.

2.5.26 All equipment shelves mounted in frames, cabinets, or bays shall have a minimum of four screws used to secure the unit to the frame/cabinet/bay upright for shelves up to 50 pounds. A minimum of two additional screws for each 100 pounds or fraction thereof above the first 50 pounds shall be installed beyond the four screws. Exception: Single mounting space plate units may be mounted with two screws.

2.5.27 Battery stands shall be secured with Hilti 16mm HSL anchors for high seismic risk locations or Hilti HDI ½ anchors for low seismic risk locations in accordance to quantities specified by the equipment manufacturer. Hilti 12mm HSL anchors in high seismic risk locations may be necessary under special circumstances with approval of Seismic Protection Engineer. For more information, refer to Section M of ATT-TP-76300.

2.5.28 BDFBs, DC power distribution bays, rectifiers, and other network power equipment bays shall be anchored with a minimum of 4 Hilti 12mm HSL size anchor.

2.5.29 Distributing frame blocks shall be installed with 4 mounting bolts when the holes on the distributing frame are available

2.5.30 Equipment frames, BDFB’s and any other network equipment frames installed on a raised access floor system shall be secured in accordance with ATT-TP-76402.
2.5.31 An equipment frame spacer guard box shall be bolted to its adjoining equipment frames or end guard and not anchored to the office floor. Guard box units that are not designed to secure to adjoining equipment frames shall be secured to the building floor with similar floor anchor hardware as used for equipment frame installation.

2.6. Rolling Ladders And Tracks

2.6.1 Hanger rods or bolts used for direct support of ladder track shall be provided with cotter pins or self-locking nuts. Otherwise, the ends of conventional bolts shall be staked.

2.6.2 Ladder track shall be supported at approximately 5 feet intervals and not to exceed 6 feet.

2.6.3 Ladder track shall not exceed a maximum of 4 feet beyond the last track support.

2.6.4 The ladder stop bolt shall be installed a maximum of 3 feet beyond the last track support.

2.6.5 Ladder track supports, splices and handrails shall be free of burrs and sharp edges.

2.6.6 Handrails shall be located or relocated as follows:
   a) When ladder serves distributing frame and other frames - locate to the side away from the frame.
   b) When ladder serves frames on right side only - relocate to the left side.
   c) When ladder serves frames on both sides - leave on the right side.

2.6.7 Rolling ladder shall have correct slant/direction with respect to the equipment lineup. Ladders will typically slant in a direction such that the foot is nearest the main cross aisle.

2.6.8 When a short section of track is required, the section shall be placed at some intermediate location in the track instead of at the end.

2.6.9 The track shall be assembled and aligned to ensure the proper operation of the ladder trolley and brake.

2.6.10 Sections of track shall be spliced as shown in Figure I-1. Figures I-2 through I-5 show additional ladder track details.

2.6.11 Ladder track shall be installed as level as possible.

2.6.12 Ladder stop bolt and bushings shall be installed on all ladder track ends and shall be equipped with a cotter pin or lock nut.

2.6.13 Ladder stop bolts shall be placed or relocated to ensure accessibility of equipment from rolling ladder.

2.6.14 Ladder stop bolts shall be placed or relocated so as to prevent the ladder from hitting anything (e.g., walls, water coolers, alarm panels, etc.).

2.6.15 Non-creep bolts shall be installed, burred and staked on all ladder track ends. If the track is extended, install a new bolt.
2.6.16 Ladder track splice screws shall be equipped with washer, burred and staked or secured with self-locking nut.

2.6.17 Fenders and wheel guards shall be provided on all ladders where they come into contact with the guardrail.

2.6.18 Brake shall be adjusted so that it operates properly.

2.6.19 Brake ropes shall be trimmed and clamped to remove risk of personal injury.

2.6.20 Ladders shall run free and clear of equipment.

2.6.21 Ladder tracks ends shall be equipped with rubber plugs.

2.6.22 A minimum clearance of 15 inches shall be maintained between the end of ladder track and walls, columns, etc., on the end toward which the ladder(s) slope, to facilitate installation and removal of the ladder trolley.

2.6.23 The gap between spliced ends of ladder track shall not exceed 1/8 inch.

2.6.24 Ladder track splicing sleeves shall be assembled with lock washers and locknuts.

2.7. Threaded Rods, Bolts, Nuts, Screws And Cotter Pins

2.7.1 Bolts, nuts and screws used to secure parts or units shall be tight.

2.7.2 The appropriate size bolt or rod shall be utilized.

2.7.3 The Installation Supplier shall cut the end of a bolt or rod that extends into the equipment or wiring area, or presents a personnel hazard.

2.7.4 The exposed end of the bolt or rod shall not exceed the diameter of the bolt or rod, except where personnel safety or equipment protection will not be compromised.

2.7.5 Bolts, screws or rods shall not be more than one thread under flush.

2.7.6 Both ends of bolts, screws or threaded rods shall be free of sharp edges and burrs.

2.7.7 The tips of all cotter pins shall be bent back until resting against the rod or bolt to prevent injury.

2.7.8 Self-locking nuts that have been loosened or removed shall not be reused.

2.7.9 Split nuts shall not be used in any auxiliary framing or cable cable rack support applications.

2.7.10 Any threaded rods that are cut shall have cut end(s) covered with grey enamel paint so there would be no bare steel surface exposed.

2.8. Unistrut Incorporated Within Auxiliary Framing

2.8.1 Where strut is placed below the regular framing or extends more than three inches beyond a clip or support and could cause harm to personnel and/or service, the strut shall be equipped with a finishing detail.

2.8.2 There shall be a minimum 5-inch clearance between the ends of strut and any building structural obstruction.
2.8.3 Strut sections shall have at least 2 supports unless otherwise specified. The supports shall be at intervals not to exceed 6 feet and shall not extend more than 30 inches beyond the last support.

2.9. **Ceiling Hanger Rods**

2.9.1 Hanger rods shall be inserted into ceiling inserts seven full turns.

2.9.2 If ceiling inserts are rusty or filled with concrete, the inserts shall be cleaned out with a 5/8"-11 tap.

2.9.3 A 5/8"-11 hex nut and a 1-3/4 inch outside diameter washer shall be used at the ceiling on all hanger rods and bolts, regardless of ceiling construction.

2.9.4 When hanger rods are installed through ventilating ducts additional 1-3/4 inch washers and 5/8"-11 hex nuts shall be installed at the bottom of the duct. Add sealing compound to seal any air leakage.

2.9.5 Under no circumstances shall more than one splice be installed on a hanger rod. In no case shall threaded rods used for the support of mezzanine platforms be spliced.

2.9.6 Ceiling hanger rods shall be installed vertically plumb to within 2 inches over 5 feet run (2 degrees). Hanger rods shall be installed in a single piece to full length whenever possible. Where splice is necessary only one splice is permitted in a hanger run.

2.9.7 Hanger rods anchored to surface mounted or embedded strut channels shall be secured to inside channel strut nut threaded at minimum to 7 full turns and hanger rod locked in place with an additional nut and washer on outside of strut channel.
FIGURE I-1--SPlicing Sleeves for Ladder Track

splice sleeve

.255" x .493" x .062 lockwasher & self locking nut

P" 1" 2" 2" P" 1"

Track

Butt ends of track together where possible, but in no case shall ends of track be more than 1/8" apart

1/4"-20 x 3/4" R H M SCR
FIGURE I-2--TRACK SUPPORT BRACKETS

--- View A ---
- 1/4-20 x 3/4 RHM SCR
- 255 x .493 x .062 LOCK WASHER
- HANGER BRACKET

--- View B ---
- 1/4-20 x 3/4 RHM SCR
- 255 x .493 x .062 LOCK WASHER
- HANGER BRACKET

--- View C ---
- 1/4-20 x 7/8 RHM SCR
- 255 x .493 x .062 LOCK WASHER
- HANGER BRACKET
- SHIM
- LADDER TRACK

--- View D ---
- 1/4-20 x 3/4 RHM SCR
- 255 x .493 x .062 LOCK WASHER
- HANGER BRACKET
- TRACK

--- View E ---
- LADDER TRACK SUPPORT PER FIGURE 16-10, 13-17, 24, 25
- CUT AWAY TO SHOWN BOLT CLEARANCE
- 5/16 IN. HOLE TO BE DRILLED ON & OF HANGER BRACKET AND TRACK BY INSTALLER
- TRACK
- HANGER BRACKET
- 1/4-20 x 7/8 RHM SCR
- SELF LOCKING NUT AND .493 x .062 LOCK WASHER

--- Notes ---
- TRACK SUPPORT BRACKETS
- INSTALLATION REQUIREMENTS
- AT&T-TP-76300
- Section I, AT&T-TP-76300

--- Section Information ---
- AT&T | March 2016
- Revised November, 2018

--- Additional Notes ---
- RELOCATION OF CREEPER BOLT WHERE INTERFERENCE FROM END OF THREADED ROD PREVENTS IT BEING INSTALLED IN REGULAR HOLE PROVIDED IN BRACKET (SHEET STEEL BRACKET SHOWN)
FIGURE I-3--LADDER STOP AT SUPPORT BRACKET

SIDE OF SUPPORT SHALL NOT EXTEND BEYOND END OF TRACK

SOFT RUBBER BUSHING 1 1/4 OD

BRACKET

3/32 X 3/4 COTTER PIN

3/8-16 X 2 3/4 HMM BOLT

3/8-16 HEX NUT

SECT A-A
FIGURE I-4--TRACK SUPPORTED WITH SINGLE BAR DIRECTLY FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE
FIGURE I-5--TRACK SUPPORTED FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING - SLOPING TRACK - 2 INCH DIFFERENCE IN AUXILIARY FRAMING LEVEL
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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section provides general and workmanship requirements pertaining to cable installation.

1.1.4 Changes in this issue of Section J are summarized in Table J-1.

1.1.5 Refer to the respective sections of ATT-TP-76300 for additional requirements for fire and smoke stoppage (Section F), power cable (Section M), CO grounding cable (Section H) and fiber optic cable (Section O).

1.2. General Requirements

1.2.1 Standing on or applying excessive stress/pressure to cable on racks or equipment is not acceptable when installing, removing or securing cable and wire. Walking on top of installed cables shall be avoided.

1.2.2 Only tinned copper cable shall be installed in the Carrier Communications Space. Untinned wire is not approved for use in the central office except for TIA / EIA 568B Categorized cable and RS232 cables.

1.3. General Cable Routing
1.3.1 No deviations shall be made from the job cable running list without the approval of the AT&T Equipment Engineer.

1.3.2 Storing excess cable on or in cable racks, compartments or ducts shall be avoided, except for the following reasons:
   a) When the excess cable is five feet or less.
   b) When the excess cable is required for proper equipment operation the excess cable shall be distributed on or in cable racks, compartments or ducts so the pile-up is not concentrated at a single location.
   c) When the excess cable is associated with equipment located in temporary locations and the excess cable will be used when the equipment is moved to its ultimate location, the excess cable shall be coiled banded, identified and secured to the cable rack above the equipment frame. This type of stored cable shall be repositioned on subsequent cabling operations to avoid burial.
   d) When cable is equipped with apparatus that cannot be disconnected and reterminated in the field.
   e) When storing all cable designated “Future” on the cable rack. Provide adequate length for ultimate termination.

1.3.3 On factory connectorized cable runs of less than 300ft, allowable slack shall be no more than 10% of the overall length of the run or rounded up to the next 10ft increment. Factory connectorized cable runs greater than 300ft, allowable slack shall be no more than 30ft.

1.3.4 For formed or connectorized cable, the Installation Supplier shall install the connectorized or formed end of the cable first; then trim excess cable to the measured length for the route of the installed cable.

1.3.5 For bulk cable, the Installation Supplier shall install the cable and cut off the excess to the proper length.

1.3.6 Excess cable associated with installation of equipment in a temporary location (such as in preparation for a hot slide) shall be stored or removed as directed by the Implementation Engineer.

1.3.7 Cable slack shall not be stored on or near cable racks over distributing frames or DSX frames.

1.3.8 Cable shall be dressed away from sharp corners or edges and/or heat producing devices, and shall not interfere with the addition of future equipment.

1.3.9 Switchboard and power cables installed on vertical cable racks shall be limited so that the cable is not closer than 3 inches from the side of the cable hole.

1.3.10 The Installation Supplier shall support cable at cable rack breakoffs such that the maximum length of unsupported cable does not exceed 3 feet, except as follows:
a) Where cable to a distributing frame passes through a floor opening immediately under the frame, an unsupported length of not more than 4 feet measured along the shortest cable is permissible.

b) Vertical cables in floor openings do not require support within the opening.

c) Cable dropping off cable rack above distributing frames may be unsupported for a maximum length of 4 feet.

1.3.11 Cables shall not run over building obstacles (such as water pipes, conduit, air ducts, etc.).

1.3.12 Existing non-standard transitions created under legacy company's policies may be used until the feeding and receiving cable paths reach their designed fill capacities.

1.3.13 Cables routed using cable rack or basket tray shall enter/exit the routing system via its side (stringer or side wall) and not pass through its base (between rungs or wire mesh).

Exception:

a) The remote patch panel end of a fiber trunk cable routed within an AIC Structured Cable Management system is allowed to pass through the cable rack. Refer to ATT-C-60000-E-09 for detail.

b) Routing of power cables as stated in ATT-TP-76300, Section M, Paragraph 1.5.

1.4. **Cable Diversity Requirements**

1.4.1 When diversity is required, cable shall be routed as per customer or service requirements demand.

1.4.2 Diverse leads run vertically within a bay/cabinet shall be run down opposite sides of the bay/cabinet.

- a) When the manufacture designed the equipment to terminate diverse power leads on the same side of the shelf, the Installer Supplier may run diverse power leads on the same side of the bay/cabinet.

1.4.3 Diverse leads, to the same network element, shall not cross at any point if physically possible.

1.5. **Temporary Installations**

1.5.1 All temporary cabling and wiring shall be supported as required so as to not jeopardize service or personnel.

1.5.2 Cabling shall not be suspended by lacing cord or nylon cable ties at any locations.

1.5.3 All temporary fiber optic cables shall be run using temporary raceways (spiral wrap, split harness protective sheathing, etc.; will be acceptable for this application). Cables shall not be run over auxiliary bars, ladder tracks, light fixtures, threaded rods, etc.

2. **CABLING REQUIREMENTS**
2.1. **Common Items**

2.1.1 Cable shall be formed and dressed so as not to allow cables to protrude out past the footprint of the bay.

2.1.2 Installed cables, hanging unterminated in equipment areas, shall be neatly coiled above the floor level and have their exposed ends insulated.

2.1.3 Cable and wire shall be installed neatly within the stringers of the cable rack.

2.1.4 P-wire and switchboard cable shall not be installed on dedicated power cable racks unless directly associated with power circuits.

2.1.5 The Installation Supplier shall remove all cable tags before job completion, except tags designated “future” or tags left as directed by the AT&T Equipment Engineer.

2.1.6 Fiber jumper/patch cord type cable shall not be installed on cable rack; wire basket tray or a Fiber Protection System shall be used (interbay cable routing).

2.1.7 Cable entering equipment frames shall enter the framework in a manner that will not block access of future cable.

2.1.8 Cables within an equipment unit (i.e.; switch, etc.) shall meet the manufacturer’s requirements.

2.1.9 Shop cabling requirements within the “foot print of the equipment” shall be as defined by the manufacturer. If these requirements conflict with the requirements given in ATT-TP-76300, the manufacturer’s requirements shall apply.

2.1.10 Transitional devices installed on grounding and power cables shall be placed between cable rack straps, and shall not be adjacent to each other, but staggered, so the transition device shall not rest against metal or another transition device. The portion of the heat shrink that covers the cable insulation may overlap with the portion of the heat shrink that covers the cable insulation of an adjacent cable. Each layer of power cables shall alternate the set of cable rack straps where the transition devices are placed, so that one layer of transition devices are not resting directly upon the lower layer. See Figure J-8.

2.1.11 Cables shall not be installed on blocked cable racks or runs.

2.1.12 All cable butt connections on coaxial and switchboard type cable shall be taped or have heat shrink placed around the butt. The tape and heat shrink shall be placed a minimum of 1 inch above and below the butt.

2.2. **Cable Protection**

2.2.1 When installing cable (power, signal, grounding, etc.), the Installation Supplier shall provide adequate protection to prevent:

   a) damage to new and existing cable and equipment
   b) harm to personnel
   c) electrical damage/short
2.2.2 When cable and wire come in contact with sharp metal edges, the Installation Supplier shall use formed fiber or two layers of sheet fiber to protect against damage at the point of contact.

2.2.3 The Installation Supplier shall protect all cable at break-offs when attached directly to the cable rack stringers with formed fiber or two layers of sheet fiber.

2.2.4 Cable rack straps shall be protected with formed fiber or two layers of sheet fiber where power cables drop through a cable rack. See AT&T-TP-76300 Section M for cases where power cables may pass through a cable rack.

2.2.5 When rubber, neoprene and other non-textile jacketed power cable are secured, 2 wraps of insulating fiber protection shall be applied to the cable sheath at each secured or banded location. This requirement does not apply to power wire or cable within a bay.

2.2.6 Fiber protection shall be placed on the cable rack cross straps at outside bends or offsets in cable racks.

2.2.7 Cable shall be protected with fiber at points of contact with the flange side of cable rack cross straps. This condition may be encountered where inverted cable racks are used, or where cable must be placed on the flange side of cable racks.

2.2.8 Individual 735C type coaxial cables (see Table J-4 or J-5) shall be protected where they are to be secured or banded if 9-ply cord is to be used. This protection shall be accomplished by the use of two layers of sheet fiber or one layer of outer sheathing from multiple coaxial cables (i.e., six-pack or twelve-pack). Coaxial cables within a multiple cable package (i.e., six-pack or twelve-pack) and individual 734C type cables do not require this additional protection, since the outer sheathing of the package provides sufficient protection.

2.2.9 Under no circumstances shall the securing stitch, strap or cable tie be pulled so tightly as to deform the cable sheathing.

2.3. Damaged Cables

2.3.1 Damaged cable sheathing shall be repaired with electrical tape. The tape shall be applied in two half lapped layers with the final two wraps applied without tension and over lapping. The tape shall extend a minimum of 2 inches past the damaged section in both directions.

2.3.2 Seriously damaged sections of cable sheathing shall be repaired by removing the damaged section and replacing it with the covering from a similar cable. Apply a single half lapped layer of electrical tape over the new section to secure it in place.

2.3.3 Damaged power cable sheathing shall be repaired by wrapping with a minimum of two half lapped layers of rubber tape then two half lapped layers of electrical tape. The rubber and electrical tape shall extend a minimum of 2 inches past the damaged section in both directions.
2.3.4 A run of cable shall be replaced if the number of damaged or spliced conductors exceeds 5% of total conductors.

2.3.5 TIA / EIA 568B Categorized cable with damaged sheathing shall be replaced.

2.4. **Securing Cable and Bundling**

2.4.1 Method for securing cable is to use 9 ply polyester twine. Securing of cable has a structural member providing support passing through the loop of the securing device.

2.4.2 Methods of bundling cable include the use of 9 ply polyester twine or hook and loop tape. Bundling of cables does not have a structural member providing support passing through the loop of the bundling device.

2.4.3 Hook and loop tape (e.g. Velcro™ tie wrap)

   a) May be used to bundle all braided coaxial cable types, Power Distribution Unit AC service cables, and fiber trunk/jumper/patch cord type cables.

   b) Shall not be used to secure interbay DC power, switchboard, or fiber cables.

   Exception: Hook and loop tape maybe used for securing of fiber cables upon entry into a cable management glide or spacer.

   c) Only AT&T approved hook and loop tape shall be used. The tape shall meet a minimum of UL-94 V-2 fire rating and have a minimum width of ½ inches.

   d) Hook and loop tape overlap shall be the greater of an inch or half of the bundled diameter.

2.4.4 When shielded cables are bundled, bundling shall facilitate cable management and cable identification and shall meet all cable installation requirements, including minimum cable bend radius. Cable bundles shall not be greater than 1 ½” diameter or 4 ¾” circumferences, bend radius, support, identification, and management.

2.4.5 Cables and wires on horizontal cable racks shall be secured at the first and last strap, and at intervals not to exceed 3 feet. See Table J-4.

   a) Legacy non-standard stitching spacing and patterns may be continued for additions to established cable racks.

2.4.6 Chicago or Kansas City stitches shall be used when securing cable with 9 ply polyester twine. See Figures J-3 through J-6.

2.4.7 Cable installed on horizontal ladder type cable racks shall be secured at break-off.

2.4.8 On vertical and inverted horizontal cable racks, cables shall be secured at every strap. See Table J-5.

2.4.9 All cables shall be dressed to avoid congestion and to permit accessibility to equipment.

2.4.10 All cables and wires shall be secured at the first support of frame or bay.
2.4.11 All cables shall be secured at the butt location of the cable. If the butt is not within 1 inch of the cable bracket, it shall be banded to the existing cables in the form.

2.4.12 When the cable butt is located below the lowest cable bracket in an equipment frame or bay, the length between the butt and the last bracket shall be no more than 10 inches.

2.4.13 The cables shall be secured at all cable brackets provided with the manufacturer's equipment.

2.4.14 If cable is terminated at a point above the top bracket in the bay, the cable shall be banded to the other cables at the point of break off, at the top of the bay or an L-type securing bracket.

2.4.15 Cable and wire shall be banded halfway between the cable rack and top support on the frame or bay when distances exceed 3 feet.

2.4.16 On cable rack with horns and pans the cable and wire shall be sewn only at break-off.

2.4.17 P-wire on panned cable racks shall be banded every 5 to 6 feet to prevent curling or drooping, and at points where the wire changes direction.

2.4.18 Cables on ladder type cable racks having retaining brackets used to separate high and low level transmission leads in carrier systems, shall not be secured, except at turn-off points.

2.4.19 Excess 9-ply polyester twine shall be trimmed to a maximum length of 1/2 inch.

2.4.20 The Installation Supplier shall secure cables to the cable securing brackets, if provided, at the rear of the shelf as required for proper cable management. This is required for cables traversing across the back of the shelf.

2.4.21 The installation supplier shall secure cables as shown in Tables J-2 through J-5.

2.4.22 Cable runs on vertical cable rack shall have cables secured at each cross strap. Cable clamps may be used as supplemental support when required. Cable clamps shall be provided when vertical cable racks of 15 inches and wider extend between more than two floors.

a) Where the runs are in exposed locations, one set of clamps shall be installed per floor. The clamps shall be located near the ceiling and the cable shall be secured at each alternate cable strap.

b) Where the runs are located in shafts or other enclosures, two sets of clamps shall be installed per floor, one just above the cable hole sheathing and the other about half the distance to the ceiling. The upper clamp shall not be less than 7 feet from the floor. Cables shall be secured in an orderly manner immediately above each clamp.

c) Clamps are not required if vertical cable runs are secured by sewing with twine at every cable rack cross strap.
2.4.23 Inverted horizontal cable racks shall be equipped with supplemental cable support. These supplemental supports shall clamp the cables firmly but not so tight as to distort the cables. The supports shall be placed along the run at approximately 10-foot intervals for runs that can ultimately contain less than 100 square inches of cable and at approximately 6-foot intervals for larger runs of cables.

2.5. Coaxial Cables

2.5.1 Coax cables on panned cable racks with cable horns are not required to be secured to cable rack cross straps. Bundling of cables may be necessary and cables can be grouped on cable racks.

2.5.2 Coaxial cable runs in cabinets shall be secured.

2.5.3 Coaxial cables in supported vertical runs shall be secured as per Table J-5.

2.5.4 Coaxial cables in unsupported vertical runs shall be bundled a minimum of every 9 inches.

2.5.5 Coaxial cable shall not be unsupported for greater than 30 vertical inches except when installed in conduit.

2.5.6 Coaxial cables are to be secured and protected with sheet fiber where they waterfall off cable rack. They are to be formed in a loop fashion to adhere to the required bend radius.

2.5.7 Coaxial cables on unpanned cable racks without horns shall be secured to cross straps as per Tables J-4 & J-5.

2.5.8 Adjacent cable bundles may be fastened together.

2.5.9 Coaxial cables (i.e.; 500, 625, etc) mounted on antenna masts, towers or other vertical structures shall be secured using a Valmont type cushion hanger and appropriate standoff hardware. Cushion sleeve shall be provided with holes sized to outside diameter of cable where all cables will not be overly tight or possess any play between cushion and cable.

2.5.10 Coaxial cables (i.e.; RG6, RG11, etc.) mounted on antenna masts, towers or other vertical structures shall be secured using a coated stainless steel strap and cushion sleeve. The supplier shall install the maximum width strap available. Coaxial cables shall first be bundled using the coated stainless steel strap and cushion sleeve, then the bundle shall be secured to the vertical structure using the coated stainless steel and cushion sleeve. When securing the bundle to the structure, the securing strap shall be 1 inch above or below the bundle strap.

2.5.11 The installation supplier shall use the manufacturer’s recommended installation tools for the installation of the coated stainless steel straps. The installation supplier shall not exceed the manufacturer’s recommended tensioning specification nor shall the installation supplier deform the outer sheath of the cable(s). Hardware securing straps affixed to the tower shall not require drilling, cutting or cause deformation of structural members of the tower.
2.5.12 Cable management systems the transition coaxial cables from antenna masts, towers or other vertical structures to their entry point within the site shall be provided with a rigid weather-resistant, wind-resistant cover for protection of cables from weather and falling debris.

2.6. AC Power Cords in Equipment

2.6.1 All power cords in cabinets shall be bundled for management purposes.

2.7. Distributing Frame Distributing Frame

2.7.1 On distributing frames (vertical side) having transverse arms on 13-inch vertical centers, cable shall be secured at all transverse arms.

2.7.2 On distributing frames (vertical side) having transverse arms on less than 13-inch vertical centers, cable shall be secured at the first (top or bottom) transverse arm where cable enters the frame and at alternate arms, counting from the first arm. Also secure the cables which butt or turn-off at the arm before the butt or turn-off.

2.7.3 On distributing frames (vertical side) the cable shall be butted 1/2 inch below the transverse arm and place the cable butt in the fanning ring. If fanning rings are not used, secure the cable butt. The cable sheath shall be left in place to within 2 inches of the connecting block. Where this is not practical, exposed wire from the cable shall be secured as appropriate to within 2 inches of connecting block and neatly dressed.

2.7.4 On distributing frames (horizontal side) cable and wire shall be secured at three places on the transverse arm: near the stiffening bar, at the center and near the butt location. On transverse arms 12 inches or less in length, cable shall be secured at two places.

2.7.5 On distributing frames (horizontal side) the cable shall be butted no more than 2 inches from the rear of the terminal strip. Cables that cannot be butted 2” or less from the terminal strip or serve multiple terminal strips shall have the wires neatly dressed and the cable butt secured.

2.7.6 Cables transitioning from the vertical to the horizontal side of the distributing frame shall break off at the transverse arm directly above the transverse arm the cable is to be terminated.

2.7.7 On distributing frames the cable shall be neatly dressed at the rear of the block or terminal strip. No cable shall protrude beyond the side of the block or terminal strip, (vertical side), nor below the block or terminal strip (horizontal side).

2.8. Formed Cable

2.8.1 Formed cable shall be secured at a level that affords access to the equipment.

2.8.2 Internal framework cable bundles shall be secured:

a) To the framework cable management no more than twelve inches from the entrance to the framework.
b) At intervals not to exceed twelve inches within the framework.

c) Formed and dressed to maintain proper cable support, management and bend radius.

2.9. Nylon Cable Ties

2.9.1 Nylon cable ties may be used for temporary securing during the job. Upon completion of installation without prior approval, nylon cable ties SHALL NOT be used for:

a) Securing cables to distributing frames
b) Banding or securing cable on cable racks
c) Banding together of cable installed in compartmentalized troughs/racks.
d) Banding or securing of coaxial cables
e) Banding or securing fiber optic jumpers
f) Securing cable to the top cable securing bracket on equipment frames
g) Securing battery and battery return cables at any location.

2.9.2 Nylon cable ties shall be of an adequate size, type, strength, etc. for the particular application.

2.9.3 Except where reusable nylon cable ties are provided by the manufacturer, tails of nylon cable ties shall be trimmed to within 1/32 of an inch.

2.9.4 The Installation Supplier shall use a tool specifically designed for tensioning and cutting of nylon cable ties. Side cutters or equivalent shall not be used.

2.9.5 Nylon cable ties shall be tensioned around cable or wire forms tightly enough to hold the cables or wire together and/or properly positioned, but not so tightly or at such angles so as to cause possible damage to the insulation of the cable or wire.

2.9.6 Nylon cable ties, banded around cables or wire, shall be capable of being rotated with slight to moderate pressure applied with the thumb to the head of the tie. If banded cables or wire, under and/or adjacent to the nylon cable tie, twist or deform when pressure is applied to the head of the tie, then the tie has been applied to tightly.

2.9.7 Under no circumstances shall nylon cable ties have sharp or jagged cut ends protruding from the locking head. A nylon cable tie is considered to have sharp or jagged ends when it is sharp to the touch.

2.9.8 The locking head of nylon cable ties shall be positioned so as not to interfere with the installation or removal of apparatus or equipment.

2.9.9 When cables/wire is added to a bundle secured with nylon cable ties, the existing tie shall be removed and the entire bundle secured with a new tie, 9-ply polyester twine or Hook and Loop straps. This requirement does not apply to firestopping banding requirements (see Section F).
2.9.10 Where cable or wire forms are secured to cable securing brackets, the locking head of nylon cable ties shall be positioned on the side of the bracket opposite the side on which the cables or wire are installed.

2.9.11 Adhesive-backed tie wrap bases that rely only on the adhesive backing to attach to walls, columns, equipment, auxiliary framing, etc., shall not be used to secure cable or wire outside the confines of a frame.

2.10. **Bending Radius**

2.10.1 Cables shall not be sharply bent or twisted during a forming operation.

2.10.2 The minimum inside bending radius of switchboard, shielded and twin conductor cable is 5 times the cable diameter.

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

2.10.4 The minimum inside bending radius of bundled coax (735 type) cable is 10 times the bundle diameter.

2.10.5 The minimum inside bending radius of power wire and cable is 7 times the cable diameter.

2.10.6 The minimum inside bending radius of fiber optic cable, jumpers or patch cords is 1 inches.

2.10.7 The minimum inside bending radius of fiber optic trunk cable (OFNR) is 1 inch or 10 times the cable diameter, whatever is larger.

2.10.8 The minimum inside bending radius of Jacketed Metallic Clad (JMC) cable is five times the diameter of the cable measured on the inner side of the bend.

2.10.9 The minimum inside bending radius of 1505A, 1694A and 1855A non-bundled and bundled Video type coaxial cables is 10 times the cable/bundle diameter.

2.10.10 CO grounding system conductors shall be installed with a minimum radius of one foot. If the one foot radius objective can not be met, a smaller radius is acceptable based on the following conditions:

a) For the #2 AWG peripheral conductor at a radio site the minimum bend radius shall be 6 inches.

b) For all other conductors, the minimum bend radius shall not be less than 5 times the finished diameter of the cable. Table J-8 provides the minimum bending radius, rounded up to the nearest inch, for the most common grounding conductor sizes based on the approximate diameter for rubber-covered wire (type, RHH, RHW).

2.10.11 The Installation Supplier shall adhere to the NFPA 70 and NEC for the bend radius and insulation/covering types as pertains to AC power cords/cables.

3. **POWER CABLING**
3.1. General

3.1.1 Where possible, the Installation Supplier shall install all leads in continuous lengths from the power source to the equipment termination. Where the size of the power cable is too large for the termination connection, in-line reduction (barrel) splices shall be used to terminate the power cable.

3.1.2 Exposed ends of power cables, while being installed, or transitioned, shall be insulated with an electrical tape secured heat shrink cap or a heat shrink cap that has been heat shrunk onto the end of the cable(s).

3.1.3 For special synchronization power requirements, see Section T of ATT-TP-76300.

3.1.4 Power Plant battery voltage sense leads shall be cabled on auxiliary framing “J” hooks or “L” brackets or on a cable rack where auxiliary framing or cable racking is available; otherwise, metallic conduit may be used as an alternative to run voltage sense leads between the battery string and power plant. If the metallic conduit will be in close proximity to bus bar (less than 1 foot), up to 18” of PVC electrical conduit shall be used at either end of the metallic conduit as required to provide nonconductive clearance between the conduit and bus bar.

3.2. Sewing And Securing

3.2.1 Power cable leaving cable racks, supports, and entering frames, racks or other equipment shall be supported at least every 3 feet.

3.2.2 The Installation Supplier shall comply with Table J-2 and Table J-3 for sewing power cable to the cable racks. The requirements apply to uniform size leads.

3.2.3 DC Power cable shall be secured on unpanned cable rack:
   a) immediately before and after turns
   b) immediately before and after changes in elevation
   c) at every strap or flat bar at every turn

3.2.4 For vertical power cable runs, the Installation Supplier shall install one power cable clamp per floor where three or more floors are involved. No clamps are required when power cable runs are one or two floors.

3.2.5 The Installation Supplier shall insulate the cables from the clamping bar by using an angle type insulator or by wrapping the cables with two (2) wraps of insulating fiber at the clamp.

3.2.6 DC Power cable terminations shall be supported and/or secured in such a manner as to prevent stress on the connection.

3.2.7 Secondary power feeds that are installed on panned cable racking shall be banded every six feet.

3.2.8 Primary and secondary power cables shall be secured no more than 18 inches before and after a transition device (i.e., 3 feet maximum span).
3.3. **DC Power Cable Routing**

3.3.1 When connecting battery return cables to the return bus bar in BDFBs/SPDUs, Power Boards (PBDs etc.), the Installation Supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar.

3.3.2 When connecting to BDFD/SPDU fuse position studs, the Installation Supplier shall arrange cables in such a manner so as to not block access of future terminations.

3.3.3 Unfused battery and battery return leads shall be run on unpanned (ladder type) dedicated power cable racks. The rack shall be designated accordingly.

3.3.4 Unfused battery conductors between the batteries and power boards shall have properly sized redundant leads to allow routine battery maintenance.

3.3.5 Primary battery and battery return leads shall be run on unpanned (ladder-type) dedicated power cable rack.

3.3.6 Secondary power leads shall be run on dedicated secondary power cable racks (unpanned). On a new BDFB, the Transport OTV shall add the dedicated secondary cable rack (unpanned). If dedicated secondary power cable rack is not possible:

   a) Secondary power leads may be run on existing non-dedicated cable rack, which already contain transport cable. In these cases, secondary power cable shall be segregated from transport cable as best possible.

   b) Within 10 feet of an existing SPDU / BDFB that was not engineered with a dedicated secondary power cable rack, secondary power cable may be run on existing dedicated primary power cable rack. In these cases, secondary and primary power cables shall be segregated as best possible to permit future addition of primary power feeds.

3.3.7 Battery and battery return leads are a pair and shall be installed closely coupled except when being referenced to the Ground Window

3.3.8 The BDFB/SPDU battery conductor need not be paired with the battery return conductor for the portion of the run to and from the MGB if a significant amount of additional cable for the battery conductor is required to maintain pairing. See Figure J-2 (b) and (c). The return conductor shall be closely coupled (to itself) along the route to and from the point where it leaves the route of the battery conductor and the connection to the MGB. Where significant conductor length is not a factor, the battery and battery return conductors shall remain paired. See Figure J-2 (a).

   Note: When the battery return conductor is longer than the battery conductor, the size of the battery return conductor shall be adjusted, if necessary, to meet any voltage drop requirements.

3.3.9 The battery return conductors of a circuit serving common bonding network equipment may be connected directly to the Common Bond Network (CBN) side MGB as in Figure J-2 (b) or, to save space on the MGB, they may be bonded to the MGB with a conductor not exceeding 3 feet in length. This is shown in Figure J-2 (a) and (c).
Note-1: One bonding conductor may be serially connected, using crimp type parallel connectors (H-Tap), to more than one battery return conductor, provided the bonding conductor is no longer than 3 feet.

Note-2: The bonding conductor shall be the same size as the battery return conductor for sizes up to #1/0 AWG. Larger conductors may be bonded using a #1/0 AWG.

3.3.10 All new BDFBs / SPDUs shall have the return bus bar insulated from the framework.

3.4. AC Cable

3.4.1 See ATT-TP-76300 Section M for AC cabling requirements.

4. CABLE RACK LOADING

4.1. Blocked Cable Runs

4.1.1 When blocked cable runs in cable racks or cable penetrations are encountered, the Installation Supplier shall contact the detail engineer for instructions.

4.1.2 A cable hole shall not be filled beyond 75 percent of its capacity, and cables shall not be placed closer than 3 inches from edges. The Installation Supplier is to notify the Implementation Engineer when 75% of the cable hole capacity has been reached.

4.1.3 When a cable hole reaches capacity no more cable shall be run through the cable hole and the cable hole shall be marked to reflect blocked condition.

4.1.4 The Installation Supplier shall report a blocked cable hole to the AT&T Engineer and the AT&T Space Planner, fill out a JIM reporting the blocked condition and place a copy of the JIM in the Electronic Job Folder.

4.2. Cable Pileup

4.2.1 Installation Suppliers shall immediately notify the AT&T equipment engineer when 75 percent of the cable pileup capacity of a cable rack or a portion of a cable rack has been reached. Cable racks shall be CLOSED when 100 percent of the cable pileup capacity of a cable rack or a portion of a cable rack has been reached. See Tables J-6 & J-7.

4.2.2 Cable horns shall be sized to allow for 100 percent fill capacity of the cable rack as defined in Tables J-6 & J-7. Shorter cable horns shall only be used when physical obstructions or the racking plan design limits the maximum fill of the cable rack.

4.2.3 Cables run on panned racking equipped with cable horns shall not exceed the height of the cable horn or the requirements that are stated in Tables J-6 & J-7, whichever is less. Cable rack horn extensions shall not be installed. Cable horn extensions are devices such as pipes applied over existing cable horns to increase their length. New cable horn shall be added to the existing cable racks when possible to allow for the maximum fill as defined in Table J-7.
4.2.4 No new applications of Bar-type cable rack shall be installed in offices or reapplied in other parts of office. Existing Bar-type cable racks shall be used with cable pileups below height of side bar. At intersections of Bar-type cable racks, side bars extending through the intersection and in path of cables shall be cut off and remaining stub covered with firmly secured rubber cap or the bar may be bent out of way of cables.

5. GROUNDING CONDUCTORS

5.1 Grounding Conductors – DC Powered Systems

5.1.1 All grounding system conductors shall be routed on and secured to:
   a) A cable rack or cable bracket containing only grounding conductors
   b) The side or bottom of ironwork details or cable rack containing other cable types
   c) The surface of ceilings, columns, or permanent walls.

   Note-1: Grounding conductors may be placed on the same cable brackets used to support other cables if the grounding conductors are secured to the surface of the bracket opposite that used to secure the other cables.

   Note-2: Some equipment manufacturers allow grounding conductors routed within their equipment systems to be routed with other conductors, typically dc power conductors. When a system is approved for use, the routing requirements of the equipment vendor may apply.

5.1.2 When grounding conductors are routed on the side or bottom of cable racks or other ironwork or surface of ceilings, columns or walls, the conductors shall be secured at an interval of 12 inches maximum. When cable brackets are used for support, they shall be placed at an interval of 20 inches maximum.

5.1.3 When a horizontally run grounding conductor is placed on or under a cable bracket or other support detail, the conductor shall be secured to each bracket or support detail.

   (See Figure J-1): In addition:
   a) Grounding conductors up to and including #1/0 AWG may be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with nylon cable ties or 9-ply waxed polyester twine.
   b) Grounding conductors larger than #1/0 AWG shall be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with 9-ply waxed polyester twine.

5.1.4 Grounding conductors secured to the underside of cable racks shall be secured to alternate cross straps.

5.1.5 The exterior surface of conduits or raceways containing AC power conductors shall not be used to support grounding system conductors.

5.1.6 Several methods of supporting grounding conductors, including vertical and horizontal equalizers, and typical material are shown in ATT-TP-76416, Grounding and Bonding
Requirements for Network Facilities. The use of support methods similar to those shown in this document is acceptable.

5.1.7 Unless expressly required by local code, CO grounding system conductors (other than ACEG conductors) shall not be run in metallic conduit. If a CO grounding system conductor is placed in metallic conduit, raceway or sleeve more than three feet in length, it shall be bonded to the conduit, raceway or sleeve at each end with a minimum #6 AWG conductor.

5.1.8 When metal clamps are used to support or secure CO grounding conductors, the clamps shall not completely encircle the conductor. The metallic continuity shall be interrupted by non-metallic hardware, a cable tie or 9-ply waxed polyester twine. The phrase *completely encircle* applies primarily to ferrous metal cable clamps. It does not apply to an opening or “ring” formed by a combination of interconnected metallic objects such as cable racks, auxiliary framing, threaded rods, etc., unless the length (l) of this opening is more than 3 times its diameter (D). Examples of openings that do not create complete encirclement of a grounding conductor are:

a) Where the conductor is routed through a metal cable hole cover instead of a floor sleeve (l is typically < ¼”, D is typically > 1 ½”)

b) Where the conductor is on a cable rack and passes through the opening formed by the cable rack’s stringers and straps (l is typically <3”, D is typically > 18”)

c) Where the conductor passes through as interior wall constructed with sheet metal studs (l is typically < 8”, D is typically > 48”)

d) Arrangements similar to (a) through (c) above.

5.1.9 The DC Electrical Ground (DCEG) conductor for BDFBs/SPDUs shall be a minimum #1/0 AWG conductor, and shall be connected directly to a CO GRD bus bar or tapped to a horizontal equalizer of equal or greater size.
### TABLE J-2--HORIZONTAL RESTING RUNS (POWER)

<table>
<thead>
<tr>
<th>Size of Copper Cable</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Ultimate Number of layer</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 MCM-750 MCM</td>
<td>alternate</td>
<td>4</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 1/0-350 MCM</td>
<td>alternate</td>
<td>2</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 6-1</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>4</td>
</tr>
<tr>
<td>No. 14-8</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>any number bundled</td>
</tr>
</tbody>
</table>

### TABLE J-3--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (POWER)

<table>
<thead>
<tr>
<th>Size of Copper Cable</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Ultimate Number of layer</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 MCM-750 MCM</td>
<td>every</td>
<td>4</td>
<td>any number</td>
<td>1</td>
</tr>
<tr>
<td>No. 1/0-4/0</td>
<td>every</td>
<td>4</td>
<td>any number</td>
<td>1</td>
</tr>
<tr>
<td>No. 6-1</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 14-8</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>1 inch diameter bundle max</td>
</tr>
</tbody>
</table>

### TABLE J-4--HORIZONTAL RESTING RUNS (SWITCHBOARD AND COAXIAL)

<table>
<thead>
<tr>
<th>Diameter of Cable</th>
<th>Type</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1/2&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>over 1/2&quot; to 3/4&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>over 3/4&quot; to 1&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>over 1&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>(735 type)</td>
<td>mini-coax</td>
<td>every fourth</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>(734 type)</td>
<td>coax</td>
<td>every fourth</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### TABLE J-5--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (SWITCHBOARD AND COAXIAL)

<table>
<thead>
<tr>
<th>Diameter of Cable</th>
<th>Type</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1/2&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>over 1/2&quot; to 3/4&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>over 3/4&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>(735 type)</td>
<td>mini-coax</td>
<td>every</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>(734 type)</td>
<td>coax</td>
<td>every</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

### TABLE J-6--CABLE CAPACITY OF STANDARD CABLE RACKS (5'-0" Support Spacing) (SWITCHBOARD AND COAXIAL CABLES)

<table>
<thead>
<tr>
<th>Rack Width</th>
<th>Normal Capacity</th>
<th>75% Rule Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capacity (In.²)</td>
<td>Pileup (inches)</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>132</td>
<td>132</td>
</tr>
<tr>
<td>1'-3&quot;</td>
<td>168</td>
<td>210</td>
</tr>
<tr>
<td>1'-8&quot;</td>
<td>228</td>
<td>285</td>
</tr>
<tr>
<td>2'-1&quot;</td>
<td>288</td>
<td>360</td>
</tr>
</tbody>
</table>

Note (1)  \( \text{In.}^2 \) capacity is based on the rack width minus 1" for stringer attachment hardware.

Note (2)  According to the above a new switch or other equipment entity having 500 \( \text{In.}^2 \) of **secured** interconnecting cable to other network elements requires a minimum of three 1'-8" via cable rack paths \((500/171 = 2.9 \text{ racks @ 75% capacity})\).
Table J-7 -- Permissible Cable Pileups On Horizontal Racks Suspended Grid System

<table>
<thead>
<tr>
<th>Supports On</th>
<th>5' Centers</th>
<th>6' Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secured Power Cable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rack Width</td>
<td>5&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Width Of Rack</td>
<td>Width Of Rack</td>
<td></td>
</tr>
<tr>
<td>1'-0&quot; to 1'-8&quot;</td>
<td>7&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supports On</th>
<th>5' Centers</th>
<th>6' Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unsecured Switchboard Cable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rack Width</td>
<td>5&quot; to 1'-0&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Width Of Rack</td>
<td>Width Of Rack</td>
<td></td>
</tr>
<tr>
<td>1'-3&quot; to 2'-1&quot;</td>
<td>15&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supports On</th>
<th>5' Centers</th>
<th>6' Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secured Switchboard Cable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rack Width</td>
<td>5&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Width Of Rack</td>
<td>Width Of Rack</td>
<td></td>
</tr>
<tr>
<td>1'-0&quot; to 2'-1&quot;</td>
<td>12&quot;</td>
<td>10&quot;</td>
</tr>
</tbody>
</table>

TABLE J-8 – MINIMUM BENDING RADIUS FOR GROUNDING CONDUCTORS

<table>
<thead>
<tr>
<th>Grounding Conductor Size</th>
<th>Minimum Bending Radius (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 AWG</td>
<td>2</td>
</tr>
<tr>
<td>4 AWG</td>
<td>3</td>
</tr>
<tr>
<td>2 AWG</td>
<td>3</td>
</tr>
<tr>
<td>1/0 AWG</td>
<td>4</td>
</tr>
<tr>
<td>4/0 AWG</td>
<td>4</td>
</tr>
<tr>
<td>750 kcmil</td>
<td>7</td>
</tr>
</tbody>
</table>
FIGURE J-1 - USE OF CABLE TIES TO SECURE GROUNDING CONDUCTORS

NOTE: Grounding conductors larger than #1/0 AWG must be secured with sewing twine.
Figure J-2 Bonding of Battery Return Conductors of Shared Power Plant to the MGB

A - From Power Plant
B - To CBN BDFB
C - Battery Return Conductors
D - Battery Conductors
E - MGB

Closely Coupled to (b) or (c)
Figure J-3 Kansas City Stitch

1. Double a length of twine, even up ends and pass loop under the strap.
2. Double loop end back on itself.
3. Place free ends through loop.
4. Hold in position; pull out slack.
5. Completet stitch.

Starting Stitch

1. Place free ends over and under these strands.
2. Place free ends under strap.
3. Pull out slack and hold with finger.
4. Try to avoid crossed stitches under strap.
5. Pull out slack and hold with thumb.
6. Remove slack by pulling up and to the right; keep loop back of cable.
7. Tighten stitch by pulling to right to drawing loop to top front edge of cable. Remove slack & tighten stitch with a steady even pull.
Figure J-4 Ending Stitches

1. Keep stitches straight on centerline of strap.
2. Make loop near end when pulling twine under stitches that are already made.
3. Twine looped back with knot ready to be pulled tight.
4. Method of ending stitches.
Figure J-5 Sewing Cable to Supports at Turns (Chicago Stitch)
Figure J-6 Cables From Miscellaneous Run Secured Together Between Rack and First Support with a Modified Chicago Stitch
Figure J-7 Cable Routing Restrictions for Racks Installed At Different Levels

CABLE SHALL EXIT/WATERFALL OFF THE SIDES OF CABLE RACK AT POINTS OF TERMINATION ONLY.

EXCEPT FOR ATT-TP-76409 FIG. 6(F) ARRANGEMENT, CABLE SHALL NOT BE ROUTED BETWEEN VERTICALLY OFFSET RACKS AT CABLE RACK INTERSECTIONS OR ALONG THE LENGTHS OF PARALLEL CABLE RACKS THAT ARE AT DIFFERENT LEVELS.
Figure J-8 Method of Placing Transition Devices
SECTION K -- WIRING AND CONNECTING

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TABLE K-1 – SUMMARY OF CHANGES IN SECTION K

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/11/2016</td>
<td>Entire Document</td>
<td>Modification</td>
<td>N/A; March 2016 TP76300 Rewrite</td>
</tr>
<tr>
<td>09/01/2017</td>
<td>3.4.16</td>
<td>Deletion</td>
<td>ATT-TP-76300-384</td>
</tr>
</tbody>
</table>

K-1
1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the requirements for wiring, fanning and forming switchboard cable, treatment of loose wires and the requirements for soldered, coaxial, ABAM, compression/crimp type, quick connect and solderless wrapped connections.

1.1.4 Changes in this issue of Section K are summarized in Table K-1.

2. GENERAL REQUIREMENTS

2.1. General

2.1.1 Un-terminated ends of switchboard cable (not connectorized) shall be protected and stored to prevent incursion into working equipment.

2.2. Connecting

2.2.1 Sufficient length shall remain in all wires after connecting operations are completed so that they may be re-skinned and reconnected if necessary.

2.2.2 All connections shall be made to ensure proper electrical operation of equipment.

2.2.3 All connections shall be torqued to the manufacturer's specifications. If specifications are not available from the manufacturer, refer to ATT-P-05100-E drawing for NEMA torque information to be used.

2.2.4 Bus bar connections shall be marked to indicate that they have been tightened to recommended torque levels per drawing ATT-P-05100-E BATTERY, RETURN, AND BUS BAR CONNECTION HARDWARE REQUIREMENTS. The marking shall normally show on the bolt head (first choice) or on the nut (second choice), whichever is easiest for visible inspection, and carry through the washer and onto the connecting surface.

2.2.5 Any connector drilled with two fastening holes shall be secured using both holes.

2.3. Reused Equipment

2.3.1 Soldered wire wrap terminals on reused or relocated equipment which meet quality standards shall be cleaned of solder if new solderless wire wrapped connections are needed. Wires on these terminals will not require soldering if all other connecting requirements are met.

2.4. Mechanical Connections
2.4.1 For DC circuits, mechanical connections (thread pressure type) shall not be installed unless authorized by the AT&T Equipment Engineer. If the original factory equipment has mechanical connections, the connections shall be tightened to the manufacturer’s specifications.

2.4.2 Per the NEC, mechanical connections are allowable and approved for use for AC circuits.

3. SPECIFIC REQUIREMENTS

3.1. Wire and Cable

3.1.1 For DC applications, only AT&T approved wire and cable shall be used as defined in the Minor Materials list, AT&T Drawings and Practices.

3.1.2 AC applications shall follow NEC and local jurisdictional requirements.

3.1.3 AC and DC wire and cable shall be dressed in such a manner as to:
   a) avoid excessive strain and congestion
   b) ensure accessibility for maintenance
   c) allow for future applications
   d) maintain clearance between terminals
   e) and secured to wiring brackets, if provided

3.1.4 Spare and unused wire shall be left long enough to reach the ultimate circuits being served, then placed in a PVC tube or folded back and sewn to the existing form.

3.1.5 For AC wiring, the Installation Supplier shall use color-coded wiring in accordance with the NEC.

3.1.6 Tip and ring conductors shall be paired. Single leads and split pairs are not acceptable for tip and ring applications.

3.1.7 The normal twist of wires (such as tip and ring pairs) shall be left in place between the butt and connection point. Because of various equipment configurations, it may not always be practicable to keep the twist in place to the actual connection point. In these cases, the last twist in the wire shall be as close to the connection point as possible or at a point where one of the wires leaves the form.

3.1.8 P-wire shall not be spliced.

3.1.9 Splices shall not be made within conduits.

3.2. Distributing Frame

3.2.1 Loose wires shall be banded at each point of breakout with cord and protected with fiber.

3.3. Soldered Connections

3.3.1 Solder shall be rosin core, 60 percent tin and 40 percent lead (or an equivalent lead free solder) having a melting range of 360-370 degrees F.
3.3.2 Soldered connections shall have a smooth bright appearance with the wire fused to terminal and completely covered with solder. Connections shall be checked for cold solder joints by means of visual inspection. Proper solder joints have a shiny appearance while cold solder joints have a dull or dirty appearance.

3.3.3 A minimum of one and one quarter turns shall be made on all soldered wrapped connections.

3.3.4 Wires connected at perforated terminals shall be brought through the hole from below or from the left, bent against the terminal and away from the apparatus.

3.3.5 Wire terminals with holes, notches and semi-tubular terminals shall be filled with solder.

3.3.6 Wire ends shall be cut off a maximum 1/16 inch from the terminal.

3.3.7 Minimum clearances between soldered connections and adjacent metal work shall be 1/32 of an inch.

3.3.8 Minimum clearances between adjacent soldered connections shall be 1/64 of an inch.

3.3.9 Shiner length between insulation and point of contact with the terminal shall not exceed 1/8 of an inch.

3.4. Coaxial Cable and Connectors

3.4.1 Coaxial cable assemblies shall not be spliced.

3.4.2 Only approved coaxial cable and connectors shall be used.

3.4.3 When field forming coaxial cable assemblies, only approved coaxial cable connector crimping tools with registered dies shall be used. Coax ferule crimps shall be positive-embossed with the vendor ID, except for Video Equipment installations whereas a longitudinal marker on each end of the field created coaxial run shall carry the vendor ID/TEO of the installed conductor.

3.4.4 When stripping individual 734C, 735C, 1505a, 1694a and 1855a coaxial cables for use with approved BNC type coaxial connectors, the Installation Supplier shall only use the connector’s manufacturer approved cable stripping device.

Note: AT&T will not require the Switch Manufacturers (Alcatel-Lucent, Nortel, Siemens and Ericsson), to use 734C/735C cable in place of 734D/735A cable on Switch jobs. However, the Switch Supplier’s coaxial cable stripping tools and coaxial connector crimping tools must meet the approval standards of AT&T Common Systems on all Switch jobs in which 734D and/or 735A cable is to be installed. Furthermore, the Switch Supplier must continue to use only those connectors approved by AT&T on such jobs.

3.4.5 Pin height and continuity (for open and shorts) shall be verified on every installed coaxial connector. Pin height requirement does not apply to 45/90 degree type BNC as the pin height is set at the factory.

3.4.6 There shall be no cracks or evidence of double crimps on the outer sleeve.

3.4.7 The crimped outer sleeve shall exhibit six flat surfaces with no fins or excessive rounding at the 60-degree corner bends.
3.4.8 Coaxial cable leaving the rear of the BNC connector shall not be bent in such a manner as to cause kinking of the cable and shall not violate the established bending radius criteria.

3.4.9 The ferrule shall be butted against the connector body.

3.4.10 The braided shield shall not be exposed at either end of the ferrule.

3.4.11 The Installation Supplier shall ensure that all coaxial connectors are locked.

3.4.12 All "F" type connectors shall be installed onto properly prepared non-rigid coax cables, such as RG-6, RG-11, and RG-59 using manufacturer approved installation methods, instructions and tools unless superseded by specific ATT requirements. Installed F-Connectors must be torqued to the network equipment’s specification to prevent overtightening and damage to the termination port.

3.4.13 Waterproof connectors shall be used in applications where coaxial connections are exposed to outdoor elements and installed per the manufacture’s specification.

3.4.14 All rigid Coax connectors shall be installed onto properly prepared rigid cables, such as .500 and .625, using manufacturer approved installation and cable preparation methods, instructions and tools unless superseded by specific ATT requirements.

3.4.15 The Installation Supplier shall provide upon request both a copy of the coaxial connector manufacturer’s crimping documentation as well as a list of the approved tools used to connectorize both rigid and non-rigid coaxial cables. Additionally, the required end to end test records shall be placed in the Job Folder. If an installation is recorded in the Electronic Job Folder, EJF, the EJF BNC Form shall be used.

3.5. Shield Connection

3.5.1 The shields of shielded cables shall be cut, positioned and bonded to ground as specified in the job documentation. The shields of shielded cables shall be located as close as possible to the cable lead termination point.

3.5.2 Shielded cable and wire shall have the shield ground bonded at one end only. This bonding will be at the equipment (originating) end unless the product design specifies otherwise. Refer to Section T for requirements specific to synchronization.

3.5.3 Exposed shields of shielded cable shall be protected with two half-lapped layers of electrical tape or heat shrinkable sleeve.

3.5.4 On shielded switchboard cable, the drain lead shall be protected by applying a sleeve material.

3.6. Quick-Connect (Punch Type Terminals)

3.6.1 Only one wire shall be engaged in each terminal.

3.6.2 Only solder sleeve type splicing connectors shall be used for splicing individual leads.

3.6.3 Conductors shall not be placed on deformed terminals.

3.6.4 Previously terminated wire ends shall not be re-terminated. Cut them off and use new ends.
3.6.5 Wire ends shall protrude 1/16 inch beyond edge of clipped terminal.

3.6.6 Wire ends shall clear adjacent metallic parts by 1/32 of an inch minimum.

3.6.7 Textile-insulated wire shall not be terminated in slotted beam terminals.

3.7. **Solder-less Wire Wrapped**

3.7.1 Solder-less wire wrapped connections on square terminals shall conform to Figures K-2 and K-3 unless the length of the pin on the backplane does not allow for the minimum number of wraps. Common defects are illustrated in Figure K-4.

3.7.2 Pigtail connections shall not exceed 3/32 of an inch. This distance is measured from the last contact of the bare portion of the wire with the terminal.

3.7.3 Wire wraps shall be made using the tool sized to the wire gauge.

3.7.4 On terminals that are not square, 26-gauge wire shall have a minimum of 8 turns.

3.7.5 Overlapped turns shall not be counted in the number of turns of a connection.

3.7.6 Wire of gauges 28, 30 or 32 shall have one wrap of insulation in addition to the required number of wraps.

3.7.7 All connections not meeting the requirements of Figure K-2 shall be re-skinned and reconnected. Connections that cannot be rewrapped shall have a minimum of one and one half wraps for 20, 22, 24 gauge and wire shall be soldered except on equipment backplanes.

3.7.8 When solderless wrap terminals are used for cross connections, a defective wire connection shall not be soldered. The defective connection shall be removed and replaced by a satisfactory solderless wrapped connection.

3.7.9 The Installation Supplier shall not solder 26 through 32 gauge wire.

3.7.10 Exposed un-insulated wire (shiner) shall not exceed 1/8 inch.

3.7.11 Clearance between connections and adjacent metal work shall be 1/32 of an inch minimum. The wire end projection shall not violate the minimum clearance.

3.7.12 Clearances between adjacent connections shall be 1/64 of an inch minimum. The wire end projection shall not violate the minimum clearance. Wire wrap terminals on blocks, backplanes, etc. shall be straight and not bent.

3.7.13 When adding a second wire-wrap connection to a wire-wrap terminal that has a soldered connection, the Installation Supplier shall also solder the new connection.

3.7.14 The first connection on a terminal that will support multiple wire wraps shall be placed to the rear of the terminal to allow for future connections.

4. **CONNECTORS**

4.1. **710, 711 and Similar Type Connectors**
4.1.1 Cable may be spliced using modular splicing apparatus. These splices shall be done in accordance with the manufacturer's specification. The AT&T Equipment Engineer shall approve any use of these connectors.

4.1.2 The index strip shall have two wires in each slot.

4.1.3 Both halves of the connector body shall be fully latched. If not self-latching, or fitted with locking screws or securing clips, the two halves shall be secured on each end with 9-ply polyester twine, except when they need to remain readily available for rapid opening (e.g., for dial-to-dial conversion activity).

4.1.4 The cap shall be fully latched to the connector body and index strip.

4.1.5 When connectors are placed on cable racks or pressed into adjacent cables they shall be covered with heat shrink tubing.

4.1.6 Cables fitted with connectors, but not connected, shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.1.7 When modular splicing connectors are used on a modular (Cosmic) or a conventional type distributing frame, the connectors shall be spaced as to allow for cable growth, maintenance work, etc.

4.2. Connectorized Cables

4.2.1 The ends of connectorized cables shall be positively secured to the corresponding mate connector or backplane connector. In the event the screw, clip, or other interlocking device designed for the specific connector cannot be used, the male and female ends shall be secured with waxed fiber cord or tie wrap.

4.2.2 Connectorized cables (such as with Amphenol connectors) shall not be connected together in cable troughs or on cable racks.

4.2.3 Connectorized cables connected to the rear of units shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.3. Terminal Type Connectors (#10 Awg And Smaller)

4.3.1 Connections made to screw type terminals with #10 through #26 gauge tinned copper wire shall be made using the correct color coded insulated type terminal as listed on the AT&T minor material list.

4.3.2 Only one terminal type connector shall be placed under a screw or bolt.

4.3.3 The proper size connector shall be used for the wire size being terminated, as detailed in the manufacturer's specifications.

4.3.4 Only one wire end shall be terminated in a terminal type connector (lug).

4.3.5 Terminal type connectors (lugs), except #26 - #24 gauge, shall be NRTL (National Recognized Testing Laboratory) listed.

4.3.6 All terminal type connections shall be made of tin plated copper, have a welded seam and have an insulated barrel.
4.3.7 Use the following color coded terminals for the following size wire:

- Yellow/Amber terminal: #26-#24 wire
- Red terminal: #22-#18 wire
- Blue terminal: #16-#14 wire
- Yellow terminal: #12-#10 wire

*Not NRTL rated or listed

4.3.8 The terminal shall have one (1) crimp applied. The crimping tool shall have a full cycle ratchet mechanism that provides a complete crimp before the tool can be removed.

4.3.9 Wire ends shall protrude a minimum 1/16 inch beyond the end of the barrel.

4.4. Power Connections (Also refer to Section M)

4.4.1 The Installation Supplier shall not modify connectors.

4.4.2 The preferred method of power connection is to use a non-interrupted conductor with connecting lugs at each end. Transitional devices shall only be used when no other solutions (such as narrow tongue lugs) are applicable.

4.4.3 Mechanical connections (thread pressure type) shall not be used unless the device is designed to utilize mechanical lugs only.

4.4.4 C-Taps shall not be used on power leads.

4.4.5 Mechanical "H" taps shall not be used for one to one DC power conductor transitions. "H" taps are permitted for one to many DC conductor transitions, such as in the case of (1) 750 MCM to (2) #4/0 AWG conductors.

4.4.6 In-line reduction (barrel) splices shall be used for all one-to-one power cable reductions. The manufacturer provided clear heat shrink shall be installed per the manufacturer’s instructions to cover the in-line reduction splice.

4.4.7 All power cables shall be stitched in the following manner when power transition devices (H-taps, in-line reducing splices, etc.) are utilized:

   a) The cables being transitioned shall have a banding Chicago stitch placed three to six inches from the transition device where two cables are coming out of the same side of the transition device.

   b) All cable bends shall be made past the stitch and shall have a minimum bending radius of 7 times the diameter of the power cable.

   c) All cable bends shall be made prior to crimping the transition device. If additional cable bends are required after the crimping is completed, an additional Chicago stitch shall be placed prior to any cable bends being made.

4.4.8 Transitional devices shall not be placed on vertical power cable runs, cable rack waterfalls or height transitions (such as shown in ATT-TP-76409 Fig 6G), cable rack turns (such as shown in ATT-TP-76409 Fig 6A and 6D), inside power bays, BDFBs or other power distribution
bays. The intent is to not place stress on the connection by placing it in a cable bend or in a vertical position.

4.4.9 In-line reduction (barrel) splices shall be used for all one-to-one power cable reductions to reduce cable build-up on the cable racks; H-Taps shall be used for multiple cable splices.

4.4.10 The Installation Supplier shall inspect all contact surfaces for damage (nicks to cable, etc.) prior to any crimping operation. Refer to Section J, subsection 2.3, “Damaged Cable” in the ATT-TP-76300 for proper performance criteria.

4.4.11 All battery and battery return connections shall be torqued to battery manufacturer’s specifications.

4.4.12 The Installation Supplier shall verify proper polarity before landing cables (no battery reversals). Before establishing the connection, verify that less than 0.05 volts exists between the components being connected.

4.4.13 H-Tap compression connectors, where required, shall be protected using fire retardant, UL 94-V1 rated, clear covers as listed on the AT&T Minor Materials List. Clear H-Tap covers shall be secured on each end with multi-ply twine (see ATT-P-05405 Clear H-Tap Cover Drawing on WoodDuck for additional information).

4.4.14 All battery and battery return connections shall have a flat washer under the bolt head or screw head, and another flat washer under the nut in the through-bolt configuration.

4.4.15 All bus bar power connections shall be installed per ATT-P-05100-E.

4.4.16 Star washer-nut or cup washer-nut combinations supplied by the equipment manufacturer may be used in place of individual lock washer and nuts. A separate flat washer shall be installed between the lock washer-nut combination and the connector. Once used, a star washer or cup washer-nut combination shall not be reused.

4.4.17 The exposed end of bolts or studs shall not exceed the diameter of the bolt or stud.

4.5. Compression Connections -- #8 AWG and Larger

4.5.1 All electrical contact surfaces shall be cleaned by using a non-metallic, abrasive pad, wiped clean with a clean, dry cloth and have a thin coat of NO-OX-ID “A” anti-corrosive compound applied.

4.5.2 The proper connector, wire, die and crimping tool shall be used as a system to make an acceptable circumferential (e.g., hex) crimp. Normally the same manufacturer’s equipment is utilized to form the system and maintain a Nationally Recognized Testing Laboratory (NRTL) listing. All crimping tools shall have a feature that ensures positive compression.

4.5.3 The Installation Supplier shall apply crimps in such a manner as to allow inspection of the compression type connectors such that:

a) The connector shall be marked to indicate:
   1. The NRTL listed wire size.
   2. The number of crimps.
3. The proper die color code.
4. The NRTL and the manufacturer’s trademark.

b) The completed crimp shall be available for inspection and shall exhibit the following:
   1. The crimp shall emboss the die code distinctly and legibly into the connector.
   2. The number of crimps shall exactly match the connector.
   3. If the die generates corners or flashing they shall be uniform and thin, with no sharp edges and excess flashing shall be removed.
   4. The connector shall not be covered with a heat shrink, unless the heat shrink is clear and rated V1 or better.

4.5.4 All connectors shall be constructed of tin plated copper, except as noted below. Aluminum connectors shall not be used.

4.5.5 When tinned plated connectors are connected to bus bars a thin coat of NO-OX-ID “A” anti-corrosive compound is required.

4.5.6 Lead coated connectors shall be used when connecting to vented lead acid (VLA, aka “flooded”) type batteries at the post or terminal plate. A thin coat of NO-OX-ID “A” anti-corrosive compound is required.

4.5.7 All connectors shall be the two (2) hole crimp type lugs except when connecting to a fuse post in a power bay or when the equipment specification drawing requires a single hole lug. Single hole lugs require an external tooth or split-ring lock washer between the bolt head and the connector, or with stud, between the nut or screw head and the connector, except when connected to a fuse post where a flat washer is also required. (Refer to AT&T Standard Drawing ATT-P-05100-E for assembly details.)

4.5.8 The proper size connector shall be used for the wire size being terminated as detailed in the manufacturer’s specifications:
   a) Only one (1) wire end shall be terminated in a lug.
   b) Larger wires shall not have strands removed to fit smaller connector.
   c) Wires shall not be folded to fit connectors.

4.5.9 Compression type connectors shall not be attached to wire ends by soldering.

4.5.10 Wire/cable insulation shall be cut back so that, when inserted, the wire/cable extends to the full length/depth of the connector barrel or groove as viewable in the inspection hole. A small setback of the conductor from the inspection window is acceptable after the connector is crimped, as long as the crimp(s) do not overlap or overhang the conductor in the connector barrel, and the conductor is easily viewable at the inspection window.

4.5.11 The skinner (bare wire) shall be inserted into H-taps the entire length of the H-tap.

4.5.12 The maximum shiner (space) shall be no greater than 1/16 inch between the end of the barrel and the cable insulation butt. If the shiner is greater than 1/16 inch and does not exceed 1/4 inch, the space shall be covered with clear heat shrink tubing, except for grounding
connectors. Where the shiner exceeds ¼ inch, the connection shall be remade. If battery and battery return cables have manufacturer applied clear heat shrink tubing, it is permissible for the connector inspection window and compression crimps to be covered.

4.5.13 Clear heat shrink tubing shall be applied per the manufacturer's instructions (excessive heat shall be avoided).

4.5.14 Compression crimps shall not extend onto the tang area.

4.5.15 Compression crimps shall not overlap each other.

4.5.16 All compression connectors shall have an inspection hole between the tang and the barrel.

4.5.17 Connectors terminating on a flooded lead acid battery post or battery plate shall not have an inspection hole.

4.6. Grounding Conductors

4.6.1 Unless otherwise specified, all grounding and bonding conductors shall be connected by two-hole crimp type (compression) connectors with lockwashers between the lug and securing nuts.

4.6.2 Mechanical connectors, fittings, or connections that depend solely on solder shall not be used.

4.6.3 Connections to cold water pipe or conduit shall use a Burndy type GAR-TC or equivalent connector (Refer to Figure K-5).

4.6.4 Unplated metallic surfaces shall be prepared to a bare, bright finish before joining. A thin layer of corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the unplated surface. If a connector is to be secured directly to a painted surface, the paint shall be removed down to bare metal and a thin layer of a corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the bare metal surface. The bare metal shall be visible for inspection completely around the lug.

4.6.5 External tooth lockwashers will be allowed between the lug and contact surface on one-hole grounding lugs with conductor size No. 8 AWG and smaller. Under this circumstance, removing paint and application of NO-OX-ID “A” anti-corrosive compound is not required. A lockwasher is always required between the lug and screw head. Verification of a locking-type washer shall be by visual inspection. Refer to Figure K-1.

4.6.6 Two grounding connectors shall not be connected back-to-back on a ground bar unless:

a) The equipment served by both conductors will be completely de-powered before the securing hardware is loosened (e.g. connections at a bus bar or an equipment enclosure), or

b) A sufficient length of the conductor that will not be permanently disconnected is both available and accessible to attach a temporary bond around the securing hardware (e.g., connections at a CO ground bar or other bus bar).

4.6.7 Bolts, nuts, screws, threaded pressure devices, raceway fittings and every ground system connecting or securing device shall be free from corrosion, properly assembled, correctly
tightened and accessible for inspection. Within buildings, exothermic welding may be used at water pipes, connections to grounding system bus bars and bonds to building steel. In occupied areas within a building, the use of exothermic welds shall be restricted to those methods that use “smokeless” or “low smoke emitting” processes, such as the EXOLON® process from Erico Products, Inc.

4.6.8 At all bus bars, the end of every CO grounding system conductor whose far end termination is not readily apparent shall be equipped with a 145P tag (or equivalent) identifying the termination point of the opposite end of the conductor.

4.7. **Lockwashers for Grounding Connections**

4.7.1 This section applies primarily to the use of lockwashers with the securing hardware for connectors used to terminate the framework grounding conductor to equipment frameworks, cabinets and other enclosures.

4.7.2 These requirements apply when lockwasher information has not been furnished by another part of this document, a standard drawing, a manufacturer’s drawing or a detailed specification.

4.7.3 When a lockwasher is required, one of the following shall be used:

a) An external tooth type (ETLW) or A split ring (helical spring) type.

b) When required between the surface of a one-hole connector and the surface, to which the connector is secured, the lockwasher shall be an external tooth type. Refer to Figure K-1.

c) Unless specified otherwise by the manufacturer, all types of lockwashers shall be Grade 2 or higher and shall have a zinc-chromium electroplate finish.

4.7.4 For a fastener and nut arrangement (through-bolt) or a nut only arrangement (when a stud is used), a lockwasher shall be placed between the nut and the surface to which it mates.

4.7.5 For a fastener only arrangement (tapped hole), a lockwasher shall be placed between the fastener head and the surface to which it mates. Refer to Figure K-1.

4.7.6 Additional hardware information may be found in ATT-TP-76201, Common Systems – Hardware Products and Materials Specifications.

4.8. **DC Power - General Connecting**

4.8.1 Equipment being installed with multiple loads (i.e. “A”, “B”, “C”, etc.):

a) shall be installed to different load supplies on the BDFB/SPDU; if there is only a two-load BDFB/SPDU available in the area, the loads shall be split with at least one on each load supply keeping the BDFB/SPDU load balanced as close as possible.

b) shall maintain separate primary protection device integrity throughout the circuit unless an AT&T technical drawing supersedes this requirement.

4.8.2 Power lead connections shall not be stacked (piggy backed).
4.8.3 For a single network element (bay) with multiple feeds, it is acceptable to attach the battery return leads to the return bus bar back to back (sandwiching the return bus bar between the two return lugs). The individual bay returns shall be paired to ensure that the removal of one bay will not affect another. In the event a bay has three returns, the third return shall be stand-alone on the return bar. Returns from separate bays shall not share the same return bar position unless authorized in writing by the AT&T engineer.

4.8.4 Battery return leads shall be connected to the battery return bus bar associated with the same BDFB/SPDU FB, etc., as the related battery leads.

4.8.5 Secondary power distribution cable connections to BDFB/SPDU fuse posts shall be up to the maximum power cable size (based on circuit ampacity and voltage drop requirements) allowed by the Fuse Disconnect/BDFB Manufacturer.

4.8.6 Secondary power distribution cabling to a 1/4-20 connection stud on a 15800 (TPS) or other type Fuse Disconnect shall be up to (≤) #2AWG. Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect shall be up to (≤) 2/0AWG. Manufacturer provided torque requirements shall be used unless a specific requirement is outlined in the equipment specific Wood Duck drawing, including the ATT-E-00151-E-01 drawing for fuse panels. ATT-P-05100-E provides torques values based on NEMA-CC1-1984 for use when neither the manufacturer nor the equipment drawing provides specific requirements.

4.8.7 The Installation Supplier shall apply a thin coat of NO-OX-ID “A” anti-corrosive compound to all connections of dissimilar metals to inhibit future corrosion. Cable ends shall be coated with the anticorrosive compound before making a crimp connection. All unplated connectors, braid straps, bus bars, etc., shall be brought to a bright finish and then coated with the anticorrosive compound before they are connected.
FIGURE K-1 - APPLICATION OF LOCKWASHERS

Lug → ETLW

ETLW → Split Ring

Stud

Framework, bus bar, etc.

Lug → ETLW

ETLW or
Split Ring

Framework, bus bar, etc.
FIGURE K-2 -- SOLDERLESS WIRE WRAPPED CONNECTIONS

20 GA = .032"
22 GA = .025"

24 GA = .020"
26 GA = .016"

28 GA = .013"
30 GA = .010"
FIGURE K-3 – SOLDERLESS WIRE-WRAPPED CONNECTIONS

Physical Turns of Bare Wire

Start Of Turn
1 2 3 4 5 6

ONE SOLDERLESS CONNECTION

TWO SOLDERLESS CONNECTIONS

THREE SOLDERLESS CONNECTIONS

Connection Near Base of Terminal When Odd Number of Terminals are Connected

Note: When surface strapping is specified, connect the incoming lead at the base of the terminal and use a similar strapping arrangement.

K-16
FIGURE K-4--SOLDERLESS WIRE WRAPPED CONNECTIONS - DEFECTS

"A" INSUFFICIENT TURNS

"B" EXCESSIVE SHINER LENGTH

"C" SEPARATION EXCEEDS .010"

"D" MORE THAN ONE BULGED TURN

"E" NO 4 ADJACENT TURNS

"F" OVERLAPPING - OVERLAPPED TURNS DISCOUNTED

"G" SEPARATION EXCEEDS .005"

NOTE: A SCALED SKETCH DEPICTING TYPICAL SOLDERLESS WRAPPED CONNECTION OF 24 GAUGE DEFECTS "A" THRU "F" 28 GAUGE DEFECT SHOWN IN "G"
FIGURE K-5 - Pipe Ground Connector

- Conduit or Pipe
- Two Hole Compression Lug
- #6 AWG to 750 kcmil max. Ground Wire
- Flat Washer
- Lock Washer
- Hex Nut
- Burndy Type GAR-TC Ground Connector
- (3/8" Bolts on 1" Centers)

- Terminal B, Att-TP-76300
- INSTALLATION REQUIREMENTS
- Revised September, 2017
- AT&T | March, 2016
INSTALLATION REQUIREMENTS
AT&T | March, 2016

Method to Connect Two-Hole Grounding Lug to Conduit or Pipe
(Section 5.20.13)
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1. **GENERAL**

   Installation Supplier = Organization performing the requested work activity

   AT&T Engineer = Person requesting the work activity.

1.1. **Introduction**

1.1.1. 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 installation specifications.

1.1.2. 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.

1.1.3. This section contains requirements for and the description of the different classes of equipment designations

1.1.4. If complete designation information for any wiring, cabling, equipment or groupings of equipment is not provided, the Installation Supplier shall contact the AT&T representative to determine the required designation.

1.1.5. Changes in this issue of Section L are summarized in Table L-1.

1.2. **Requirements**

1.2.1. The Installation Supplier shall clean the surface to be designated. If necessary, touch up the painted surface with appropriate (type and color) paint.

1.2.2. All designations shall have the correct information, be at the proper location, be legible from a normal distance and viewing position, and be the proper color.

   a) Letters “FIC”, “RR”, or “FID” shall not be included in designations.

   b) All designation information shall be in order consistent with previous designations in the technical space or as depicted in this TP (e.g. Relay Rack, Shelf, Slot, Port or Jack #, TX or RX, and AT&T job order number) except when directed to do it differently in the Woodduck drawings and/or TEO.

1.2.3. All designations shall be sized per Table L-4.

1.2.4. All designations shall be properly aligned and spaced (e.g. fiber cable designation labels placed approximately three inches from the connector. Adjustment to suit the installation is allowed).

1.2.5. Designations shall not be hand written.

1.2.6. Stamping or labeling is the only approved method for designating equipment.
1.2.7. “Arial” font shall be used unless the labeling equipment does not support the Arial font. Alternative fonts may only be used if labeling equipment is not equipped or upgradable to "Arial" font.

1.2.8. Capital Text shall be used for all general labeling. Lower case font is to be used only when specifically required as part of system address or designations.

1.2.9. The minimum font size for labeling is 1/16”. Font size shall be increased to fit available space.

1.2.10. Transmit and Receive shall be used on designations requiring functional reference. Common abbreviations for these terms are TX and RX.

1.2.11. DESIGNATION TAGS

a) Tags are of a preformed stamped fire retardant material that measures ¾” to 1” wide, by 1¼” to 1¾” in length with rounded corners and a ¼ inch hole at one end. Tag shall be affixed with multi-strand waxed cord at a termination point to identify the far end termination, typically referred to as a 145 type tag and/or 145 type number plate as listed on the Minor Material list.

b) Designation tags shall be installed so they are visible. Designation tags visibly placed behind equipment safety covers or cabinet doors are acceptable.

c) Designations on tags shall be sized to allow for all information needed but shall be no smaller than 1/8 inch. Both sides of the tag can be utilized. (Refer to Figure L-3 for Requirements)

1.2.12. DESIGNATION MARKERS

a) Designation markers shall be ½ to 1 inch in width tape, not to exceed 3 inches in length.

b) Cable, wire or fiber patch cord < ¼ inch diameter shall be designated using a flag style marker.

c) A designation marker shall not overlap itself.

d) Multi-strand waxed cord shall not be used to affix a marker.

e) Designations on ¾ to 1 inch markers shall be sized to allow for all information needed but shall be no smaller than 1/16 inch. (Refer to Figure L-2 for Examples)

f) Designations on ½ inch markers shall be sized to allow for all information needed but shall be no smaller than 1/16 inch. (Refer to Figure L-2 for Examples)

g) A designation marker on ½ inch tape shall have no more than 3 lines of information. (2 lines of information for Video Coaxial Cabling).

h) Designation markers shall be installed so they are visible and legible. Markers must be staggered at high density applications to achieve visibility.

i) Longitudinal markers shall not be deployed, except for Video Equipment installations where the following conditions will apply:
1. Cables identified with longitudinal markers shall have two longitudinal markers at each end. The first marker with the near end information shall be placed closest to the connection point, followed by the second marker with the far end information.

2. Longitudinal markers shall have the information printed three times and positioned so that the information can be read without having to twist the cable.

3. Longitudinal markers shall be of a self-laminating type to prevent the label from peeling. If the marker cannot be placed in a manner to keep it from peeling, the marker shall be protected with clear heat shrink.

4. Video equipment longitudinal labels shall be placed on Cat 5/6 and Coax cables.

5. The Brady-style label/sleeve system shall be utilized for all video applications.

6. Video equipment high density applications requiring the use of BNC and FConnector-removal tools.

7. Approved longitudinal labels used in video equipment installations shall be accessible and readable; the placement of the 1st label from the equipment connector shall be a minimum of 6 in. away and no further than 10 in. away.

j) Flag Markers (Refer to Figure L-2)

1. Flag markers shall not exceed 3 inches in length from the cable to the end of the flag.

2. No adhesive surface shall be exposed once flag markers are affixed.

3. Flag markers shall only have the designations stenciled on the non-adhesive side.

4. There is no requirement to place a flag marker on any fiber cross connect (cross connect being defined as fibers on the front of an FDP to another front side of a FDP).

k) Designations shall be orientated on the designation marker so that the lettering is perpendicular to the cable as shown in Figure L-2.

1.2.13. Designations shall not be modified by placing a designation label onto an existing label.

1.2.14. The Installation Supplier shall designate both ends of all miscellaneous type interbay cables, (e.g. Ethernet, alarm, COI LAN, etc.), with the applicable near-end (upper portion of the label) and far-end (lower portion of the label) termination information (bay number, shelf, slot, port, jack, etc.), and AT&T job order number. Refer to Figure L-2 for examples.

1.3. Labeling (Refer to Figure L-3)

1.3.1. Label identification and designation for all batteries, battery racks, primary power equipment and associated 145 type tags located in the power room or power plant vicinity shall be done with manufacturer recommended labeling or stamping. The labeling shall be applied as to adhere for the life of the equipment and use color stable, high contrast lettering. Stamping is also an approved method as required by AT&T.
1.3.2. All label background colors shall be in the monochrome family of whites, grays, blacks or clear. Lettering shall be black or white, in contrast to the backing material or underlying equipment color when clear backing is used. It is acceptable for labels, used to distinguish fiber racks, to be yellow with black characters.

1.3.3. Labeling shall not be placed where they are exposed to repeated physical contact.

1.3.4. When applying a label to a textured or smooth surface, a piece of plastic or rubber shall be used to press the label to conform to the textured surface. This can be visually verified when the label changes from a slight haze to a clear finish.

1.3.5. Labels shall be placed so that they do not peel or lift but remain permanently affixed.

1.3.6. Labels shall not be utilized to augment existing stamping, with exception of fuse and sync record books. The Installation Supplier may either add the new information with a stamp or remove all of the existing designation and replace it with a new label. On equipment units including end guards, consistent labeling or stamping shall be done on a line-by-line basis.

1.3.7. If adhesive labels are provided by the manufacturer, the Installation Supplier shall verify that the information shown is correct.

1.3.8. The use of thermal transfer technology tape systems is limited to applications on smooth, nonporous surfaces. This tape shall not be used on ripple-finished surfaces or any other irregular surfaces.

1.3.9. All bays shall be designated with a visible DC or AC power source label at the top (front/side) of the bay. For SHO/VHO applications, all DC chassis shall be designated with a DC source power label. (See Figure L-10)

2. EQUIPMENT TYPES

2.1. Common Items

2.1.1. The front and rear of frames and bays shall be labeled with the bay designation, per the floor plan. Required format is FFFAAA.BB, F=Floor, A=Aisle and B=Bay (e.g. 020214.03). For more information, see the creLink master floor plan guide available in the “CRELink Drawing Read Only Job Aid” located in TDocs.

2.1.2. The front and rear of equipment positions shall be designated with name and number. For SHO/VHO applications the front and rear of equipment shelves and panels shall be labeled with the node name and aisle.bay.plate/panel/shelf designation.

2.1.3. When designation cards are furnished for the top of the bay, the bay designation shall be placed on the cards. Required format is FFFAAA.BB, F= Floor, A=Aisle, B=Bay (e.g. 020214.03).

2.1.4. When bay designation cards are not furnished, the bay designation shall be placed on the base cover if it is not blocked from view by equipment. If the bay designation cannot be placed on the base cover; it shall be placed on the left upright between 4½ and 5½ feet
above floor. For cabinets in order preference place label at the 1) Top of cabinet 2) Bottom of cabinet 3) Left upright of the cabinet or 4) right upright of the cabinet

2.1.5. The plug-in identification information shall not be covered.

2.1.6. Within transport and power areas all equipment lineup end guards shall be identified with their aisle designation only. Individual bay identifiers are not required. If applicable even/odd identifiers are to be placed below the aisle identifier.

2.1.7. Dedicated cable racks reserved for specific purposes (power, un-fused power cable, fiber optics, etc.), shall be designated except as noted below.
   a) Designations shall be placed on the outside of both stringers at the beginning, end and at intervals not to exceed 10 feet on horizontal cable rack.
   b) These designations shall specify the purpose for which the cable rack is dedicated, followed by the word “ONLY” (e.g., power cable only, un-fused power cable only, fiber optic cable only, AC whip only, etc.).
   c) Designations shall be made 4½ to 5½ feet from the floor on vertical cable rack.
   d) Designations are not required if the cable rack is dedicated for fiber optic cables and is either yellow or orange in color.
   e) Designations are not required for switching equipment cable racks.

2.1.8. The AT&T job order (TEO) number shall be stamped or labeled on the front of all new equipment bays and units on the left side. If space does not permit the placement of this information on the front of the unit, then the information may be placed on the frame upright adjacent to the equipment unit. The AT&T job order (TEO) number shall be placed on each unit of a partially equipped bay. If placed only once on a fully equipped bay this information shall be placed on the top left or bottom left upright of the bay. It shall be placed on each unit of a partially equipped bay. Plug-ins, Distribution frame blocks and other minor items do not require the placement of a job order number.

2.1.9. Equipment mounted in cabinets, or cabinetized racks that have removable doors, covers, or finishing details, shall have the designation stamped on both the cabinet framework, and the doors, covers, and finishing details. The designation shall be placed on the doors, covers, or finishing details in approximately the same location as it would be on the framework.

2.1.10. Flag markers with near and far-end termination details shall be placed on the un-terminated end of wire that is reserved for future use.
   a) Does not apply to intra-bay wiring (i.e. switchboard cable and p-wire, etc.)

2.2. Transport

2.2.1. When communication panels are to be added, which are to be multiple to an existing panel, the multiple destinations shall be designated on the rear of both the new and existing panels.
2.2.2. Designation(s), with near and far-end termination details (e.g., shelf/bay/DF block, circuit number, TX/RX, etc.), shall be placed on both ends of un-terminated cables reserved for future use (by AT&T) or for collocation interconnection (by the CLEC). (Refer to Figure L-2)

Note: In the case of CLEC cables, the DS0 cable tag needs to include what is designated at the MDF block. CLEC cable name and Line Splitter if designation includes Line Splitter, e.g., XXX01 (cable name) 1-100, 101-200, etc. (pairs), OE 001(bay). 01 (shelf)-001-100 (ports), CP001 (bay). 01 (shelf)-001-100 (ports). For Fiber, DS1 and DS3 cables, the Transmit and Receive leads shall be tagged separately. (For MDF Example Refer to Figure L-2)

2.2.3. The Installation Supplier shall designate both-ends of all inter-bay transport cables, alarm cables/wires, Ethernet cables, etc. with the applicable near-end and far-end termination information (bay number, shelf, slot, port/jack/WL#, etc.), and AT&T job order number. Refer to Figure L-2 for examples. Technology Center Ethernet ties do not require cable labeling as patch panels are cabled completely in pairs and only the patch panel is labeled. Installations with only one patch panel shall have at minimum, far end information, on the patch panel.

2.2.4. The Installation Supplier shall designate terminations associated with CLEC interconnection cabling, showing the minimum label requirements as reflected in Table L-2.

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Term Type</th>
<th>Minimum Label Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS0</td>
<td>100 PR Block</td>
<td>Refer to Drawing ATT-E-01891, Figure 3</td>
</tr>
<tr>
<td>DS1</td>
<td>84 Term Panel</td>
<td>ACNA / Panel / Jack (i.e. SUV 04 01 – 56)</td>
</tr>
<tr>
<td>DS3</td>
<td>24 Term Panel</td>
<td>ACNA / Panel / Jack (i.e. SUV 05 01 – 03, 8, 10 – 12)</td>
</tr>
<tr>
<td>Fiber</td>
<td>72 Fiber Term Panel</td>
<td>ACNA / Panel / Jack (i.e. SUV 03 01 – 24, 49 – 72)</td>
</tr>
</tbody>
</table>

2.2.5. The Installation Supplier shall designate the TID (Target ID) on the added equipment shelf when the NMA TID or equivalent (e.g. Granite Shelf ID, CLLI code) is included in the TEO and shall follow the format as specified in the equipment drawings when provided. The TID designation shall be placed on the front center portion of the shelf. If the front center portion of the shelf is not available, the designation shall be placed on any available space of the shelf or on the left bay upright.

2.3. AC Power

2.3.1. Power Service Cabinets (PSC’s) shall be supplied from the House Service Panel and are used for building distribution loads.

2.3.2. Power Distribution Service Cabinets (PDSC’s) shall be supplied from the House Service Panel and are dedicated to DC power plants.

2.3.3. Protected Power Service Cabinets (PPSC’s) shall be supplied from the UPS or inverter systems and serve AC protected power network elements.

2.3.4. AC building-type loads shall not be commingled with critical loads in PDSC’s and PPSC’s
2.3.5. Power Distribution Service Cabinets (PDSC’s) and Power Service Cabinets (PSC’s) shall be designated with name, number, voltage, phase and type of service, e.g., PWR DISTG SERVICE CAB 101 200A 240/120V 1PH/ 3W FED BY PANEL “X - CB#,” or PWR SERVICE CAB 101 200A 240/120V 1PH/ 3W FED BY PANEL “X - CB#,” (Refer to Figure L-6)

2.3.6. Protected Power Service Cabinets shall be designated with the PPSC cabinet designation, UPS system number or inverter system, voltage and phase. Refer to Figure L-7 and Figure L-8 for examples.

2.3.7. AC power service cabinet circuits shall be designated (labeled or stenciled, not handwritten) beside the circuit breaker or on the designation card with the location of the circuit being served and the circuit breaker amperage.

2.3.8. All hardwired AC powered equipment shall be designated with a 145 type tag (within six inches of the connection) with the location of power source and the circuit breaker number of the power source.

2.3.9. All AC outlets and light switches shall be designated with the location of the power source and circuit breaker number or inverter frame location. AC power strips with multiple outlets (such as those used with data mountings) shall be designated same as above once near the first outlet on the strip.
   a) Disconnected switches left in place because blank plates are not available shall be designated “DISCONNECTED” or “INACTIVE”.
   b) Lighting and equipment switches and AC circuits associated with the building facility not in place to provide service and illumination in the work environment (e.g. Thermostats, wall outlets, fluorescent ceiling lights, etc) are exempt of the TP requirements and shall follow the circuit designation requirements of the building management organization.

2.3.10. Voltage on all AC outlets shall be designated on or adjacent to the cover plate above the outlet for all voltages greater than 120 volts AC.

2.3.11. New end guards and existing end guards for all retrofitted lighting aisles controlled by motion sensors shall be designated at a height of between 5’ and 6’ with the location of the power source and circuit breaker number for the lighting circuit and a direction arrow to indicate to which aisle the information applies. See example below:

**Lighting (Motion Sensor Controlled)**

Panel #

Circuit #

[Diagram showing arrows indicating which side(s) of the line up the lighting is controlled by motion sensors]
Use a 1” Brother P-Touch or similar labeling device with three rows of text per label as illustrated by the photograph below.

2.3.12. "Disconnect AC Before Opening" shall be designated or labeled on trolley coupling or end cap.

2.3.13. All AC circuits originating in miscellaneous or building electrical panels (PSC’s) shall be designated (labeled or stenciled, not handwritten) on the panel schedule card.

2.3.14. Foundation Distribution Cabinets (FDC’s) shall be supplied from the UPS or inverter systems and serve AC protected power network elements.

2.3.15. Inverter fed AC power service cabinets shall be designated with name, number, voltage and type of service, e.g., Protected Power Service Cabinets, PPSC CAB 001 208V AC 60 HZ 3PH 4W. Refer to Figure L-7 and Figure L-8 for examples.

2.3.16. All AC powered equipment with power cords greater than 6 feet long shall have the power cords labeled at both ends with a 145 type tag. Designations shall include the near and far end information.
2.3.17. All AC powered equipment with power cords less than 6 feet long shall have the power cords labeled at the plug end with a 145 type tag. Designation shall include the near and far end information.

2.3.18. All 145 type tags shall be secured with multi-strand waxed cord, with a sufficient pigtail to allow the tag to be rotated for viewing. Tags equipped with metal rings shall have the ring removed. The tag size shall be between ¾” to 1” wide, by 1¼” to 1¾” in length.

2.4. DC Power

2.4.1. Power Boards (PBDs)

a) All fuse and circuit breaker positions shall be designated with frame location, fuse/circuit breaker size, load, and, if applicable, fuse panel number or equipment unit.

b) Fuse or circuit breaker numbers shall be designated on the front and back of the panel.

c) The numbering convention for existing power plants shall be matched.
   1. A supplemental PBD added to an existing power plant shall follow the numbering convention already in place for that plant.
   2. Panels added to an existing PBD shall follow the numbering convention already in place for that plant.

d) New power plant PBDs shall be numbered in bay.panel.fuse format. The panel and fuse sequence will be similar to BDFBs; bottom to top, left to right (viewed from front), on a per bay basis. Reference standard drawing ATT-05400-E for typical PBD configurations.
   1. PBD individual bays shall be designated with the bay floor plan location per the standard FLLLLL.BB designation. E.g., if the PBD bay is located at 010100.08, then that PBD bay shall be designated as 08.panel.fuse in the database of record. Each supplemental PBD bay shall be numbered similarly, using its floor plan bay location.
   2. Each panel position shall be designated as its peak mounting height in either inches or rack units (RU). e.g., if a panel occupies inches 1 thru 8 of the power distribution bay, it will be designated panel number 8. A second panel that occupies inches 9 through 16 will be designated as panel number 16.
   3. The bottom left fuse position on each panel shall be designated as 1. For vertical split panels, the fuse positions will be counted in odd increments on the left, and even increments on the right (viewed from the front of the PBD).

Exception: When a PBD manufacturer hard codes a fuse position number convention in the power plant controller, then the manufacturer dictated convention shall be followed. The AT&T format of bay.panel.fuse shall still be in effect.

2.4.2. Miscellaneous Fuse Bays and Panels

a) The Installation Supplier shall designate fuse panels in a miscellaneous fuse bay with row designation in configurations with multiple fuse panels and voltage designation.
2.4.3. Power Distribution Units (PDUs, aka Fuse and Alarm Panels (FAPs))
   a) The Installation Supplier shall designate fuse panels in a single bay with row designation in configurations with multiple fuse panels and voltage designation.
   b) The Installation Supplier shall ensure that miscellaneous bay mounted fuse panels have a fuse record book, fuse assignment card or plate mounted on the bay upright adjacent to the fuse panel.
   c) The Installation Supplier shall record equipment additions, amperages and fuse positions on the fuse designation card, record book, or bay mounted designation plate.
   d) Fuse record book covers shall be designated with “Fuse Record” and bay location.
   e) Fuse record card covers in PDUs shall be designated with the bay location and if applicable, the fuse panel number.
   f) The Installation Supplier shall stamp, label or type added circuits on fuse record book sheets with black ink, or use lettering guide with permanent black ink. A marking pen may be used.
   g) Correction fluid shall be used to remove circuit information from the fuse record book for circuits removed from fuse panels.
   h) The fuse record sheet shall be retyped after a maximum of 5 handwritten additions, removals or corrections. Replacing pages shall be of the same size as existing pages.

2.4.4. BDFBs and Secondary Power Distribution Units (SPDUs)
   a) Alarm fuses in BDFBs/SPDUs not mounted adjacent to the discharge fuse shall be designated to associate them with discharge fuses.
   b) All fuse and circuit breaker positions shall be designated with frame location, fuse/circuit breaker size, load, and, if applicable, fuse panel number or equipment unit.
   c) Fuse or circuit breaker numbers shall be designated on the front and back of the panel.
   d) At the BDFB/SPDU, power load (e.g., A, B, C or D) shall be designated on the shelf (panel).
   e) The Installation Supplier shall designate on the front of the BDFB/SPDU (under meter, if applicable) the size and location of the primary fuse or circuit breaker feeding the BDFB/SPDU. (See AT&T Drawing ATT-P-05410-E for an example of the labeling designation.)
   f) The actual engineered one way voltage drop shall be designated on the BDFB/SPDU near the power board designation per ATT-P-05410-E Figure #6.
   g) BDFBs/SPDUs shall be numbered from bottom to top, starting with “1.” On horizontal panels the count will start at the bottom left and go to right. Each fuse position shall be designated with its panel and fuse position number, e.g., 2.15 (fuse panel 2, fuse position 15). See AT&T Power Drawing – ATT-P-05400-E for specific BDFB/SPDU designation requirements.
Exception: When an SPDU/BDFB is provided as part of a turnkey solution and the SPDU/BDFB is dedicated to the turnkey solution it may follow the numbering convention assigned by the manufacturer.

In these instances, the SPDU/BDFB shall be stenciled as being dedicated to the specific piece of equipment and if entered into a capacity tracking system (e.g. TAB/db, Irma), notes shall be placed in the inventory system that the SPDU/BDFB is not available for assignment to any equipment other than the equipment for which it was installed."

h) External BDFB/SPDU battery return bus bars or the supporting auxiliary framing shall be stamped with the BDFB/SPDU number associated with the bus bar. If the auxiliary framing is designated, the designation shall be located directly above or below the return bus (within 12 inches) and shall also include arrows.

2.4.5. Bus bars outside the power plant area shall be designated with potential and group designation (such as "-48V Load A," "Battery Return," etc.) in 3/4-inch lettering.

2.4.6. Battery Racks

a) The battery rack shall be designated with:
   1. Polarity, Voltage (e.g. -48V) and String ID
   2. Battery cell manufacturer, model and capacity
   3. Battery manufactured date
   4. Date installed
   5. AT&T job order number
   6. Battery rack manufacturer and model number

b) The designation shall be placed on the right side of the rack upright or shelf as to match existing applications where applicable; if the right side of the rack is against the wall, the front of the upright shall be used. (See Figure L-11)

c) All characters shall be 3/8 inch, with the exception of string identification which shall be ¾ inch.

d) The battery stand shall be designated to indicate the selected pilot (P) cell and the position number of each cell.

2.4.7. In order to provide a reference for PDSC assignments, plug-in rectifier bays shall be labeled to indicate rectifier slot assignments using the G1, G2, G3 format. If sufficient room does not exist on the front of the bay for the labels then a sheet designating the assignments will be placed in a plastic holder and attached to the front of the bay (not obstructing airflow).

2.5. 145 Tag Requirements for DC Power (Refer to Figure L-9)

2.5.1. All 145 type tags shall be secured with multi-strand waxed cord, with a sufficient pigtail to allow the tag to be rotated for viewing. The tag size shall be between ¾” to 1” wide, by 1¼” to 1¾” in length.
2.5.2. Except as noted below, the Installation Supplier shall place 145 type tags with the far end designation, on all battery and battery return leads. For leads connected to the battery return bus bar, the associated fuse number shall also be designated on the 145 type tag.

a) When a network element is installed in a bay and the battery and battery return leads run to a fuse panel within the same bay, the Installation Supplier shall update the fuse designation card or fuse record book, indicating designation of shelf. 145 type tags or equivalent are not required on battery and battery return leads at the network element or fuse panel.

b) When a network element is installed in a bay and the battery and battery return leads run outside the bay to a fuse panel in a different bay, the Installation Supplier shall place 145 type tags or equivalent on the battery and battery return leads at the rear of the network element showing far end designation. When battery and battery return leads utilize 16 gauge or smaller wire, one 145 type tag can be used for both leads. 145 type tags or equivalent are not required at the fuse panel if the fuse panel is equipped with designation card or fuse record book. The designation card or fuse record book shall be updated.

c) Battery and battery return leads internal to switching systems do not require 145 type tags.

d) When the cables in question do not utilize a typical cable routing system, i.e. ladder type cable rack, and both ends of said cables are visually traceable.

2.5.3. Any un-terminated ends of power cable shall be equipped with a 145 type tag designating the far end termination.

2.6. BITS Shelves

2.6.1. Building Integrated Timing Supply (BITS) shelves shall be designated in accordance with AT&T Standard Equipment Drawings.

2.6.2. Shelf labels shall be placed on the front face panel of the wire wrap panel above each BITS shelf in accordance with Table L-4. SHO/VHO Shelf labels shall be placed on the front face panel of the BITS shelf in accordance with Table L-4.

2.6.3. Designation markers for "near and far-end identification" shall be placed on each BITS to NE timing cable 2 to 6 inches from the butted end of the cable at both the BITS end of the circuit and at the network element end of the circuit. (Refer to Figure L-2). SHO/VHO Designation markers for "far-end identification" shall be placed on the cable 2 to 6 inches from the butted end of the cable at both the BITS end of the circuit and at the network element end of the circuit. (Refer to Figure L-2)

2.6.4. All cable markers shall be white with black letters.

2.6.5. BITS record books shall be maintained only where they currently exist. BITS records books shall not be created for locations for which they do not currently exist. The Installation Supplier shall type, stamp, or label (never handwritten) all designations on the designation markers. Where BITS record books are maintained, the installation supplier shall type or stamp all entries in the BITS record book, or shall supply an updated hard copy of
assignments from the regionally approved record keeping system (e.g. TAB/db, SyncTrac, or GeoLink). See 2.6.10 for additional information on BITS record books.

2.6.6. "P" or "S" shall indicate Primary and Secondary designations. Primary is equal to Lead A, Secondary is equal to Lead B.

2.6.7. The designation marker at the network element end of each BITS to NE timing cable shall contain the near and far-end terminating location of the BITS shelf including the bay, shelf, slot/Group, port, and primary or secondary. (Refer to Table L-4) SHO/VHO designation markers at the network element shall contain the far end terminating location of the BITS shelf including the bay, shelf, slot, port, and primary or secondary. (Refer to Table L-4) The designation marker at the BITS shall contain the far end terminating location. For a single timing lead to an entire bay (i.e. D4, SLC 96 bays etc.), the bay location designation is sufficient. If multiple leads are supplied for timing within a single bay (i.e. SONET ADMs, SLC SERIES 5 bays etc.), each termination shall be individually addressed. SONET ADM designations shall include the bay and shelf locations.

2.6.8. The designation marker at the BITS end of each BITS to NE timing cable shall contain the near and far-end terminating location. For a single timing lead to an entire bay (i.e. D4, SLC 96 bays etc.), the bay location designation is sufficient. If multiple leads are supplied for timing within a single bay (i.e. SONET ADMs, SLC SERIES 5 bays etc.), each termination shall be individually addressed. SONET ADM designations shall include the bay and shelf locations.

2.6.9. When replacing a Timing Signal Generator (TSG) and reusing the existing wire wrap panels, the cables between the new TSG and the wire wrap panels shall be labeled on each end per the instructions included in the Engineering Requirements documents.

2.6.10. For existing BITS record books the Installation Supplier shall designate the far end termination in the record book. If a database record is placed as the designation in the BITS record book, it shall be fastened in the book using the securing screws of the book. Plastic pouches and sleeves shall not be used.

2.7. Distributing Frames

2.7.1. The vertical side of distributing frames shall be designated as follows:

a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the vertical stiffening bar between the transverse arms for each shelf. The label or stamp shall be placed between the transverse arm of the vertical being identified and the next higher vertical (i.e. the label for vertical 5 would be placed between the transverse arms of verticals 5 and 6). When the frame block is added, designate the shelf letter on the lower right front of the frame block.

b) Designate the 7th (G) shelf from the floor with the vertical number at the end of the transverse arm for each vertical (i.e. 1, 2, 3…). When a frame block is added, designate the vertical number on the lower right front of the frame block.
c) Where the shelf and vertical designations intersect, designate the location with the vertical number first, followed by the shelf letter, (i.e., 1G, 5G, 10G…).

2.7.2. The horizontal side of the distributing frame shall be designated as follows:
   a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the horizontal stiffening bar between the transverse arms for each shelf. When the frame block is added, designate the shelf letter on the lower right front of the frame block.
   b) Designate the fourth (D) and the tenth (K) shelf with the vertical number on the horizontal stiffening bar between the transverse arms. When the frame block is added, designate the vertical number on the lower right front of the frame block.
   c) Where the shelf and vertical designations intersect, designate the location with the shelf letter first, followed by the vertical number, (i.e., D1, D5, D10…).

2.7.3. On the vertical side of distributing frames, circuit numbering within the block shall be from top down. Vertical block placement, low count to high count, shall follow the existing pattern unless directed otherwise by the TEO. On the horizontal side, circuit numbers shall be numbered from left to right (facing the front of the terminal strip).

2.7.4. Cable board designations shall include vertical number, cable number, cable pair count, pair gain number and pair gain count.

2.7.5. The Installation Supplier shall stamp or label distributing frame blocks and/or covers as instructed in the TEO or drawings. The minimum requirements are:
   a) Functional lead designation for each circuit type (at least one row per terminal strip)
   b) Circuit designation (by name or drawing number)
   c) Equipment location (relay rack number, etc.)

2.7.6. When new equipment is added, the inside and outside cover(s) of the frame blocks shall be updated.

2.7.7. For cables going to CLECs, the Installation Supplier shall designate distributing frame blocks and/or covers per drawing ATT-E-01891-E Figure 3.

2.7.8. “Tip” designation shall always precede the “Ring” designation.

2.7.9. The cable pair information shall be designated on COSMIC frames designation cards.

2.7.10. For COSMIC frames blocks, labels are created manually unless the frame is owned by one of the Telco legal entities. For Telco jobs the FRAMEMATE program can be used to create the labels.

2.8. Grounding Designations

2.8.1. The Installation Supplier shall place 145 type tags or equivalent on ground cable terminations; however, grounding conductors do not require identification of short runs when both ends are clearly visible from a point on the floor. The tag shall be designated to show the far end termination.
2.8.2. The Installation Supplier shall designate bars associated with the CO grounding system or isolated bonding network with the functional designation of the bar in 3/4-inch lettering. This includes the CO Ground Bar, Main Ground Bar (MGB), Office Principal Ground Point Bus (OPGPB), etc., and collection bars or splice plates such as Common Bonding Network (CBN) collection bar, Integrated Ground Splice Plate (INGSP), Frame Bonding Equalizer (FBE), etc. A sign at the bus bar may be used instead of stamping at the discretion of the ATT Representative.

2.8.3. The MGB shall be identified with minimum 3/4" letters by way of stamping, stenciling or a designation plate. The designation shall be located so that it is easily visible from the floor. The designation may be directly on the bus bar or on the supporting cable rack or ironwork adjacent to the MGB.

2.8.4. The MGB portion of battery return bars shall be identified using stenciling or an identification plate. Lines and arrows shall also be used to identify the boundaries of the MGB.

2.8.5. The Installation Supplier shall designate the CBN side of the MGB with "Common" and the isolated side of the MGB with "Isolated". A separation line shall be designated on the MGB to delineate the two sides. SHO/VHO terms used in designations for IS POP/VHO GRD bus bars shall be either "POP/VHO GRD", "POP GRD", "VHO GRD". For OPGP bus bars, the terms used in the designations shall be "OPGP", "O.P.G.P." or "Office Principal Ground Point". Terms such as "Telco Ground" or "Telephone Ground" shall not to be used.

2.8.6. Certain CO grounding system conductors shall be equipped with a brass or plastic laminate tag with the phrase "DO NOT DISCONNECT" designated on the tag. The letters shall be 3/16" minimum. The following conductors shall always be equipped with this tag:
   a) Conductor from earth electrodes
   b) Grounding conductors at a water pipe
   c) Grounding electrode conductors from a house service panel or other source of a separately derived system (transformer, UPS, etc.)
   d) Horizontal equalizer connections at a bus bar
   e) Vertical equalizer connections at a bus bar
   f) Both ends of a power plant's DC system grounding conductor
   g) Both ends of grounding conductors between a protector frame and an office bus bar.
   h) Conductor serving a cable entrance facility.

3. FIBER OPTIC LASER WARNING LABELS

3.1. Requirements

3.1.1. Manufacturer supplied fiber optic warning labels shall be applied to the equipment per manufacturer's specifications.
4. OTHER DESIGNATIONS

Cables or jumpers installed but not designated for anything shall be flagged with the "from" location, "to" location and the word "SPARE" followed by a unique number (e.g. Spare #1, Spare #2, etc).

4.1. DSX

4.1.1. Digital system cross connect (DSX) panels equipped with manufacture supplied front designation strips/panels shall be designated with far-end connection information. SHO/VHO Digital system cross connect (DSX) panels shall be designated on the front of the panel with network element connection information as leads are terminated on the panel (not required on rear). The following information shall be provided on designation strips of the DSX panel:
   a) Frame/module name and number or relay rack number.
   b) Circuit number (such as channel, bank, repeater, multiplexer, fiber terminal, etc.).
   c) Jack positions shall be labeled with the first, last, and at least every fifth jack with its associated circuit number within the group.
   d) On DSX-3 panels, one designation area shall be reserved for AT&T use.
   e) Place a circuit limit designation (brackets) when designating frame terminal strips or DSX jacks. This designation shall indicate the beginning and end of circuit terminations. It shall also be used to separate group, sub-group, functional and numeric designations.

4.1.2. Cables carrying DS-0 and DS-1 signal shall have at both ends of the cable identified with a single flag style designation with near and far-end designations at the cable butting point. The designation shall contain the Near-End information (located on the upper portion of the label), the Far End information (located on the bottom portion of the label), the RR code, Jack #, and AT&T Job order number.

4.1.3. Multiple DS-3 cables under one sheath (6 pack, 8 pack, etc.) shall have at both ends of the cable identified using a single flag style marker with near and far-end designations. The designation shall contain the Near-End information (located on the upper portion of the label), the Far End information (located on the bottom portion of the label), the FIC, Jack #, AT&T job order number and the Engineered Coaxial Cable Length from the Network Element to the DSX-3 panel or the Engineered Coaxial Cable Length from the Network Element to the Network Element if no intermediate DSX-3 panel exists in the circuit. [Example: 245ft] to be placed at the right side of the marker as, shown in Figure L-2.
   a) The designation shall be applied at the point where the cable is butted (to allow for each individual cable to be easily identified).
   b) If the cable sheath is not butted upright at a point level with the cable termination as stated in 4.1.3.a) the designations shall be applied to each individual cable.

4.1.4. Individual cables carrying DS-3 signal shall have at both ends of the cable flag style markers with near and far-end designations. The designation shall contain the Near-End
information (located on the upper portion of the label), the Far End information (located on
the bottom portion of the label), the FIC, Jack #, AT&T job order number and the
Engineered Coaxial Cable Length from the Network Element to the DSX-3 panel or the
Engineered Coaxial Cable Length from the Network Element to the Network Element if no
intermediate DSX-3 panel exists in the circuit. [Example: 245ft] to be placed at the right side
of the marker, as shown in Figure L-2.

a) When an individual cable is disconnected, it shall be designated accordingly to insure it
may be properly reconnected.

4.2. FIBER

With respect to this section reference section O 1.2 for acronyms and definitions.

4.2.1. Fiber distribution frame shelves shall be designated according to manufacturer’s
specifications.

4.2.2. If the manufacturer does not provide designations, the fiber terminations will be identified
every 6 couplers top to bottom i.e. 1-6, 7-12 etc. left to right on the front and right to left on
the rear of the shelf covering the full count of the shelf.

4.2.3. Fiber termination panels shall have far end termination designations (frame location, panel
and port) placed on the following.

a) At the front of the panel or manufacturer provided assignment card.

b) If the fiber termination panel is for dedicated use, (e.g., tie pairs, tie cable, OSP Cable,
etc.), the far end frame location, panel and port shall be indicated on the front of the
cover. If inventoried in the provisioning inventory database (e.g., TiRKS, Granite, etc.),
the cable name along with the “A” CLLI code and cable count shall be labeled on the
front of the panel.

The “Z” CLLI code, if provided, shall also be included.

Cable name, A/Z CLLI, and cable count formatting examples:
CABLE 7002/OKLDC0A03/OKLDC0A03 (1-72)
CABLE HY01/HYWRCA01 (73-144)
CABLE W3601/SNFCCA01/SNFCCA01W36 (1-144)"

4.2.4. Labeling conditions for non-terminated fiber cables/patch cords.

a) Individual patch cords or cable breakouts at the NE equipment location shall have both
Near-End (at the top) and Far-End (at the bottom) applicable termination information
placed as a flag style designation label on each individual conductor/breakout.

b) Duplex Type Jumpers/Patch cords shall have a single flag style designation label on
one leg of the duplex with both Near-End (at the top) and Far-End (at the bottom)
applicable termination information.

c) TX and RX fiber designations are not required for fibers that carry bidirectional traffic
(e.g. PON ports on OLT devices).

4.2.5. Labeling conditions for terminated fiber cables/patch cords

L-19
a) All fiber terminations at the rear of the FDF, except for fiber cable with 900μ breakouts, shall not require a label.

Fiber cable with 900μ breakouts at rear of the FDF shall have a single flag style designation label. The designation shall include the Near-End (at the top) and Far-End (at the bottom) information containing the Relay Rack, Shelf, and AT&T job order number. This label is to be placed on outer jacket of fiber cable, not on individual 900μ strands/breakouts.

b) All fiber patch cords at the NE equipment location shall have a single flag style designation label. The designation shall include the Near-End (at the top) and Far-End (at the bottom) information containing the Relay Rack, Shelf, Slot, Port or Jack #, TX or RX, and AT&T job order number.

c) All fiber cable with 1.6mm or 2.0mm breakouts at the NE equipment location shall have a single flag style designation label in each fiber strand/breakout. The designation shall include the Near-End (at the top) and Far-End (at the bottom) information containing the Relay Rack, Shelf, Slot, Port or Jack #, TX or RX, and AT&T job order number.

Note: Fibers used for bidirectional traffic shall not include TX or RX designations on the label.

d) Duplex Type Jumpers/Patch cords at the NE equipment location shall have a single flag style designation label on one leg of the duplex (TX) with the tags at the terminated ends. The designation shall include the Near-End (at the top) and Far-End (at the bottom) information containing the Relay Rack, Shelf, Slot, Port or Jack #, TX, and AT&T job order number.

If each leg terminates on different NEs, or different cards within the same NE then both ends shall have their own label.

e) Multi-stranded cables that terminate on the front side of the OSP LGX/FDP (1.6/2.0mm breakouts) shall have a single flag style designation label in each fiber strand/breakout at both, the OPS NE equipment location and the front side of the OSP LGX/FDP. The designation shall include the Near-End (at the top) and Far-End (at the bottom) information containing the Relay Rack, Shelf, Slot, Port or Jack #, TX or RX, and AT&T job order number.

Examples of the equipment in question are the CIENA 6500 and the CORIANT NSN hiT 7300. These are normally two (2) fiber riser cables.

4.2.6. Fiber panel designations (except NG4 product line) for SM (Single-Mode) and MM (Multi-Mode) use.

a) Fiber panels dedicated for MM fiber shall have a label on the front of the panel designating it “For Multi-Mode use only”.

b) Fiber panels sharing SM and MM fiber shall have a label on the front and the rear of the panel designating it “ports 1-x for Single-Mode use only” and “ports y-z For Multi-Mode use only”.

L-20
c) Fiber panels sharing SM and MM fiber shall get their label updated every time the SM and MM range is changed.

4.2.7. There is no requirement to place a flag marker on any fiber cross connect (cross connect being defined as fibers on the front of an FDP to another front side of an FDP).

4.2.8. The TX and RX designation is not required when both sides of the fiber assembly are terminated to rear of a fiber panel (e.g. cross aisle fiber tie).

4.2.9. Typical Fiber Termination Information (See Figure L-2 for other examples).

a) Fiber Panel (Generic):
   FFAAAA.BB, Panel PP, Jack ZZ (TX or RX or neither)

b) Fiber Panel (NG4 Style):
   FFAAA.BB, Panel P, Tray T, Jack ZZ (TX or RX or neither).

c) Network Element:
   FFAAAA.BB, Shelf XX, Slot YY, Port ZZ (TX or RX or neither)

Fiber distribution frame shelves shall be designated according to manufacturer’s specifications.

4.3. **Cable Hole Designations**

Cable hole and wall designations are documented in the floor plan by the COLD Engineer.

4.3.1. Through-penetrations shall be uniquely identified as follows;

a) The cable hole designation shall be stamped on the top steel cover(s) and face of sheathing channel of floor openings.

b) The cable hole designation shall be stamped on both sides of wall openings. Where multiple covers are involved all covers shall be stamped.

c) Cable hole designations shall be centered horizontally approximately 2 inches from front edge of cover (bottom edge of wall covers).

d) Designations on cable hole sheathing shall be centered horizontally just below the top of the sheathing assembly. Note: Cable hole numbering conventions can be found in Section 4 of ATT-TP-76400

4.4. **Retired In Place Equipment**

4.4.1. Equipment retired in place shall be clearly marked, “RETIRED IN PLACE” with black lettering on a white background. Equipment staged for reuse shall be clearly marked, “DECOMMISSIONED EQUIPMENT” and shall have black lettering on a white background. Follow instructions provided in APEx document ATT-JA-000-003-812, Process to Retire In Place (RIP) or Stage it for Reuse.

4.5. **Information Services Equipment**
4.5.1. When communication panels are to be added, which are to be multiple to an existing panel, the multiple destinations shall be designated on the rear of both the new and existing panels.

4.5.2. 145 type tag(s), with near and far-end termination details (e.g., shelf/bay/DF block, circuit number, TRMT/RCV, etc.), shall be placed on the unterminated end of cables reserved for future use. (Refer to Figure L-3)

4.5.3. The Installation Supplier shall designate terminations showing the minimum label requirements as reflected in SHO/VHO Table L-3.

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Term Type</th>
<th>Minimum Label Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1</td>
<td>84 Term Panel</td>
<td>Relay Rack / Panel / Jack (e.g. 0201.01 / 3 / 1 - 84)</td>
</tr>
<tr>
<td>DS3</td>
<td>24 Term Panel</td>
<td>Relay Rack / Panel / Jack (e.g. 0201.01 / 3 / 1 - 24)</td>
</tr>
<tr>
<td>Fiber</td>
<td>72 Fiber Term Panel</td>
<td>Relay Rack / Panel / Jack (e.g. 0202.05 / 8 / 1 - 72)</td>
</tr>
</tbody>
</table>
### TABLE L-4 – MINIMUM SIZES OF CHARACTERS (inches) FOR COMMON APPLICATIONS ON FRAME AND RACK-MOUNTED EQUIPMENT

(See TP76300 Section L 1.2.9)

<table>
<thead>
<tr>
<th>Designation Location</th>
<th>Size</th>
<th>Designation Location</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aisle End Guards</td>
<td>3/4</td>
<td>HMDF</td>
<td></td>
</tr>
<tr>
<td>RR/Bay Designations</td>
<td>3/4</td>
<td>Terminal Covers - Outer</td>
<td>1/8</td>
</tr>
<tr>
<td>Bay Name (OC 48, D4 CXR etc.)</td>
<td>3/8</td>
<td>Terminal Covers - Inner</td>
<td>1/8</td>
</tr>
<tr>
<td>Equipment Designations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shelf/Panel/Unit Numbering/Lettering</td>
<td>1/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TID</td>
<td>3/8</td>
<td>Fiber Protection System</td>
<td>3/4</td>
</tr>
<tr>
<td>CLEI Codes</td>
<td>1/8</td>
<td>AC Assignments</td>
<td></td>
</tr>
<tr>
<td>Fuse Panel Assignments</td>
<td>1/8</td>
<td>PSC, PDSC, PPSC</td>
<td>1/8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outlet / Switches</td>
<td>1/8</td>
</tr>
<tr>
<td>BDFB, PBD, PDB, PDF etc.</td>
<td>1/8</td>
<td>AC Panels</td>
<td>1/8</td>
</tr>
<tr>
<td>Fuse Position</td>
<td>1/8</td>
<td>Light Switch Aisle Arrow (length)</td>
<td>3/4</td>
</tr>
<tr>
<td>Fuse Assignments</td>
<td>1/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panels</td>
<td>1/8</td>
<td>Battery Stands</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>String ID and Voltage Designation</td>
<td>3/4</td>
</tr>
<tr>
<td>145 type Tags (see Para 1.2.11c for more info)</td>
<td>1/8</td>
<td>Number of Cells</td>
<td>3/8</td>
</tr>
<tr>
<td>DSX Panels</td>
<td></td>
<td>Battery Manufacturer or Model</td>
<td>3/8</td>
</tr>
<tr>
<td>Shelf Designations</td>
<td>1/8</td>
<td>Battery Manufacture Date</td>
<td>3/8</td>
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<tr>
<td>Slot Assignments</td>
<td>1/8</td>
<td>Date Installed</td>
<td>3/8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Battery Rack Manufacturer and Model Number</td>
<td>3/8</td>
</tr>
<tr>
<td>VMDF</td>
<td></td>
<td>Year Completed, TEO, Supplier Name</td>
<td>1/8</td>
</tr>
<tr>
<td>Term Board</td>
<td>3/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable Heading</td>
<td>1/4</td>
<td>Cable Hole Cover, Sheathing, Wall</td>
<td>3/4</td>
</tr>
<tr>
<td>Terminal Covers - Outer</td>
<td>3/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Covers - Inner</td>
<td>1/8</td>
<td>Clock Assignments</td>
<td>1/8</td>
</tr>
</tbody>
</table>
FIGURE L-2

FLAG LABEL EXAMPLES:
*Note: Not mandatory format

- FRONT  ONE SIDED  REAR
  0.50  NEAR: 010101.01 PNL01 JK01RX  FAR: 010202.02 TEO  ***

- FRONT  ONE SIDE  REAR
  0.75  EQUIPMENT NAME  245FT
  NEAR: 010101.01 PNL01 JK01RX  FAR: 010202.02 PNL03 JK01TX  TEO  ***

- FRONT  ONE SIDE  REAR
  1.00  NEAR: 010101.01 PNL01 JK01  CARD03 RX  245FT  CARD 04 TX  TEO  ***

- FRONT  TWO SIDE  REAR
  0.50  EQUIPMENT NAME  245FT
  NEAR: 010101.01 PNL01 JK01RX  FAR: 010202.02 PNL03 JK01TX  TEO  ***

- FRONT  TWO SIDE  REAR
  0.75  NEAR: EQUIPMENT NAME  010101.01 PNL-01 JK-01 TX  245FT  TEO  ***

- FRONT  TWO SIDE  REAR
  1.00  NEAR: EQUIPMENT NAME  010101.01 PNL-01 JK-01  CARD 03 RX  245FT  TEO  ***

- FRONT  TWO SIDE  REAR
  0.50  NEAR: EQUIPMENT NAME  010101.01 PNL01 JK01RX  FAR: 010202.02 PNL03 JK01TX  TEO  ***
FIGURE L-3

145 STYLE DESIGNATION TAGS
*Note: Not mandatory format
MINIMUM

FRONT NEAR  REAR FAR
010101.01  01.01 RX
TEO #1  0.75
 1.25

MAXIMUM

FRONT NEAR  REAR FAR
EOPT NAME  010101.01
01.01 RX
TEO #1

010202.02  03.01 TX

FIGURE L-6 -- POWER SERVICE CABINET LABEL EXAMPLE

PSC 101
120V/240V - 1P/3W

200A Fed By
Panel H10 - CB#3
FIGURE L-7 -- PROTECTED POWER SERVICE CABINET LABEL EXAMPLE

PPSC 01
120V/208V - 3P/4W
200A Fed By UPS 1-A

FIGURE L-8 -- PROTECTED POWER SERVICE CABINET LABEL EXAMPLE

PPSC 03
120V - 1P/3W - 200A
Fed By Inverter 000.28
FIGURE L-9

SOURCE

BATT

LOAD

Notes:

1) An SPDU (BDFB, FAP, etc.) can be a Source or a Load.
2) FLLLLL.BB is bay / relay rack / cabinet designation where:
   FF is the floor,
   LLLL is the lineup, and
   BB is the bay / rack / cabinet.
3) Typical Abbreviations:
   PBD – Power Board
   BDFB – Battery Distribution Fuse Board
   BDCBB – Battery Distribution Circuit Breaker Board
   FAP – Fuse and Alarm Panel
   PDU – Power Distribution Unit
   PEM – Power Equipment Module
   PNL – Panel
   SH – Shelf
   FS – Fuse
   LD – Load
   BAT or BATT – Battery
   RTN - Return
4) “LD-A”, “LD A”, and “LDA” are equivalent and acceptable.
5) Sequence of information and number of lines used may be adjusted to fit within the 145 tag space.
6) “XYZ” is a generic example of a network element name.
Examples – Primary Feeds (PBD as the Source):

- **BDFB**
  - 020110.00
  - PNL 5 LD-E
  - BATT

- **PBD**
  - 00010001
  - PNL 24 FS 1
  - LD-E BATT

- **BDFB**
  - 020110.00
  - RTN LD-E

- **PBD**
  - 00010001
  - PNL 24 FS 1
  - LD-E RTN

- **FAP-2 LD-A**
  - 020112.04
  - BATT

- **PBD**
  - 000100.1
  - PNL 6 FS 3
  - LD-A BATT

- **FAP-2 LDA**
  - 020112.04
  - RTN

- **PBD**
  - 000100.1
  - PNL 6 FS 3
  - RTN LDA

- **XYZ SH1**
  - 020112.06
  - PEM 0-0 LDA1
  - BATT

- **PBD 000100.1**
  - PNL 6 FS 4
  - LD-A1

- **XYZ SH1**
  - 020112.06
  - PEM 0-0
  - RTN LD-A1

- **PBD 000100.1**
  - PNL 6 FS 4
  - RTN LD-A1
Examples - Secondary Feeds (SPDU as the Source):

SPDU / BDFB
- 020112.02
  - FAP LD A BATT
- 020112.02
  - FAP LD A RTN

SPDU / BDFB
- XYZ SH-1
  - 020112.08
    - LD-A1 BATT
- XYZ SH1
  - 020112.08
    - LD-A1 RTN

SPDU / FAP
- XYZ
  - 020112.12
    - SH 1 LD-A BATT
- XYZ
  - 020112.12
    - SH 1 LD-A RTN

BDFB
- 020110.00
  - PNL 5 FS 1
    - LD A BATT
- 020110.00
  - PNL 5 FS 1
    - LD A RTN
- 020110.00
  - PNL 5 FS 2
    - BAT LD-A1
- 020110.00
  - PNL 5 FS 2
    - RTN LD-A1

FAP FS 8
- 020112.10
  - BAT LDA

FAP LD-A
- 020112.10
  - FS 8 RTN

NE

NE (not in same bay)
### SECTION M -- POWER

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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 Changes in this issue of Section M are summarized in Table M-1.

1.1.4 ATT-TP-76400, Section 12 and ATT-TP-76300, Section M are an engineering and installation pair. To minimize redundancy, many common requirements are listed in ATT-TP-76400, Section 12 and the reader of Section M is referred back to Section 12. A few requirements are duplicated in both sections. The lack of duplicating a requirement in Section M does not relieve the Installation Supplier from Compliance. The Installation Supplier shall adhere to all the requirements documented in ATT-TP-76400, Section 12.

1.1.5 Additional power wiring and connecting requirements can be found in ATT-TP-76300, Section K.

1.2. Definitions

1.2.1 Advanced Technical Support (ATS): Local GNFO technical support for power issues, aka Maintenance Engineer.

1.2.2 Alternating Current (AC): A form of electric power where the electric charge periodically reverses direction. Typical waveform is sinusoidal with a frequency of 60 Hz in the U.S.

1.2.3 Authority Having Jurisdiction (AHJ): As defined in the NEC, typically local government Electrical Inspector or Fire Marshal.

1.2.4 AT&T Engineer: The term “AT&T Engineer” will be used in this section to refer to the AT&T representative who is responsible for approving the order to engineer and install the equipment, regardless of organizational structure and job titles - aka, MEI.

1.2.5 AT&T Standard Drawings are equipment bay layout, wiring and Power drawings that are maintained on the TDocs website.

1.2.6 American Wire Gauge (AWG): Wire size standard commonly used in the U.S.

1.2.7 Central Office (CO): Carrier Communications Space containing switching and transport equipment.

1.2.8 Direct Current (DC): A form of electric power where the electric charge flows in one direction only.

1.2.9 DESP: Detail Engineering Service Provider. In this section, DESP refers to the provider of power detail engineering services, including DC power plant, UPS, inverter, and standby generator detail engineering service providers.
1.2.10 **Emergency Power Off (EPO):** EPO is a means to disconnect power to all electronic equipment, HVAC systems, batteries, and shall cause all required fire/smoke dampers to close in Non-Network Space under certain conditions by the AHJ.

1.2.11 **GES** – Global Engineering Support

1.2.12 **Global Network Field Operations (GNFO):** Local Electronic Technicians, Supervisors, etc.

1.2.13 **IDC** – Internet Data Center

1.2.14 **Information and Communications Technology (ICT)** - is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning.

1.2.15 **Installation Supplier** – provider of equipment installation services.

1.2.16 **IS** – Internet Services

1.2.17 **IS POP** is an Internet Services POP. Primary distinction between an IS POP and a general POP is that typically an IS POP is AT&T Partitioned Network Space located in a facility controlled by AT&T that is predominantly used for Carrier Communications Space. See also **POP**.

1.2.18 **Listed:** Per the NEC, “Listed” refers to equipment, materials, or services included in a list published by an organization – typically a Nationally Recognized Testing Laboratory (NRTL) - that is acceptable to the Authority Having Jurisdiction (AHJ) and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose. The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. In this section, “listed on the MML” will also be used to refer to AT&T approved minor materials.

1.2.19 **Manager – Engineering Implementation (MEI):** AT&T Engineer, aka Engineer.

1.2.20 **Minor Materials List (MML):** Minor material approved products list found on the TDocs website. There are two lists applicable to power: AC Power MML, and DC Power and Grounding MML. The term MML will be used in this section to apply to both lists.

1.2.21 **Mobile Telephony Switching Office (MTSO):** Traditional wireless telecommunications equipment building containing switching and transport equipment.

1.2.22 **Nationally Recognized Testing Laboratory (NRTL):** Evaluates products or services and states that the equipment, material, or service either meets appropriate designated standards or has been tested and found suitable for a specified purpose. Underwriters Laboratory (UL) is an example of a NRTL.

1.2.23 **NEC:** National Electric Code, aka NFPA 70.

1.2.24 **NiCad:** Nickel – Cadmium, a type of battery technology.
1.2.25 **NTC** – National Technology Center.

1.2.26 **PBD** – Power Board. The Power Board is the primary distribution point of a DC power plant.

1.2.27 **POP** – Point of Presence. A point-of-presence (POP) is an artificial demarcation point or interface point between communications entities. The term, as used in this section, typically refers to AT&T Network Equipment Space in a facility controlled by another communications provider. It can also refer to AT&T Network Equipment Space in a facility controlled by a different legacy AT&T affiliate. See also IS POP.

1.2.28 **Secondary Power Distribution Unit (SPDU):** SPDU includes Battery Distribution Fuse Board (BDFB), Battery Distribution Circuit Breaker Board (BDCBB), mini-BDFB, micro-BDFB, Power Distribution Cabinet (commonly found in switching systems), Power Distribution Unit (PDU), and Fuse and Alarm Panel (FAP). In this section, “BDFB” will be used to refer to SPDUs that are designed to serve multiple bays of equipment and are typically sourced at a Power Board. “Bay mounted SPDU” will be used to refer to SPDUs typically designed to serve a single bay of equipment and are typically sourced from a BDFB.

1.2.29 **Uninterrupted Power Supply (UPS):** A standby plant typically consisting of rectifier(s), battery, inverter(s), isolation transformer, and AC distribution used to serve AC powered equipment.

1.2.30 **VHO:** Video Hub Office is a building containing video services equipment in Non-Network Space.

1.2.31 **VRLA:** Valve Regulated Lead Acid, a type of battery technology.

1.2.32 **TDocs:** AT&T server that is accessible to approved DESPs that houses AT&T Standard Drawings, Job Aids and Approved Product Minor Material Lists.

### 1.3. General Requirements

1.3.1 The Installation Supplier shall ensure that manufacturer's equipment specifications and documentation provided by the DESP are turned over to local maintenance forces.

1.3.2 The Installation Supplier shall ensure that manufacturer's recommended spare parts provided by the DESP are turned over to local maintenance forces.

1.3.3 The Installation Supplier shall ensure all remote alarms (and local alarms where applicable) are wired in accordance with ATT-P-05010-E “Power Equipment Alarm Standards” drawing, and tested in accordance with ATT-TP-76900.

1.3.4 When adding equipment on waterproof floors, the Installation Supplier shall secure equipment frames to the floor in accordance with ATT-TP-76300, Section B: sub-section “Penetrating Waterproof Environments”.

1.3.5 The Installation Supplier can reference the specific installation requirements for battery, return, and busbar hardware connections that are listed in ATT-P-05100-E.

1.3.6 The Installation Supplier shall verify (with a multi-meter) the absence of voltage on the battery and battery return leads before connecting the leads. That is, when two conducting parts are to be landed, there shall be less than or equal to 0.05V between them.
1.3.7 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed.

1.3.8 Power equipment and busbars shall be protected any time there is installation activity in the immediate vicinity. See ATT-TP-76300 Section B.

1.3.9 Installation Supplier shall ensure BDFB/SPDU Load Demand Worksheet (LDW) requirements detailed in ATT-TP-76300 section E are met.

1.3.10 The fuse assignment record for a new BDFB/SPDU shall be completed by the DESP or Installation Supplier per local practice (either direct in the database or completed form sent to the appropriate AT&T contact) prior to Installation Complete Date.

1.3.11 See ATT-TP-76400 section 12 and Table 12-2 for Working Space requirements.

1.4. DC Power Cable Reuse

1.4.1 See ATT-TP-76400 section 12 subsection 3.5 for requirements governing reuse of DC power cable.

1.5. Power Cables Passing Through a Cable Rack

1.5.1 Power cables passing through a cable rack are limited to the following cases:

a) Unfused power cables (all cases).

b) Existing primary or secondary distribution bays (Power Board or BDFB) where the power distribution bay was originally installed with either primary or secondary cable rack installed directly overhead, requiring primary or secondary power cables to pass thru cable rack rungs.

1.6. Removal Of DC Fuses Or Opening DC Circuit Breakers

1.6.1 Unless stated otherwise in the MOP, the Supplier shall not remove a fuse or open a circuit breaker serving energized equipment. The AT&T GNFO / Operations representative is responsible for opening the circuit on energized equipment.

1.6.2 The Installation Supplier shall ensure that all circuit breakers that are spare, unassigned, or reserved for future equipment are in the "Off" position.

1.7. DC Protection Devices

1.7.1 Fuses and circuit breakers shall be of the type and capacity as indicated in the job documentation. Under no circumstances shall circuit protection devices (fuses or circuit breakers) be placed in parallel in order to increase circuit capacity.

1.7.2 Dummy fuses shall be installed at all open faced and GMT type vacant fuse positions.

1.7.3 Cartridge, knife, and blade type fuses and disconnect switches shall be coated with a thin film of NO-OX-ID “A” anti-corrosive compound prior to fuse installation (on contact surfaces only).

1.7.4 The use of any fuse reducer shall require the authorization of the AT&T Engineer.

1.7.5 Spare circuit protection devices shall be placed in a designated location or turned over to the AT&T Representative at job completion if a spare fuse holder is not provided.
1.7.6 When provided by the DESP, connecting hardware shall be installed on all BDFB/SPDU fuse posts.

1.7.7 Circuit Protection devices shall not be installed or activated on unterminated leads.

1.7.8 The Installation Supplier shall verify that all electrical contact surfaces are not damaged.

1.8. **Battery Post**

1.8.1 The Installation Supplier shall refer to the job documentation and cell manufacturer's documentation for specific requirements and precautions for cleaning and treating cell posts. If the cell manufacturer's recommended procedures for cell post cleaning and preparation differ from those specified in this section, then the Installation Supplier shall contact ATS for direction.

1.8.2 All contact surfaces of flooded lead acid and VRLA battery posts and contact areas of intercell connectors shall be cleaned and coated with a thin film of NO-OX-ID "A" anti-corrosive compound.

1.8.3 All cell post connections shall be made with the proper tools and shall be tightened to the manufacturer’s torque requirements.

1.8.4 When lead-plated details and/or details with elongated holes are used, flat lead-plated or stainless steel washers shall be used under the nut and under the bolt head.

1.8.5 Tin-Zinc coated connectors shall be used when connecting to lead acid-type batteries or battery post terminal adapter plates. Existing stock of lead coated connectors may be used until exhausted.

1.8.6 On new battery string installations, all nuts, bolts and washers shall be stainless steel, unless specified otherwise by the manufacturer. Stainless steel (316 or better grade) is required, and the flat washer shall be 1/8 inch thick. The smooth (rounded) side of the flat washer shall be placed against and not overhang the battery strap or connector lug. Where lock washers are provided by the battery manufacturer, they shall be assembled on top of the flat washer as shown in the ATT-P-05100-E drawing.

1.8.7 The threaded portion of bolts on intercell connectors shall not be installed to have exposed threads past the nut more than the equivalent diameter of the bolt.

2. **DC BUSBARS**

2.1. **Assembly**

2.1.1. The Installation Supplier shall use zinc-chromium plated SAE J429 ASTM B117 & B633 specifications or ASTM B99 silicon bronze finished busbar joint, fastening and support bolts, nuts, washers, etc. as listed on the Minor Material List. The hardware shall be American National Coarse with a Class #2 Fit. Busbar runs shall be supported on a maximum of 6 feet centers. Each length between joints shall be supported on both sides of a mechanical splice. Typical supports are within 6 inches of the end of the busbar. The unsupported length of a busbar section cantilevered beyond the last support shall not exceed the lesser of 18 inches or 25% of the length of the busbar section. E.g., for a 3 foot busbar, then the maximum cantilever is 25% of 3 feet, or 9 inches. Reference Figure M-5 – Busbar Support Distances.
2.1.2. Busbar runs supported by ceiling inserts, threaded rod and/or auxiliary framing channels shall be braced, both side and lengthwise, according to AT&T seismic requirements.

2.1.3. Except for the auxiliary framing bar supporting the red insulator, busbars shall be installed at least one foot from metal pipes, cable racks, conduit, auxiliary framing, etc., unless approved by the AT&T Engineer or Power ATS representative. In no case shall this distance be less than three (3) inches.

2.1.4. New busbar installations shall be a minimum of 7’3” and a maximum of 9’3” above finished floor (AFF), as measured from the bottom of the bar. Additions to existing busbars outside these limits may continue at the current height of the existing busbar.

2.1.5. The busbar shall be insulated from all supporting ironwork with approved (DC Minor Material List) insulators.

2.1.6. Exposed busbar splice plates with plant voltage potential, located outside the power plant environment, (e.g. above or below secondary power distribution frames, cable rack, auxiliary framing, etc.,) shall be protected, in order of preference:
   a) With non-combustible covers (V-1 or better rating), or
   b) Have each busbar and its associated cable connectors wrapped with two half-lapped layers of plastic insulating tape.

2.2. Connecting Busbars Together

2.2.1. Existing aluminum busbars or details shall not be connected directly to heat producing devices. Examples are:
   a) Fuse terminals
   b) Switch terminals
   c) End cells

2.2.2. Aluminum busbars shall not be tapped for fastening terminal lugs or for fastening bar to bar. Use through-bolts or clamp joints.

2.2.3. Only American Standard Unified Course (UNC) Grade 5 threads and hardware shall be used on all external power plant and busbar connections (internal manufacturer power plant connections may be metric as long as there are no requirements for field installation interaction).

2.2.4. High spots, sharp edges and burrs shall be removed from all electrical contact areas, before assembly, to maximize continuity. Contact surfaces shall be flat.

2.2.5. Plated contact surfaces shall be cleaned without using abrasives coated with a thin film of NO-OX-ID “A” anti-corrosive compound and then assembled in a timely manner.

2.2.6. All non-plated contact surfaces shall be cleaned with a fine abrasive material coated with a thin film of NO-OX-ID “A” anti-corrosive compound and then assembled in a timely manner.

2.2.7. Joints between laminated busbar sections shall be made with square clamps. At such busbar joints, the busbar laminations shall overlap each other not less than the width of the busbar. At such busbar joints, a busbar section ending at the clamp shall not extend farther than 2 inches.
beyond the nominal square dimensions of the clamp. For example, a 6"x6" clamp must have at least 6" of material in the clamp and can have up to 2" of material protruding beyond the clamp where the busbar section is ending. See Figure M-4.

a) Busbar terminations for single lamination battery and rectifier connections shall be permitted to be made with rectangular clamps having their long nominal dimension equal to the width of the main busbar run and their short nominal dimension equal to the width of the busbar termination (drop). For example, in a 6" main busbar run, terminations using a single lamination to connect a battery string or rectifiers may be made using a rectangular clamp such as a 3"x6" where the termination (drop) is 3" wide. See Figure M-4.

b) Note: This requirement does not apply to BDFB external return busbars or CO ground bars, which are not laminated busbars. BDFB manufacturer recommendations shall be followed for BDFB external return busbar extensions.

2.2.8. For through-bolt connections on busbars, flat washers shall be used under the nut and under the bolt head. In addition, a lock-washer shall be used under the nut. (See AT&T Drawing ATT-P-05100-E for assembly details.)

2.3. Busbar Clamps

2.3.1. Clamps that have a busbar contact surface concave in shape are defective and shall not be used.

2.3.2. Busbar clamp bolts shall be equipped with self-locking pal nuts. Non-self-locking nuts shall be torqued per the manufacturer's specifications before applying a pal nut. The pal nut shall be applied with the smooth (flat) side in, open side out, run up to the regular nut, tightened and taken up only one quarter turn with an insulated wrench. On larger clamps, lock nuts may be provided instead of pal nuts. The lock nuts shall be tightened until tension is snug against the regular nut.

2.4. Taping

2.4.1. Two overlapping wraps of plastic electrical insulating tape, (e.g., Scotch 33 or Scotch 88) shall be applied when taping busbars with battery potential.

2.4.2. The Installation Supplier shall tape the portion of the battery return bar in close proximity to live exposed terminals, studs, etc. In power rooms or in power board lineups containing power exclusively, taping is not required.

2.4.3. Busbars, studs, nuts and details having 150 volts or more to ground shall be taped with two layers of friction tape, unless protected by enclosures or barriers.

2.4.4. Power panels and power boards having 150 volts or less shall have exposed details taped when located in open type frames, racks, boards and bays. In power rooms or in power board lineups containing power exclusively, taping is not required.

3. FLOODED LEAD-ACID STORAGE BATTERIES

3.1. General
3.1.1 Batteries shall not be unpacked until the battery stand installation is complete and the Installation Supplier is ready to install the batteries.

3.1.2 The Installation Supplier shall not place cells of different manufacturers in the same string.

3.1.3 When cells in a string are replaced, the replacement cells shall have the same constant current discharge rating (aka ampere hour) or constant power discharge rating (aka watts per cell), the same number of plates and shall have the same manufacturer. KS20472 L1 round cells can be replaced by LS20472 L1S cells.

3.1.4 Battery cells shall not be lifted or moved using the intercell connectors, cell posts or covers; with the exception of the KS20472 round cell battery which is designed to be lifted by the jar cover lip.

3.1.5 The battery marked as the pilot cell shall have a thermometer installed.

3.2. Cautions

3.2.1 While batteries are being charged, the Installation Supplier shall post temporary warning signs in conspicuous locations near the batteries as follows:

**Warning!** BATTERY GASES ARE FLAMMABLE. NO SPARKS OR OPEN FLAME NEAR CELLS.

3.2.2 While batteries are being charged, the following precautions shall be observed:
   a) Provide maximum ventilation (at least 2 air changes per hour).
   b) Before charging, allow the cell to stand at least 1/2 hour on open circuit or on float voltage.
   c) Install explosion vent caps before charging.

3.3. Shipping Batteries for Removal or Reuse

3.3.1 When batteries are removed for non-reuse, procedures described in Section V shall be followed.

3.3.2 Batteries scheduled for reuse shall be inspected by the ATS (or their designees) to determine battery string condition; pressure testing as required (before and/or after redeployment); estimated time for relocation; and pre-determination of expected length of a boost charge where required for input to the engineering cost estimate. The batteries shall be prepared for shipment as follows:
   a) All cells shall be individually marked with the original string cell position number.
   b) All battery records shall be packed with the batteries in a plastic sleeve, taped to cell #1 in each string. Where battery records are not available, a written statement regarding this shall be placed in the plastic sleeve. The date and time the string is removed from float shall also be placed in the plastic sleeve.
   c) Batteries relocated as a complete string shall be reinstalled in the same order as placed in the original installation.
   d) If a string is removed and cells are shipped to different locations for reuse, a copy of the complete battery string record shall be included with each shipment.
e) Miscellaneous battery items such as spark arrestors and thermometers shall be packed and stay with the cell in which they were originally installed.

f) Shipping plugs and filling tube caps shall be firmly installed to prevent electrolyte spillage.

g) Battery terminals shall be protected against short circuits with tape, caps or protective packaging.

h) Battery intercell connectors and associated hardware shall be inspected and replaced as necessary; non-stainless steel hardware shall be replaced regardless of condition.

i) Perform a complete review of batteries at new location(s) as required in ATT TP 76300 Section M, Paragraph 3.4.5.

j) Pressure testing shall be required where specified by the ATT Engineer in the TEO, ATS, or GNFO based on the condition of the batteries prior to shipment and/or when received at the installation site. Jar pressure tests when taken before relocation shall be compared to pressure testing results after the battery relocation and installation. Jar pressure testing at a minimum shall always be done after the batteries are installed on the battery rack.

k) After relocation and installation, the ATS shall verify estimated charge testing requirements for the re-used batteries are sufficient for the condition of the batteries. If additional charging is required over the initial job estimate, the ATS will notify the ATT Implementation Engineering and the Installation Supplier. Boost charging where specified by ATS shall at a minimum meet or exceed manufacturer requirements to maintain the battery warrant.

3.3.3 Batteries shall be packaged and shipped per AT&T EH&S guidelines (contact AT&T Engineer for further information if necessary).

3.4. Cell Unpacking, Cleaning And Inspection

3.4.1 Flooded battery cells shall remain in their protective packaging or be protected from damage until commencement of battery installation.

3.4.2 All cells shall be cleaned and neutralized thoroughly as soon as practical after they arrive on the job. Use a wet cloth in a 5% - 10% baking soda or soda ash solution, squeeze out sufficiently, and wipe thoroughly to neutralize cell top and sides. Ensure that posts, post holes and post seals are thoroughly cleaned.

3.4.3 After neutralization has been completed, the Installation Supplier shall remove salts and residue with water, wet cloth and frequent rinsing. Batteries and/or jars shall be wiped clean until dry to be sure all soda residues have been removed.

3.4.4 Solvents, mineral spirits, commercial detergents, ammonia, or other cleaning compounds or oils, waxes or polishes shall never be applied to the cell jar or lid. When such information is not provided in the job documentation (e.g., cell manufacturer's documentation) only water and baking soda or soda ash may be used.

3.4.5 The Installation Supplier shall make a visual inspection of all batteries shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent their proper installation, maintenance and/or operation.

The Installation Supplier shall inspect for the following defects:
• Breaks in the jar to cover seal.
• Crooked posts.
• Plates improperly supported on the bottom bridge.
• Loose paste material between the jar wall and interior.
• Bent or broken internal parts.
• Cracked jar or cover.
• Scratched, gouged, or chipped jar or cover. Indentations of more than 1/64 of an inch should be reported.
• Hairline cracks around the cell and post.
• Small dots on the post or early signs of post porosity.
• Uneven gaps or flaws in the cover.
• Crystals on plates.
• Low (touching plates) or high (at or above upper level mark) electrolyte level.
• Presence of sprues (raised areas) on the jar.

3.4.6 When uncrating cells, the Installation Supplier shall check for stains or discoloration in the packing material to locate damaged or defective cells.

3.4.7 The Installation Supplier shall install explosion proof vents when cells are first unpacked.

3.4.8 In all geographic areas, batteries awaiting installation shall be secured (strapped together in groups of four or more with non-metallic straps).

3.4.9 Unpacked batteries awaiting installation shall not be covered with a tarp.

3.4.10 Upon installation of a new battery string, the Installation Supplier shall inspect and verify that all voltage-matching stickers are of like color prior to their initial charge. The exceptions being round cell and UPS batteries, which do not supply the stickers.

3.5. Pressure Testing

3.5.1 The following testing requirements apply only when ordered by the AT&T Engineer, or if any battery leakage is found in any of the cells during unpacking:

a) The Installation Supplier shall pressure test all cells. The cells shall be pressure tested after placement onto the stand to assure that they were not damaged during placement. The Installation Supplier may choose to perform an additional pressure test prior to placing cells on the rack (to avoid placing a "leaker"). This, however, does not replace the "on the rack" test.

b) Cells, posts and cover seals shall withstand a pressure of 1/2 pound per square inch for one minute without any noticeable loss in pressure. Do not over pressurize the cells.

c) Document the results of the pressure test on the Pressure Test Record (Figure M-1).

3.5.2 Pressure Test Records shall be turned over to the AT&T Engineer at the completion of the job.
3.5.3 The Installation Supplier shall notify the AT&T Engineer, as soon as practical, if a cell does not pass pressure tests.

3.5.4 Cells that do not pass the pressure test shall not be connected until the cell has been fixed and passed a retest, or is replaced.

3.6. Electrolyte Spills

3.6.1 All spills shall be contained and reported to:

AT&T Environmental Health & Safety at 1-800 KNOW EHS or for Legacy-B locations, 1-888-330-CRES. Refer to Section V, ATT-TP-76300 for additional requirements concerning Electrolyte spills.

3.7. Battery Water

3.7.1 Prior to initial charging, if the electrolyte level is below the bottom fill line, the Installation Supplier shall adjust the electrolyte level to the bottom fill line. No adjustment shall be made if the electrolyte level is above the bottom fill line.

3.8. Battery Preparation

3.8.1 The Installation Supplier shall notify the AT&T Engineer if the electrolyte is above the upper level line when the cells are received at the job site. The Installation Supplier shall NOT remove excess electrolyte for any reason.

3.8.2 A Storage Battery Charge Report (see Figure M-2) shall be maintained on each battery throughout the installing and charging phases of battery installation. A completed copy of the Storage Battery Charge Report shall be provided to the AT&T Representative at job completion.

3.8.3 The Installation Supplier shall check the installed batteries for the presence of crystals. If crystals or other defects are detected, notify the AT&T Engineer. The Installation Supplier shall note the presence or absence of crystals on the Storage Battery Charge Report.

4. BATTERY RACKS

4.1. General

4.1.1 Battery racks shall be positioned, assembled, aligned, grounded, designated and installed as specified in the job documentation, ATT-TP-76300, and the rack manufacturer's documentation.

4.1.2 For personnel protection, creating sparks while working with batteries shall be avoided. To avoid Electrostatic Discharge (ESD), the Installation Supplier shall perform one of the following steps prior to beginning each work operation involving battery work:

a) Firmly touch a grounded metal rack/object or battery termination plate near the return (grounded) end of the battery for the removal of static electricity.

b) If the battery stand is equipped with an ESD ground termination, an ESD wrist/ankle strap may be used for self-discharge. However, it is not the intent to require the technician to wear the device while working on the batteries.
4.1.3 On a two-tier, two string, rectangular, flooded lead-acid battery rack each of the battery strings shall have cell 1 on the bottom tier.

4.1.4 In seismic zones 3 and above, cell separators shall be installed between battery cells. Manufacturer supplied battery container support cradles may be used instead of cell separators if they minimize battery movement.

4.1.5 In seismic zones 2 and below, cell separators or container support cradles shall be installed between battery cells if shipped by the battery manufacturer.

4.1.6 Only materials that meet a limiting oxygen index (LOI) of 28 or higher shall be used as cell separators. (Styrofoam packing material shall not be used as separators.)

4.1.7 When tie rods are required for seismic protection on a battery stand installation, it is permissible to double nut the battery stand tie rod on both ends.

4.1.8 Battery cells shall not touch each other or adjacent framework.
   a) The spacing between the cells in a row shall match the battery manufacturer’s recommended spacing (as specified in the battery manufacturer’s installation documentation). If not specified in the battery manufacturer’s installation documentation, the spacing between the cells in a row should be in the range of 3/8” to 5/8”.
   b) The spacing between the rows of cells shall match the battery manufacturer’s recommended spacing (as specified in the battery manufacturer’s installation documentation). If not specified in the battery manufacturer’s documentation, the spacing between the rows of cells should be greater than ¾”.
   c) Side and end-rail clearance to the battery jar shall match the battery manufacturer’s recommended spacing (as specified in the battery manufacturer’s installation documentation). If not specified in the battery manufacturer’s documentation, side and end-rail clearance should be in the range of 1/32” to 1/8”.

4.1.9 In DC power plant applications, cell/jar number 1 shall be the grounded end of the battery string and cell/jar number 1 shall be installed on the bottom tier when using a two tier battery stand. Battery strings used in UPS applications are ungrounded. In UPS battery applications, cell/jar number 1 shall be the positive end of the battery string and cell/jar number 1 should be installed on the bottom tier when using a two tier battery stand. Reference AT&T standard drawing Battery String Numbering, ATT-P-05322-E.

4.2. Battery Cabling (Unfused)

4.2.1 In DC Power Plant applications,
   a) #4/0 AWG flexible type power cable shall be the standard size and type to be used on 201Ah to 1900Ah battery tier-to-tier or tier-to-termination bar applications.
   b) Size 350 MCM flexible type power cable shall be used on 1901Ah to 4000Ah cells.
   c) #2 AWG flex power cable shall be used on 200Ah and smaller individual strings (typically NiCad, VRLA or Sodium Nickel Chloride).
d) Battery racks that contain multiple strings of batteries (typically 200Ah or smaller), shall use one of the following options to size the cable from the rack collection bar to the termination bar:

1. Use the row in Table M-3 that matches the aggregate Ah of the strings contained in the rack. E.g., a battery rack that contains six (6) strings of nominal 200Ah batteries (aggregate Ah of 1200Ah) may use four (4) #4/0 AWG flexible power cables.

2. When battery discharge and recharge current is limited by either an overcurrent protection device or battery management system (BMS), then the aggregate maximum ampacity may be used with ATT-TP-76400 section 12 Table 12-3 to determine cable size, provided at least two (2) cables per battery rack are provided. E.g., a battery rack that contains six (6) strings of batteries current limited by a 100A breaker per string (600A aggregate) may use two (2) 350MCM flexible power cables. E.g., a battery rack that contains five (5) strings of batteries current limited by a 200A breaker per string (1000A aggregate) may use two (2) 750MCM flexible power cables.

4.2.2 In DC Power Plant applications, cables between the battery posts and battery busbar shall be installed as shown in Table M-3.

Exception: Factory cabling harnesses provided with a battery rack to aggregate multiple strings in a rack shall be as provided by the manufacturer.

Note: Table M-3 is based on 1 to 8 hour discharge rate and standard voltage drop scenarios for DC Power Plants.

UPS battery string cabling shall be sized to meet the UPS manufacturer’s specifications for ampacity (based on the appropriate battery discharge rate) and a 2 volt loop maximum voltage drop.

4.2.3 Cable runs, from busbar drop plates to cell posts shall have sufficient slack to allow 6 inches of movement.

4.2.4 Multi-conductor connections between inter-tier and inter-row battery posts shall be of the same size and length.

5. CHARGING STORAGE BATTERIES

5.1. Introduction

5.1.1 Subsection Subsections 5.2 and 5.6 are applicable to all battery technologies.

Subsections 5.3 through 5.5 apply specifically to flooded lead acid batteries.

Subsections 5.7 through 5.11 are specific to VRLA, Ni-Cad and alternative battery technologies.

5.2. Float, Equalize, and Initial Freshening Charge Voltages

5.2.1 Float, Equalize, and Initial Freshening Charge Voltages shall be per Table M-2:
### Table M-2 – Float, Equalize, and Initial Freshening Charge Voltages per Battery Technology

<table>
<thead>
<tr>
<th>Battery Type</th>
<th>Cell Voltage (V / cell)</th>
<th>24V System</th>
<th>48V System</th>
<th>240 Cell UPS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Float</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Standard</td>
<td>2.20V</td>
<td>26.40V</td>
<td>52.80V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Legacy</td>
<td>2.17V</td>
<td>26.04V</td>
<td>52.08V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.250 SG, UPS</td>
<td>2.25</td>
<td>N/A</td>
<td>N/A</td>
<td>540.00V</td>
</tr>
<tr>
<td>VRLA – 1.250 SG, ATL Series</td>
<td>2.20V</td>
<td>26.40V</td>
<td>52.80V</td>
<td>528.00V</td>
</tr>
<tr>
<td>VRLA – 1.300 SG</td>
<td>2.25V</td>
<td>27.00V</td>
<td>54.00V</td>
<td>540.00V</td>
</tr>
<tr>
<td>Ni-Cad - Standard</td>
<td>1.43V</td>
<td>27.17V</td>
<td>54.34V</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Equalize</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Standard</td>
<td>2.24 - 2.39V</td>
<td>26.88 - 28.68V</td>
<td>53.76 - 57.36V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Legacy</td>
<td>2.24 - 2.39V</td>
<td>26.88 - 28.68V</td>
<td>53.76 - 57.36V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.250 SG, UPS</td>
<td>2.38 - 2.43V</td>
<td>N/A</td>
<td>N/A</td>
<td>571.2 - 583.2V</td>
</tr>
<tr>
<td>VRLA – 1.250 SG, ATL Series</td>
<td>2.29V</td>
<td>27.48V</td>
<td>54.96V</td>
<td>549.60V</td>
</tr>
<tr>
<td>VRLA – 1.300 SG, Use only when recommended by the manufacturer</td>
<td>2.35V</td>
<td>28.20V</td>
<td>56.40V</td>
<td>564.00V</td>
</tr>
<tr>
<td>Molten Salt (NaMx or NaNiCl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Initial Freshening Charge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Standard</td>
<td>2.50V</td>
<td>30.00V</td>
<td>60.00V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.215 SG, Legacy</td>
<td>2.50V</td>
<td>30.00V</td>
<td>60.00V</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooded Lead Acid – 1.250 SG, UPS</td>
<td>2.50V</td>
<td>N/A</td>
<td>N/A</td>
<td>600.00V</td>
</tr>
<tr>
<td>VRLA – ATL Series</td>
<td></td>
<td></td>
<td></td>
<td>Same as Equalize Voltage</td>
</tr>
<tr>
<td>VRLA – 1.300 SG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni-Cad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithium-ion</td>
<td></td>
<td></td>
<td></td>
<td>Follow manufacturer recommendations</td>
</tr>
<tr>
<td>Molten Salt (NaMx or NaNiCl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.2 The Installation Supplier shall provide its own portable battery charger equipped with overcurrent protection and the following specifications:

a) Capable of producing a charge rate of at least:
   i. 25A for 3900 Ah (6.5kW) batteries and larger.
   ii. 20A for 2000 Ah to 3899 Ah (3.4kW to 6.5kW) batteries and larger.
iii. 12A for 1200 Ah to 1999 Ah (2.0Kw to 3.3Kw) batteries.

iv. 10A for smaller than 1200 Ah batteries (< 2.0Kw).

b) For VRLA batteries, the charger must be current limited per battery manufacturer requirements.

c) Constant DC voltage regulation with maximum AC ripple voltage output of 0.5%.

5.3. Initial Charging of Flooded Lead Acid Batteries

5.3.1 Initial charging may be performed off-site so long as charging records are kept appropriately and are available for inspection by AT&T at any time.

5.3.2 Flooded lead acid batteries shall be given an initial freshening charge. Initial freshening charge begins when the batteries are placed on the charger and is complete when all of the following conditions are met:

a) Minimum of 100 hours for all new batteries and batteries stored up to 6 months. For cells stored over 6 months but less than one year, the minimum initial freshening charge time is 225 hours. Cells stored more than one year shall not be installed. If the manufacturer “Charge By” date has been exceeded, contact the local AT&T ATS – Power representative for resolution.

b) Charge voltage and current reach steady state plus 72 additional hours. Steady state is defined as charge voltage and current having little or no appreciable change for at least three consecutive readings.

c) Visual inspection indicates every cell is gassing freely and equally (applicable only to cells that have transparent or clear translucent containers).

d) Visual inspection indicates no crystals present on the plates when examined with a flashlight (applicable only to cells that have transparent or clear translucent containers). Cells with crystals after the initial charge may contain an internal short.

e) Maximum of 250 hours. If a battery string fails to reach steady state or fails to gas freely and equally within 200 hours, contact the local AT&T ATS – Power representative for resolution. If crystals are still present after 250 hours, the cells shall be referred to the local AT&T ATS- Power representative for resolution.

5.3.3 Just before the initial freshening charge is complete, record the parameters specified on the Storage Battery Charge Report (Figure M-2) and the Pilot Cell Charge Report (Figure M-3). Then reduce the charge voltage to normal float voltage and allow the cells to stabilize for 72 hours. After the batteries have completed the initial freshening charge and have been at float voltage for 72 hours, then the Charge Reports can be completed and the batteries are ready to be turned over for service.

Example: Assume that after 60 hours, steady state voltage and charge current have been reached. After 132 hours (60 hours to achieve steady state + 72 additional hours), visual inspection indicates every cell is gassing freely and equally and no crystals are present on the cell plates. Thus at 132 hours, the initial freshening charge is complete and the charge voltage can be reduced to normal float voltage for 72 hours. After 72 hours at float voltage (204 hours total), then the batteries are ready for turnover to AT&T.
5.3.4 Before the initial freshening charge is started, the Installation Supplier shall designate the cell with the lowest specific gravity as the Pilot Cell (aka Temperature Reference Cell). The Pilot Cell shall be located on the lower shelf of the stand. Do not place the Pilot Cell on the end of a stand, near a window, or near a heating/cooling vent.

5.3.5 When more than one string is charged in parallel, the Installation Supplier shall select a separate Pilot Cell for each string.

5.3.6 The Installation Supplier shall record the Pilot Cell number in the appropriate box on the Storage Battery Charge Report (Figure M-2).

5.3.7 The Installation Supplier shall insert a thermometer in the Pilot Cell so the temperature reading can be taken without touching the thermometer. The Pilot Cell is used for the purpose of temperature measurement for the hours of charge.

5.3.8 Just before the start of initial charge, the Installation Supplier shall measure and record on the Pilot Cell Charge Report (Figure M-3) the cell temperature of the pilot cell and ensure it is a minimum of 65°F (18.3°C). If pilot cell temperature is below 65°F, ambient temperature of the site/room shall be increased until the pilot cell temperature reaches this threshold.

5.3.9 The Installation Supplier shall ensure that adequate ventilation is present to prevent the hydrogen concentration from reaching the 1 percent level at any time during the charging process. Warning signs shall be placed near the charge area. For information regarding ventilation requirements, refer to Section 6 of ATT-TP-76400.

5.3.10 Explosion proof vent caps and shipping plugs (for the electrolyte draw-off tubes) shall be firmly in place on each cell during cell charging activities.

5.3.11 Before performing any work functions, the Installation Supplier shall touch any bare metal grounded part of the battery rack to avoid ESD to the batteries.

5.4. Charging Records

5.4.1 The Installation Supplier shall complete the Pressure Test Record (Figure M-1) if a Pressure Test is requested by the AT&T Engineer in the TEO. The Pressure Test is generally reserved for existing strings that may have developed cracks while in service. It is no longer a requirement for new battery installations.

5.4.2 The Installation Supplier shall complete the Storage Battery Charge Report (Figure M-2). This report shall record the voltage, specific gravity, and temperature of each cell at the following intervals:
   a) Prior to start of initial freshening charge,
   b) At end of initial freshening charge, prior to turn-down to float voltage,
   c) After 72 hours at float voltage, and
   d) At turnover to AT&T.

5.4.3 The Installation Supplier shall complete the Pilot Cell Charge Report (Figure M-3). This report shall record the time, charge current, voltage, and temperature of the pilot cell at the following intervals:
   a) At the start of initial freshening charge.
b) Once each hour for the first eight hours of charge.

c) Three times a day after the first eight hours of charge.

d) Just before initial freshening charging is completed or temporarily discontinued if necessary.

e) When charging is restarted (if initial freshening charge is interrupted).

5.4.4 Pressure Test Record, Storage Battery Charge Report, and Pilot Cell Charge Report per ATT-TP-76300 Figures M-1, M-2, and M-3, shall be included in the paper records left on-site, in the email to the AT&T Representative, and uploaded to EJF. Output reports from logging meters are an acceptable reference attachment.

5.5. Electrolyte Level

5.5.1 While batteries are on initial charge, the electrolyte level may rise above the maximum level line. If it should become necessary to remove electrolyte to prevent overflow, the Installation Supplier shall make note of removals on the battery initial charge records. Retain electrolyte for possible reuse at the cell level.

5.5.2 Electrolyte not reused shall be disposed of in accordance with Section V, Hazardous Material and Waste Management of ATT-TP-76300.

5.5.3 After the initial charge, distilled water shall be added to bring the electrolyte midway between the lower and upper level lines. If the electrolyte level exceeds the high mark, the Installation Supplier shall note the high level on the initial Storage Battery Charge Report in the comment section, but shall not make any adjustment in the electrolyte.

5.5.4 The Installation Supplier shall ensure that the full-charge specific gravity of each cell meets the manufacturer's documentation and does not vary by more than 0.015 (15 points) per cell.

5.6. Turnover

5.6.1 The initial charge shall be approved by the AT&T Representative prior to placing the string on-line.

5.6.2 Individual cell voltages shall have a measurement within ± 0.05V of the float voltage listed in Table M-2.

5.6.3 All charged strings shall only be allowed to be removed from float for a period of ≤ 72 hours prior to being placed in service.

5.7. Valve Regulated Cells

5.7.1 The manufacturer’s installation instructions and forms shall be utilized for installation of VRLA cells.

5.7.2 Battery cabling between the battery strings and the bay collection bars shall be continuous; the use of quick-connectors is prohibited.

a) Exception: See ATT-TP-76400 section 12 subsection 2.11 for customer premise application.

b) Exception: The use of a battery quick disconnect is permissible in outside plant configurations.
i. Quick Disconnect devices shall be properly secured in a manner which provides
clearance from moisture/groundwater which may accumulate on the floor of a cabinet’s
battery compartment.

5.8. Initial Charging of VRLA Batteries

5.8.1 New VRLA batteries are shipped fully charged and do not require an initial charge unless
recommended by the manufacturer. However, if VRLA batteries have been stored for 3 months
or more, they shall be given an initial charge before being placed in service. The initial charge
shall consist of an initial freshening charge plus 72 hours at float voltage. Initial freshening
charge begins when the batteries are placed on the charger and is complete when all of the
following conditions are met:

a) Charge voltage and current reach steady state. Steady state is defined as charge voltage
and current having little or no appreciable change for at least three consecutive readings.
Note that steady state will typically be achieved in 12 to 16 hours @ 77°F (25°C) and it is
critical not to overcharge VRLA batteries.

b) Maximum of 24 hours @ 77°F (25°C), 32 hours @ 65°F (18.3°C). If a VRLA battery string
fails to reach steady state within this time, contact the local AT&T ATS – Power
representative for resolution.

5.8.2 When steady state is achieved, reduce the charge voltage to normal float voltage and allow the
cells to stabilize for 72 hours. After the batteries have completed the initial freshening charge
and have been at float voltage for 72 hours, then the initial charge is complete.

Example: After 12 hours, steady state voltage and charge current have been reached, the initial
freshening charge is complete, and the charge voltage can be reduced to normal float voltage
for 72 hours. After 72 hours at float voltage (84 hours total initial charge), then the initial charge
is complete and the VRLA batteries are ready for turnover to AT&T.

5.8.3 Minimum battery temperature shall be 65°F (18.3°C). If cell temperature is below 65°F, ambient
temperature of the site / room shall be increased until cell temperature reaches this threshold.

5.8.4 The Installation Supplier shall record individual battery jar and strap conductance values before
battery charge.

5.8.5 Before any VRLA battery string can be accepted, the resistance or conductance of all cells and
inter-cell connectors shall be read and recorded by the supplier’s installer. This record becomes
part of the battery records turned over to the AT&T Representative and must remain with the
battery string. These records are used as a baseline for future readings. The test shall meet the
following requirement.

a) Supplier shall use a test set approved by ATS.

b) No reading (conductance or intercell connector resistance) shall be more than 20% above or
below the average for the string.

c) Both a paper and electronic copy of the test results shall be left on site. Electronic test
results shall include a spreadsheet and graph of the cell conductance and intercell
connector measurements.
5.8.6 After string has settled at proper float voltage, the Float Current shall be recorded and preserved as a baseline.

5.9. Thermal Runaway Protection for VRLA Batteries

5.9.1 Thermal runaway monitor and control features per Telcordia GR-1515-CORE built into the power plant controller shall be used to ensure that thermal runaway does not occur. Manufacturer recommendations shall be followed for placement and wiring of sensors.

a) Monitor feature typically measures variance of battery cell temperature from ambient. A shorted cell is a typical root cause of thermal runaway. A shorted cell does not produce a temperature rise. To ensure the shorted cell is not also the only measured cell, the temperature of two cells in every string shall be measured.

Exception: 12V VRLA jars contain six cells; thus, only one jar per string is required to be monitored.

b) When a potential thermal runaway event is detected, the control feature typically lowers rectifier float voltage to limit current flow into the batteries, or to force a limited battery on discharge condition. Manufacturer recommended / factory default settings shall be used.

c) Exception “Monitor Only”: When an existing power plant controller is not capable of providing monitor features in compliance with GR-1515-CORE, then a separate thermal runaway monitor shall be provided. When an existing power plant controller is capable of monitor, but not capable of control features in compliance with GR-1515-CORE, then a separate thermal runaway monitor is not required, but implementation of the monitor feature in the controller is required.

i. “Monitor only” sites shall have the detection of a thermal runaway event alarmed. When the variance between battery cell temperature and ambient exceeds 10°C ± 1°C (18°F ± 2° F), a remote Power Major alarm shall be provided.

d) Exception UPS systems: Many modern UPS systems mitigate thermal runaway by limiting recharge current to a value at or below that recommended by the VRLA battery manufacturer, in lieu of GR-1515-CORE methodology

5.10. NiCad Cells

5.10.1 The manufacturer recommendations and forms shall be utilized for the installation of NiCad cells.

5.10.2 The Installation Supplier shall perform and record an Open Circuit Voltage (OCV) for each cell before installation. Any cell with less than 1.10 volts shall be replaced.

5.10.3 -48V NiCad battery strings for Central Office applications contain 38 cells with a standard float voltage per Table M-2. The float voltage can be reduced to the “optional” level shown in Table M-2 if there is an adjustment issue with high voltage alarms.

5.10.4 The higher than normal float voltage requires that a power plant be entirely supported by NiCad batteries. Strings of flooded lead acid batteries or VRLA batteries shall not be mixed with NiCad battery strings.

5.10.5 Battery cabling between the battery strings and the bay collection bars shall be continuous; the use of quick-connectors is prohibited.
a) **Exception**: The use of a battery quick disconnect is permissible in outside plant configurations.

i. Quick Disconnect devices shall be properly secured in a manner which provides clearance from moisture/groundwater which may accumulate on the floor of a cabinet’s battery compartment.

5.10.6 Battery collection bars shall be installed at the top of the NiCad stand(s).

5.10.7 Nickel plated copper lugs without inspection holes and nickel plated steel hardware shall be used for NiCad battery terminal connections (e.g., -48V, 0V). Nickel plated copper lugs with inspection holes are permitted for inter-block connector cables.

5.10.8 NiCad battery hardware shall be supplied by the manufacturer.

5.10.9 NiCad battery connections shall be torqued to 50 inch-pounds for NCX product line and 96 inch pounds for the Tel.X product line.

5.10.10 A thin film of NO-OX-ID “A” anti-corrosive compound shall be used on all external battery connections.

5.10.11 NiCad batteries contain a corrosive alkaline electrolyte solution that shall be neutralized with a special NiCad spill kit (which is labeled in bright orange). Spill kits for flooded lead acid batteries do not contain the correct neutralizing absorbent for NiCad batteries, and the lead acid battery safety equipment shall not be used when cleaning up a NiCad electrolyte spill due to the potential of a dangerous chemical reaction.

5.10.12 NiCad batteries can release hydrogen gas, and the same safety precautions regarding gassing and explosion hazard apply to NiCad as flooded lead acid battery installations (see 3.2.2).

5.10.13 NiCad batteries shall use constant voltage charging to maintain float voltage. Temperature compensated voltage control is not required.

5.10.14 High float current on a NiCad battery string is an indication of state of charge and state of health. Continuously high float current (8 to 10 times normal) may reflect that the battery is reaching end-of-life.

5.10.15 NiCad batteries shall only be recycled through the manufacturer.

5.11. **Alternative Battery Technologies**

5.11.1 Alternative battery technologies deployed in trial applications shall be installed with charge records per the manufacturer’s documentation.

6. **FLOODED LEAD-ACID STRING TRANSITIONS**

6.1. **General**

6.1.1 Prior to and during battery transition work, air flow in the battery area shall be at least two air changes per hour to eliminate the buildup of hydrogen gas.

6.1.2 The Installation Supplier shall ensure that temporary wiring for transition batteries is never less than two (2) # 4/0 AWG or one (1) 500 MCM for 1680 AH and smaller or two (2) 500 MCM for strings larger than 1680 AH.
6.1.3 The Installation Supplier shall ensure that the battery string to be transitioned has been on a stable float charge for at least 48 - 72 hours so that hydrogen gas release is minimal. Only one string shall be taken off-line at a time. When opening a string, the installation supplier shall cover cable ends by taping on a heat shrink cap after removing bolt assemblies.

6.1.4 When necessary, the transition string voltage shall be raised to adjust voltage differences to 0.05 volts or less. The AT&T ATS or GNFO representative must approve any decision to lower the plant voltage for a battery transition. The plant voltage shall never be lowered more than 2.0 volts from the normal float voltage for a -48 volt plant.

6.1.5 In all cases, the plant voltage shall be kept within the operating limits of the equipment served by the battery plant.

7. UPS SYSTEMS

7.1. General

7.1.1 See ATT-TP-76400 Section 12 for UPS requirements.

7.1.2 See sub-sections 3 through 6 for flooded lead acid and VRLA installation requirements that are applicable in UPS applications.

7.2. UPS EPO Switches

7.2.1 Where required, UPS EPO switches may be placed at the exits of the equipment rooms and at the exit or entrance of the UPS equipment rooms. Switches shall be adequately labeled, covered and protected from accidental activation. The EPO switches must lock in place to identify activation when depressed.

8. AC POWER DISTRIBUTION (DUPLICATE OF ATT-TP-76400 SECTION 12-8)

8.1. General

8.1.1 All AC wiring, conduit, power strips, and duplex receptacles shall be listed on the AT&T AC Power Distribution Minor Material List, meet the requirements of the National Electric Code (NEC), and be listed by a Nationally Recognized Testing Laboratory (NRTL).

8.2. AC Panels

8.2.1 A Power Service Cabinet (PSC) distributes AC power to non-essential loads such as computer terminals, comfort lighting, and general purpose duplex appliance outlets. It is powered from a House Service Board or larger capacity PSC. Depending on their purpose and building electrical system, PSCs may or may not be served via the essential bus.

8.2.2 A Power Distribution Service Cabinet (PDSC) distributes AC power to essential loads such as DC Power Plants, Inverters or UPSs. It is powered from the essential bus protected by the standby AC plant. PDSCs exclusively serve essential loads.

8.2.3 A Protected Power Service Cabinet (PPSC) distributes AC power to protected AC loads such as AC powered equipment and revenue producing billing / accounting systems. It is powered from AC Power Plants such as Inverters or UPSs.
PPSC is an AT&T defined term. These AC panel boards are given a variety of names by manufacturers such as Power Distribution Unit (PDU), Remote Power Panel (RPP) and Computer Load Switchboard.

8.2.4 AC test receptacle and equipment aisle lighting branch circuits shall be provided from a PSC that is served via the essential bus (i.e., protected by the standby AC plant).

8.2.5 Circuit Breaker additions to an existing PDSC shall be validated for the existence of available capacity. Additional distribution circuit breakers shall not be added to a PDSC where measured demand exceeds 80% of the primary supply circuit breaker. Installation Suppliers shall notify the responsible AT&T representative when the 80% levels have been met or exceeded.

8.2.6 The term “PPSC” shall be included in the labeled identification of all PPSCs located on the load distribution side of a UPS or inverter.

8.2.7 All distribution panel types shall have a nameplate that includes the distribution panel designation, input power source (supply panel designation), supply panel protection device rating, voltage and phases. (Reference Section L)

8.2.8 When a new distribution panel is installed in the PPSC architecture, the existing single line drawing shall be modified or created to reflect the changes and provided during the installation/completion of the job. (Reference Section L)

8.2.9 Work on AC circuits shall be performed de-energized whenever it is possible to do so without causing a service interruption. De-energizing a redundant circuit as part of an approved, planned SMOP during the maintenance window to perform work safely is not considered a service interruption. Work on energized circuits must be performed in compliance with Section B Protective Personnel Clothing and Equipment (PPE) requirements.

8.2.10 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a “Warning - Working on Circuit” tag at the AC source. The tag shall only be removed by the person performing the work. (a.k.a. “Lock-out, Tag-out”).

8.3. **AC Cable and Power Cords**

8.3.1 AC power cords shall be used to extend power from AC outlets located under raised floors to AC powered equipment, outlet strips or PDUs. The data processing system shall be permitted to be connected to a branch circuit by the following listed means:

a) Flexible cord and attachment plug cap not to exceed 80 feet (24.4 m) in AT&T Controlled Environment locations.

   In AT&T Controlled Environment locations, when run on dedicated horizontal raceways, flexible cords and cables are limited to a maximum 50 ft. distance within the raceway. The vertical portion of the flexible cord or cable may be 15 ft. on either end, for a maximum flexible cord or cable length of 80 ft.

   Flexible cord and attachment plug cap shall not exceed 20 feet (6.0 m) for Outside Plant (OSP) and Customer Premise applications.

b) Cord set assembly. Where run on concrete deck below a raised floor or in dedicated overhead raceway designed for AC power use, cord set assembly shall be supported and
secured within 18 inches of terminations. Cords shall be secured at intervals not to exceed 4 ½ feet and protected against physical damage. Where securing is not practical, cord set assemblies may be bundled and tethered.

8.3.2 All AC conductors, except AC power cords or Metallic Clad (MC) cable, shall be enclosed in a metal conduit, metal raceway or metal trough.

8.3.3 Metallic Clad (Type MC) cable is strictly limited to the following AC branch circuit applications:

a) Factory installed within bay end guards.

b) Within bay end-guards and bases to connect light switches or bay test receptacles. MC cable does not have a distance limitation in this application, but shall not have excessive slack or be coiled within the bay end-guard or base.

   1. Type MC cable shall not be installed within a cable rack or raceway containing any other cable.

   2. Where Type MC cable exits the end guard, it shall be limited to up to 3 feet maximum vertically and/or up to 3 feet maximum horizontally to the conduit junction box or panel.

   3. Where Type MC cable is secured horizontally under a cable rack, it shall be sewn to the cable rack at every cross strap.

Factory connectorized Type MC whips using snap on style compression fittings included in the AT&T AC Power MML are approved for use in these applications.

8.3.4 Type MC cable is prohibited for use in all other Network applications (feeder and branch circuit) not explicitly described above. e.g.,

a) It is prohibited for use between a PDSC and a rectifier or rectifier shelf or bay.

b) It is prohibited for use between a UPS or inverter fed PPSC and an AC powered network element, regardless of overhead distribution or under a raised floor.

8.3.5 Type MC cable may be used for certain building support applications outside the scope of ATT-TP-76300 (e.g., elevators, pumps, and motors).

8.3.6 Type AC cable is not approved in AT&T and is prohibited for all applications.

8.3.7 AC wire and cable shall be exclusively copper conductors.

8.3.8 A wire nut shall be used to cover the exposed end of all un-terminated AC conductors.

8.3.9 Wire nuts shall meet UL-94 V-1 oxygen index rating or better.

8.4. Conduit

8.4.1 Conduit shall be supported with material designed for the support of conduit, such as U-bolts, conduit clamps, conduit straps, etc. Hose clamps, cord, nylon tie wraps, and other similar material shall not be used to support conduit.

8.4.2 AC conduit troughs shall be mounted and secured per the NEC and local municipality.

8.4.3 Rigid Metal Conduit (RMC), Intermediate Metal Conduit (IMC), Electrical Metallic Tubing (EMT), Liquidtight Flexible Metal Conduit (LFMC), or Metallic Clad (MC) Cable shall be utilized for all AC circuits.
8.4.4 Non-metallic materials shall not be used as AC raceways.

8.4.5 RMC, IMC, and EMT shall be supported at intervals not to exceed 10 feet and shall be secured within 3 feet of each outlet box, junction box, device box, cabinet, conduit body, or other termination. Securely fastened outlet boxes, junction boxes, device boxes, and cabinets are considered supports.

8.4.6 Standard compression fittings are required. “Rain-tight” or “wet location” (per UL 514B, typically designated “RT”) compression fittings are not required. Set screw fittings are prohibited.

8.4.7 LFMC is permitted where flexibility is necessary after installation. LFMC shall be supported and secured at intervals not to exceed 4½ feet and shall be securely fastened within 1 foot of each box, cabinet, conduit body, or other termination. Securely fastened boxes, cabinets, and conduit bodies are considered supports. Specific applications where LFMC is permitted:

a) All final AC powered equipment connections (LFMC whips are 6 feet maximum).

b) At a rectifier bay (6 feet maximum).

c) Conduit transitions from walls or columns in Seismic Zones 3 & 4 (3 feet maximum).

d) All final AC lighting fixture connections (6 feet maximum).

e) Within bay end-guards and bases to connect light switches or bay test receptacles. LFMC does not have a distance limitation in this application, but shall not have excessive slack or be coiled within the bay end-guard or base.

f) Between the power trough and the power strip or between the PDU and the AC powered equipment being served (6 feet maximum whip).

h) Under a raised floor, directly on the concrete deck in an established engineered pathway, or off the floor secured to the pedestals. In an existing line-up where existing LFMC is run unsecured and securing new runs is not practical, then bundling or tethering new runs may be permitted.

i) In dedicated overhead raceway designed for AC power use.

8.4.8 When conduit (including LFMC) must be secured over equipment areas, it may be secured to cable rack stringers or auxiliary framing using conduit mounting brackets designed for this purpose. No conduit shall be run on cable racks with other cable.

8.4.9 All conduit raceways, regardless of type, shall have an Equipment Grounding conductor installed with the feeder or branch circuit conductors, sized in accordance with Table 250.122 in the NEC.

8.4.10 The entire length of the metallic raceway, conduit or trough shall provide a continuous conductive path for grounding.

8.4.11 The Installation Supplier shall install bushings, nipples or connectors to protect wiring. Exposed AC conductors shall not be in contact with edges of metal frameworks, boxes or raceways (e.g. running through a knockout).

8.4.12 Enclosure support shall be as follows:
a) Enclosures without devices or luminaires may be supported by RMC, IMC, or EMT if the conduit is connected to the enclosure by threaded hubs, the threaded conduits enter the box on two or more sides, and are supported within 3 ft of the enclosure.

b) Enclosures with devices or luminaires may be supported by RMC, IMC, or EMT if the conduit is connected to the enclosure by threaded hubs, the threaded conduits enter the box on two or more sides, and are supported within 1½ feet of the enclosure.

c) Enclosures with threaded entries supported by only one RMC, IMC, or EMT raceway shall be secured to building structure or framing.

d) Enclosures with knock outs shall be secured to building structure or framing.

e) Enclosures shall not be supported by LFMC.

8.5. Appliance Outlets/ AC Test Receptacles

8.5.1 AC duplex test receptacles shall be provided in equipment line-ups in AT&T Technical Space. This includes Carrier Communications Space as well as Global Technical Space. Permitted exceptions where ac test receptacles are not required within the equipment line-up include:

a) In non-AT&T controlled facilities where the facility owner provides the test receptacles (e.g., POPs, collocation cages, customer premises).

b) In facilities or equipment rooms < 500 sq ft that are equipped with existing test receptacles in the walls, spaced a maximum of 12 feet apart.

8.5.2 In Stored Program Control System (SPCS) equipment, the duplex test receptacles will be provided as an integral part of the switching system in the maintenance area (e.g., MAP, MCC) only. Any appliance outlets added to any SPCS equipment shall meet all interface and grounding requirements of that SPCS equipment.

8.5.3 New equipment lineups outside of a SPCS shall utilize the Overhead Design in the front aisle, as shown in Figure #12-9. The Overhead Design provides for a single branch circuit using standard ½” EMT conduit and metal outlet boxes installed in the middle 2/3rds of the center of the front aisle, to serve both equipment line-ups.

8.5.4 EMT conduit and outlet boxes shall be secured mechanically (e.g., supported from below aux framing) in accordance with NEC Articles 314 and 358, and ATT-TP-76400 section 12 paragraph 8.4.5. ATT-TP-76400 Figure #12-9 summarizes NEC Article 310 and 358 distance requirements for securing EMT conduit and outlet boxes.

8.5.5 The first outlet box shall be required when the first relay rack / equipment bay / cabinet is installed in either of the two facing equipment line-ups. The first outlet box shall be located within 6 feet of the first bay or cabinet, measured from the center of the first bay or cabinet to the closest edge of the outlet box, linearly along the length of the aisle. The intent is to allow flexibility for use of existing aux framing for support of conduit and outlet boxes.

8.5.6 Spacing of outlet boxes shall be at approximately 10 feet intervals, corresponding to the use of standard 10 ft sections of EMT conduit between outlet boxes. The intent is to not cut a standard 10 ft section of EMT conduit to extend the Overhead Design, unless site conditions dictate, such as the need to change the elevation of the conduit run, or to avoid an obstruction. Where...
obstructions occur, the maximum distance allowed between outlet boxes (edge to edge, measured linearly along the length of the aisle) shall be 12 feet.

8.5.7 Extensions of the Overhead Design shall be required when an equipment bay or cabinet is added - in either of the two facing aisles - where the center of the bay or cabinet is more than 6 feet from the edge of the closest existing outlet box, measured linearly along the length of the aisle.

8.5.8 When positioning aisle lighting with the Overhead Design for ac test receptacles, the position of the aisle lighting takes precedence. Conduit and outlet boxes shall be located to one side or the other of the aisle lighting, and not interfere with extension and placement of future aisle lighting fixtures.

8.5.9 In the Overhead Design, test receptacles and outlet boxes shall face down toward the floor, and be accessible.

8.5.10 Test receptacles shall not be deployed in the rear aisles of equipment line-ups.

8.5.11 Extensions of existing legacy overhead designs shall follow ATT-TP-76400 Figure #12-9 and paragraphs 8.5.3 through 8.5.10. If two overhead conduit runs exist (one for each equipment line-up), then only one shall be extended, transitioning to the center 2/3rds of the front aisle, to serve the growth of both line-ups.

8.5.12 Extensions of existing legacy Bottom of the Bay Designs shall transition to the Overhead Design, as shown in Figure #12-10. The transition riser shall utilize either LFMC or a Jacketed Type MC whip, and can be routed using the cable duct of the last equipped bay in the line-up. While vertical in the bay cable duct, nine cord may be used to tether the LFMC or Jacketed Type MC whip, if no means of securing is available. At the overhead junction box, transition riser must be secured per paragraph 8.4.7 (within 1 ft of the box). If two branch circuits exist (one for each equipment line-up), then only one shall be extended, transitioning to the center 2/3rds of the front aisle, to serve the growth of both line-ups.

**Exceptions:**

a) In 9’ and 11’6” line-ups, the Bottom of the Bay Design shown in Figure #12-6 shall be followed, pursuant to paragraph 8.5.12 (c).

b) Where obstructions do not allow for transition to the Overhead Design, the Bottom of the Bay Design shown in Figure #12-6 shall be followed, pursuant to paragraph 8.5.12(c).

c) When only one (1) duplex test receptacle is required to finish the line-up, transition to the Overhead Design is not required, and the last duplex test receptacle shall be omitted, even if the 12 ft maximum distance limitation will be exceeded.

8.5.13 AC test receptacles shall be mounted flush and equipped with a metal cover plate.

8.5.14 The Installation Supplier shall ensure that the grounding and polarity of AC test receptacles are correct, verified and recorded on the test record.

8.5.15 The DESP shall provide the installer specific work items for placement of appliance outlets, outlet boxes, conduit, J-boxes, and risers.

8.5.16 Isolated ground receptacles (orange) shall not be installed.
8.5.17 Appliance outlets shall be NEMA rated per ATT-TP-76400 Table 12-10.

8.5.18 New 120Vac test receptacle branch circuits shall be 20A circuits using NEMA 5-20R duplex receptacles and #12 AWG wiring. Extensions of existing 120Vac test receptacle branch circuits shall utilize #12 AWG wiring and NEMA 5-20R receptacles, unless it can be verified that the branch circuit is protected by a 15A overcurrent protection device (where #14 AWG wire and NEMA 5-15R receptacles can be used).

8.5.19 The maximum number of duplex appliance outlets allowed on a general purpose / AC test receptacle branch circuit shall not exceed the number specified in ATT-TP-76400 Table 12-11.

8.6. Multi-outlet Power Strips

8.6.1 Multi-outlet Power Strips serve as the final point of AC distribution typically found in the corded AC powered equipment cabinet/bay.

8.6.2 Power strip shall be securely fastened to the cabinet/bay structure.

8.6.3 Depending on the configuration the protected power strip may be specified as horizontal or vertical mounting.

8.6.4 Separate A&B protected power strips shall be provided.

a) Exception: When the equipment cabinet / bay is designed exclusively for single power feed equipment.

8.6.5 Each power strip shall be engineered with a dedicated branch supply circuit sourced from a PPSC and load managed, not to exceed 80% of the supply circuit breaker.

8.7. Branch Circuits

8.7.1 An Alternating Current Equipment Ground (ACEG) lead shall be provided with each AC branch circuit. When a conduit contains more than one AC branch circuit, one ACEG lead may be used if properly sized per the NEC.

8.7.2 AC test receptacles and equipment aisle lighting shall be placed on separate branch circuits.

8.7.3 When adding new branch circuits, or extending existing circuits, the Installation Supplier shall verify that no additional connection is made between the grounded conductor neutral (white wire) and the required green wire grounding conductor (ACEG).

8.7.4 Branch circuit conductors serving appliance outlets shall be sized per ATT-TP-76400 Table 12-12.

8.7.5 From the panel source to the end appliance outlet, the length of the branch circuit shall not exceed the limits specified in ATT-TP-76400 Table 12-13.

8.8. AC Circuit Protection Devices

8.8.1 Circuit breakers shall be sized and coordinated with system components to ensure proper isolation of feeders due to faults or overloads. Breakers shall be sized to allow all charge units to operate at full output during battery recharge.

8.8.2 Thermal breakers are acceptable for most applications and may be used unless prohibited by the equipment manufacturer's documentation.
8.8.3 For equipment loads having start surges (such as those using large capacitors), it is recommended that thermal-magnetic circuit breakers be specified.

8.8.4 Circuit design shall not include circuit protection devices engineered in parallel.

8.8.5 Circuit Protection devices shall be engineered based on an 80% rating unless the circuit protector is rated at 100%. Therefore, the continuous load on a circuit breaker should not exceed 80% of its listed capacity. The circuit protection device shall be sized at 125% of the maximum equipment connected load.

8.8.6 Circuit protection devices installed in PPSC distribution cabinets shall be specified as bolt-on type rather than the clip-on type.
FIGURES M-1, M-2 AND M-3

A reproducible copy of a Pressure Test Record (Figure M-1), Storage Battery Charge Report (Figure M-2) and Pilot Cell Charge Report (Figure M-3) are provided on the following pages.
## PRESSURE TEST RECORD

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<th>OFFICE</th>
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<th>1/2 PSI PRESSURE TEST CHECK LIST</th>
<th>SPECIFIC GRAVITY</th>
<th>CELL VOLTAGE</th>
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## STORAGE BATTERY CHARGE REPORT

(Refer to Pilot Cell Charge Report to complete charge interval readings)

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<td><strong>Initial Charge</strong></td>
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FIGURE M-4 – CONNECTING LAMINATED BUSBAR
EXAMPLE 6 INCH BAR – LAMINATED

EXAMPLE 6 INCH BAR – SINGLE LAMINATED
FIGURE M-5 – BUSBAR SUPPORT DISTANCES

Typical 8 foot busbar support spacing

3-½ to 4 feet to 3-½ to 4 feet

Typical 8 foot busbar support spacing

12" to 6 Feet Max to 12"

8 foot busbar support max spacing and cantilever

6 Feet Max to 18" Max

3 foot busbar

12" to 9" Max

- Insulators
- Aux Framing Channel
- Threaded Rod and hardware not shown
### TABLE M-3--CONDUCTORS FOR BUS DROP TO CELL POSTS

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<th>Cells AMP HR Capacity</th>
<th>8 HR Rate</th>
<th>Number</th>
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<tr>
<td>≤ 200Ah</td>
<td>1</td>
<td>#2 AWG FLEX</td>
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<tr>
<td>&gt; 200Ah ≤ 420Ah</td>
<td>1</td>
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<td>&gt;840Ah ≤ 1900Ah</td>
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</tr>
<tr>
<td>&gt;1900Ah ≤ 4000Ah</td>
<td>4</td>
<td>350 M FLEX</td>
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**Note:** Table M-3 is based on one (1) hour and longer discharge rate and standard voltage drop scenarios for DC Power Plants.

UPS battery string cabling shall be sized to meet the UPS manufacturer’s specifications for ampacity (based on the appropriate battery discharge rate) and 2 volt loop maximum voltage drop.
SECTION N -- ELECTROSTATIC DISCHARGE (ESD)

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3. CIRCUIT PACK STORAGE AND HANDLING ........................................................... N-4
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TABLE N-1 – SUMMARY OF CHANGES IN SECTION N

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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications. Refer to ATT-TP-76306 (Electrostatic Discharge Control)

1.1.2 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.

1.1.3 This section covers requirements to protect equipment from Electrostatic Discharge (ESD).

1.1.4 Changes in this issue of Section N are summarized in Table N-1.
1.1.5 The term circuit pack is equivalent to terms such as plugs, plug-ins, plug-in units, printed wiring boards, circuit boards, packs, cards, etc.

1.1.6 All equipment containing solid state electronic components is considered ESD-sensitive.

1.2. General Requirements

1.2.1 The Installation Supplier shall provide the necessary anti-static devices to prevent Electrostatic Discharge (ESD) damage to sensitive devices.

1.2.2 Static generating material shall be kept out of work areas where circuit packs are handled.

2. ESD CONTROL HARDWARE - PLACEMENT AND USE

2.1. Wrist Straps

2.1.1 A grounded wrist strap shall be worn at all times when handling a circuit pack that is not inserted in equipment or its protective storage/shipping container. A wrist strap may also be required by an equipment vendor’s documentation when performing installation and/or maintenance operations.

2.1.2 To maintain continuity between the wearer’s skin and the wrist strap ground point, the band of the wrist strap shall be properly adjusted.

2.2. Wrist Strap Testing and Testers

2.2.1 At minimum, the wrist strap assembly shall be tested each day it is used to assure proper operation. It shall be replaced or repaired when found defective.

2.2.2 The Installation Supplier shall test the integrity of the wrist strap assembly. A Go/No-Go type wrist strap tester using both audible and visual indicators shall be used for testing the wrist strap assembly. In the absence of a wrist strap tester, the wrist strap assembly shall be tested with a volt-ohm meter (VOM). The reading shall be greater than 750 kilo-ohms and less than 1.2 meg-ohms.

2.2.3 When a wrist strap assembly is tested, the band shall be properly adjusted to the wrist, and then the cord shall be stressed from side to side and subjected to a pulling stress to discover intermittent conditions. This dynamic test helps detect open cords or improperly adjusted or dirty bands.

2.3. Wrist Strap Grounding Points

2.3.1 The wrist strap shall be connected to the bay mounted grounding jack, if the bay is so equipped. An alligator clip shall be used to connect a wrist strap to an effective grounding point in equipment not equipped with a grounding jack. Any unpainted screw, nut, bolt, equipment mounting plate, etc., is considered an effectively grounded point. An ESD ground jack, incorporated on a network element equipment shelf, grounded per ATT-TP-76416 and installed per ATT-TP-76300, shall be considered an approved ESD Ground Point.

2.3.2 If a new or existing equipment rack, frame or cabinet equipped with or intended to be equipped with electronic equipment has no ESD grounding jack(s) on the installed shelves,
one shall be installed on the front right framework upright. The ESD jack and label shall be installed on the upright between 36" and 60". This requirement does not apply to Power Distribution Racks/Bay or any equipment rack, frame or cabinet, such as a fiber distribution bay, that does not have or will not have any electronic equipment or circuit packs either powered or stored.

Frame mounted ESD jacks shall be assembled per the figure below. It is preferred that the area surrounding the hole for the jack be masked to provide an unpainted surface for the jack that is visible after installation. An external tooth lockwasher, flat washer and nut shall be installed in that sequence to the back side of the assembly. The flat washer is required in all applications to insure that the teeth of the external tooth lockwasher properly engage with the framework since the nuts provided with the jack assemblies do not have sufficient diameter to apply pressure to the lockwasher teeth. See ATT-E-00174-E on the Woodduck site for additional information.

![Diagram of ESD jack installation](image)

Previously installed ESD jacks utilizing an uninsulated # 8 AWG ring type crimp connector shall be grandfathered.

An alternative solution would be to use a “Keps” nut lock washer assembly equivalent to 1/4-28 part number 90675A215 from the McMaster Catalog [http://www.mcmaster.com/pdf/114/3125.pdf](http://www.mcmaster.com/pdf/114/3125.pdf). Use of this device replaces the separate nut, flat washer, lock washer shown in the above figure.

2.3.3 The Installation Supplier shall test for continuity between the ESD jack and the bay ground lead and record this test on the test record.

2.4. Static-safe Work Station and Field Service Kit
2.4.1 An ESD Field Service Kit provides a portable static-safe workstation well suited for use at all sites and in CEVs and SLC huts not equipped with ESD protective material. An acceptable kit shall include a wrist strap and cord, a grounding cord, and a static dissipative mat that folds out to create a work surface mat. The mat shall include pouches that can be used as a temporary means to transport circuit packs while not in their protective shipping/storage containers.

2.4.2 A static-safe workstation shall be created and used at any location where personnel will handle bare circuit packs. At minimum, the workstation shall be equipped with a wrist strap assembly, a wrist strap grounding point, and a static dissipative surface on which a circuit pack can be placed. A circuit pack's static-safe shipping/storage container meets the requirement for a static dissipative surface.

2.4.3 Items not allowed at static-safe work stations include:
   a) a highly conductive work surface, unless it is covered with a static dissipative material
   b) any static-generating material not absolutely required at the work station

3. CIRCUIT PACK STORAGE AND HANDLING

3.1. Circuit Pack Storage

3.1.1 When a circuit pack is removed from an equipment shelf, bank, module, etc., the circuit pack shall immediately be placed in a static-safe container. A circuit pack shall not be removed from its container except for installation into equipment or for maintenance at a static-safe workstation (setting option switches, etc.).

3.1.2 A circuit pack storage container shall be one of the following:
   a) The circuit pack’s original static-safe shipping container
   b) An approved third party static-safe container
   c) An approved static-safe wrapping

   Note 1: While static-safe containers are the preferred method of storage, it is acceptable to store bare circuit packs in an existing circuit pack storage frame or cabinet that is a component of an approved equipment system, such as DMS-100F switches.

   Note 2: A number of static-safe transport cases for circuit packs have been approved for use in AT&T facilities. The purpose of these cases is to transport circuit packs; they shall not be used in place of storage cabinets.

3.1.3 Metal circuit pack storage cabinets shall be grounded. The requirements below are based on the storage cabinets being one or a combination of the following:
   a) Any general purpose type metal storage cabinet (wall locker, etc.) that has been braced per applicable storage unit bracing requirements using a metallic angle secured to the wall and/or floor and the top and/or bottom of the cabinet(s), an enclosure that is a component of an approved for use equipment system, or
   b) A storage cabinet that has been approved as a stand-alone type (floor support only)
3.1.4 A single circuit pack storage cabinet or a group of cabinets shall be grounded using minimum #6 AWG conductor. This connection shall be made to the common bonding network or the isolated bonding network as applicable.

3.2. Handling and Transportation Guidelines.

3.2.1 While ESD events can affect working equipment, a circuit pack is most vulnerable while not installed in equipment or in a static-safe shipping/storage container. The following guidelines shall be followed to avoid ESD damage:

a) Wear a properly grounded wrist strap assembly before working on or handling circuit packs.

b) Handle a circuit pack by its edge only; avoid touching contacts of the edge connector.

c) Avoid touching the individual components of a circuit pack.

d) Keep the circuit pack in its original shipping container or static-safe protective container until ready for use.

e) When transporting a circuit pack, place it in static-safe cardboard and/or a static-safe plastic bag or use a protective circuit pack container. The container shall be fire retardant if left in an open area or placed on open shelving to meet local fire codes.

f) Never place static generating material, like documents, inside a static-safe container.

g) Store circuit packs on approved suitable shelving. Avoid storing them in equipment bays not specifically designed as a storage area. Circuit packs stored in non-approved shelving and/or bay shall be kept in a static-safe fire retardant container.

h) Unprotected circuit packs shall only be placed on a static-safe work surface in a single layer; circuit packs shall not be placed on top of each other.

i) A circuit pack shall be accepted only when it is in an approved ESD protective container.

j) Containers are not to be opened unless wearing appropriate wrist strap assembly.
FIGURE N-1 – TWO METHODS FOR GROUNDING CIRCUIT PACK STORAGE CABINETS

A

steel angle brace bolted to the cabinets and the wall

B

#6 AWG to nearest effectively grounded metallic object

Crimp type C-tap

[END OF SECTION]
SECTION O—FIBER OPTICS

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TABLE O-1 – SUMMARY OF CHANGES IN SECTION O

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1. GENERAL

1.1 Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers AT&T requirements for running and terminating fiber optic cables and jumpers.

1.1.4 Changes in this issue of Section O are summarized in Table O-1.

1.2 Definitions

1.2.1 Fiber Optic Cable

Premise Fiber Optic Cable is intended for indoor use within an environmental structure (i.e. home, commercial, or industrial building) to carry optical signals from place to place within the structure. There are two types of Premise cable and they are as follows:

1. Trunk Cable:

Trunk cable is a stiff jacketed multi-stranded cable consisting of two or more fibers, typically used in a horizontal and distribution configuration, i.e. Optical Fiber Non-conductive Riser (OFNR) or Optical Fiber Non-conductive Plenum (OFNP).

2. Equipment Cord Cable:

Equipment Cord cable is either one or two fibers often referred to as Simplex (a single fiber internal to one sheath) or Duplex (two individually sheathed fibers bonded together in a "zip cord" style), and is commonly refer to as either a jumper or a patch cord. The functional difference between a jumper and a patch cord is defined as follows:

Patch Cord – A connection between the rear of an FOT panel and a Network Element.

Jumper – A connection within the FDF complex between panels i.e. FOT to FOT, FOT to OSP, etc.

1.3 Requirements
1.3.1 The entire length of a polyethylene sheathed fiber optic cable run shall be placed on ladder type cable rack.

1.3.2 The Installation Supplier shall not install innerduct for use with polyethylene sheathed fiber optic cable in AT&T Equipment areas.

1.3.3 The Wire Basket Tray (WBT) or Fiber Protection System (FPS) shall not be run through floor penetrations or fire rated.

1.3.4 All fiber optic connections shall be made in a manner that provides proper operation and functionality of the equipment.

2. RUNNING, SECURING AND FIRESTOPPING FIBER OPTIC CABLE

2.1 Running Fiber Optic Cable

2.1.1 When the fiber optic cable enters the building in conduit, any slack shall be stored in the cable vault or cable entrance facility area, so that the cable can be pulled back and reterminated or spliced.

2.1.2 Whenever the building has no cable vault, any fiber optic cable slack shall be stored at the entrance facility. The stored length shall not exceed 50 feet. If the fiber optic cable has metallic strength members or a metallic shield, no more than fifty (50) feet of cable shall be pulled into the AT&T Equipment areas.

2.1.3 When the fiber optic cable is direct buried and does not enter the AT&T Equipment areas in conduit and, it cannot be pulled back into the first manhole, slack shall not be stored in the cable vault or cable entrance facility.

2.1.4 Fiber optic cable shall be run on either cable rack, basket rack or in metallic/terra cotta conduit throughout the AT&T facility. All horizontal cable rack shall be panned and horned which will allow the fiber to no longer be tied down on all new installations of cable racking and there is no need to upgrade any pre-existing racking with panning unless directed to do so by the IE.

When cables are run on a vertical cable rack, cables shall be secured every strap (rung) and to the rungs only.

The use of “Y”/”U” horns and “L” brackets is no longer permitted except under the following conditions and when securing the fibers it should be done on every third horn:

a) In smaller offices like Huts the use of compartment horns is permitted where installing cable racking is cost prohibitive

b) In those locations such as Legacy-T offices that don’t have any dedicated fiber cable racking and use the compartment horn exclusively for their routing needs.

c) In those locations where there are pre-existing cable runs on compartment horns it is permitted to use these runs until they become exhausted.

2.1.5 Polyethylene sheathed fiber optic cable (not to be confused with fiber optic patch cords or jumpers) shall not be placed in any fiber raceway/duct work of the fiber protection system.
Note: Where cables have been run from the LGX to either the splice box or vault and the run is using a dedicated Fiber Protection System (FPS) it is permitted to follow the existing method and mark the FPS as (FIBER CABLES ONLY NO JUMPERS OR PATCH CORDS) AND NO WAIVER IS REQUIRED. The FPS should be inspected to insure that it has been supported properly to handle any additional weight of the cable. These cables are also subject to all bending radius standard requirements and to the capacity rules for an FPS.

2.1.6 All OSP cable entering a building, for more than 50 feet, that is not riser rated shall transition to an approved riser rated cable at the CEF or be placed in a fire stopped metallic or terra cotta conduit or approved fire rated inner duct prior to leaving the CEF.

2.1.7 Fiber cable shall not be run on dedicated primary power cable racks.

2.1.8 The cable shall be run straight on the cable rack and shall not hang off the side or run across an open area.

2.1.9 Fiber optic cable connectors shall be covered and protected with the manufacturer’s dust caps during installation.

2.1.10 Fiber optic cables shall be installed and/or secured in a manner that protects them from damage.

2.1.11 The Installation Supplier shall utilize cable clamps and grommets to secure all fiber optic cables terminating between Fiber Distributing Frames (FDF) or between FDFs and Network Elements. Clamps and grommets shall be attached to the terminating shelf if there is a designated place on the shelf itself to do so. If there is no designated place on the terminating shelf, then the clamp and grommet shall be placed on the bay upright. Multiple clamps and grommets may be used if necessary to facilitate proper cable slack management. When the bay/cabinet will not accept a clamp and grommet method it is permissible to use the wax cord and the fiber paper method of securing the cables. Note the first choice is always the use of clamps and there is no waiver required when using the wax cord method.

Note-1: Multiple cables of like size counts can be placed under one clamp only if there is sufficient space for the two or more cables and the bending radius is not compromised, the cables are not crushed or pinched.

Note-2: When using/running small count cables such as 2 & 4 count and a clamp cannot be obtained to secure such a cable then it is permitted to secure such cables using wax cord method.

2.1.12 Optical Fiber Non-conductive Riser (OFNR) cable leaving cable racks and entering frames, racks or other equipment shall be supported at least every 3 feet.

2.1.13 On vertical runs, the cable shall be secured at every strap.

2.1.14 Horizontal runs of cable on non-panned/non-horned cable racks shall be secured at every 4th strap to maintain a straight run, and flow of the bends.

2.1.15 The cable shall be secured at points of break off from the cable rack.

2.1.16 The maximum amount of fiber cables allowed to be secured i.e. stitched/strapped together are as follows:
a) Fiber counts of 2 to 6 per cable are allowed to have up to 10 cables.
b) Fiber counts of 8 to 36 per cable are allowed to have up to 5 cables.
c) Fiber counts above 36 fibers per cable are allowed to have no more than 2 cables.
d) The "micro" cables used with the T.E. connectivity Rapid Panel can have up to 12 cables.

2.1.17 Plastic tie wraps shall not be used to secure fiber optic cable inside the building.

2.1.18 On fiber cable/jumper or patchcord runs of less than 300ft, allowable cable slack shall not exceed 10% of the overall cable length rounded up to the next 10ft increment.

Example: Required cable length = 96'
Allowable slack = 9.6'
Cable length + slack = 105.6'
Next 10’ cable increment = 110’ cable total allowable length

On fiber cable/jumper or patchcord runs greater than 300ft, allowable cable slack shall be not exceed 30ft.

Excess fiber cable/jumper or patchcord slack shall be stored within an AT&T approved cable management system (i.e., vertical glide, IMP, or sub-set of the fiber routing system) specifically designed to provide this function.

2.1.19 When securing OFNR cable, a minimum of two wraps of sheet fiber shall be placed around the fiber cable at each securing point.

2.1.20 Excessive fiber optic tie cable slack shall be routed and secured on dedicated fiber slack storage racking sized to accommodate minimum bending radius.

2.2 OFNR Cabling - Raised Floor Environments

2.2.1 OFNR cable shall not be laid directly on a slab floor.

2.2.2 OFNR cable shall be run on or in its own dedicated medium. Acceptable mediums for OFNR cable in raised floor environments shall include but are not limited to cable racking, troughing, raceway, wire baskets or some other acceptable facsimile thereof which AT&T has approved.

Note: In those locations where the OFNR cables were previously tied to the floor stanchion and there is no physical way to install a cable support medium then it is permitted to install the cables in the same manner, securing to the stanchions, without a waiver.

2.2.3 OFNR cable mediums shall be mounted to the floor stanchion or directly/indirectly to the slab floor.

a) When mounting to floor stanchions, the medium shall be located 6” to 8” below the floor tile.

2.2.4 Fiber optic cabling paths shall be in 90 degree angle configurations and parallel to the floor stanchions and floor tiles.

3. FIBER OPTIC CABLELING FROM VAULT TO FDF
The following procedures apply to fiber cable run between the cable entrance facility and FDF:

a) Traditional OSP Cable – This cable shall be run in flexible, plastic, fire retardant innerduct, unless local fire or building codes dictate differently. Innerduct can be corrugated or smoothed walled. It is an NEC code requirement to install OSP cable in fire retardant inner duct when the cable enters a building.

Note: when inner duct is used, it shall be properly fire stopped at the open ends and where it penetrates any fire rated wall, floor or cable penetration.

b) OFNR Cable – OFNR/OFNP Cable – OFNR/OFNP cable shall not be run in innerduct. If OFNR/OFNP cable is installed in such a manner which causes the cable to free fall three or more floors, then a Kellum grip type of strain relief shall be used to support the cable.

c) Indoor/outdoor cable shall follow the same guidelines outlined for OFNR/OFNP cable.

Note: when securing this type of cable a fiber paper wrap is NOT required.

d) FDF PANEL DIVERSITY – When cabling from the vault into a location and the cables are routed diversely to the FDF, it is an acceptable practice to terminate these cables within the same bay as long as these cables are terminated in separate FDF shelves. These cables shall be routed on opposite sides of the bay. In the event a pre-terminated shelf is being used then there could be a situation where both cables will be running on the same side of bay. This is ok as long as the cables take diverse routes after leaving the bay.

4. FIBER OPTIC PATCHCORDS AND JUMPERS

4.1 Requirements

4.1.1 Fiber optic patch cords shall not be run on cable racks.

4.1.2 Fiber optic patch cords shall be run in an AT&T approved Fiber Protection System (FPS) or Wire Basket Tray (WBT). The following requirements apply to the installation of a fiber routing systems:

a) Basket tray replaces the previously used FPS system for routing of fiber jumper cables within ‘Greenfield’ type AT&T Technical Space builds. FPS may still be used within ‘Brownfield’ type AT&T Technical Space builds for the purpose of completing out the existing routing system design. Refer to ATT-C-50003-E-00 for more details.

b) Solid-walled FPS shall be used for horizontal runs. Covers on horizontal sections of FPS are not required. All non-horizontal FPS shall have covers. End Caps shall be required at the ends of all FPS.

c) Cable routing ‘stand-off’ brackets (non-spacer applications) or a vertical cable management two-post spacer unit is to be used for routing of fiber jumper cables vertically within the equipment frame as opposed to vertically oriented FPS.

d) FPS vertical drops are not required from the horizontal oriented FPS to the Network Equipment frame. Exposed fiber jumper cables located between the FPS or WBT drop and the Network Equipment frame are to be bundled using Hook and Loop straps every
12” to 18”. For application where the fiber jumper cable bundle exceeds 36” (horizontal FPS or WBT to equipment frame) it is to be secured approximately at its mid-point to the environmental superstructure via a Hook and Loop strap.

e) Installation supplier shall maintain proper bend radius and cable management within the bay footprint.

f) FPS is considered at capacity when its cable fill reaches ½” from the top of the duct.

g) WBT is considered at capacity when the basket tray cable fill reaches 50%.

h) Fiber equipment cords shall not be placed within the FPS or WBT with excessive slack.

4.1.3 On fiber cable/jumper or patchcord runs of less than 300ft, allowable slack shall be no more than 10% of the overall length of the run or rounded up to the next 10ft increment.

Example: 
Required cable length = 96’
Allowable slack = 9.6’
Cable length + slack = 105.6’
Next 10’ cable increment = 110’ cable total allowable length

On fiber cable/jumper or patchcord runs greater than 300ft, allowable slack shall be no more than 30ft.

Excess fiber equipment cord slack shall be stored at either the network element cable management system or the FDF cable management system, depending on space availability, while maintaining the minimum fiber bend.

a) Excess fiber patch cord slack shall NOT be stored in the FPS or WBT.

b) Under no condition, unless for testing or trouble shooting purposes, shall fibers be left UNTERMINATED at any Fiber Optic Termination Panel (FTP).

c) The following applies to spare fibers:

1. Spare fibers shall only be at the request of the IE via the TEO and shall be tagged, protected and secured properly. OTV shall size the fiber cable to be as close to the desired number of fibers as possible.

2. The OTV/VAR Shall never cut off spare fibers in a cable.

4.1.4 Protective/dust caps shall be placed on all unterminated fiber cables and fiber termination points.

4.1.5 Vertical sections of FPS placed on frame upright shall have support brackets at the top, middle and bottom.

4.1.6 In the event a previously installed FPS that contains fibers must be cut, the section(s) involved shall be removed from their previously installed position and ALL fibers shall be supported and protected before any cutting can be done.

4.1.7 The cutting of installed FPS is to be considered “Volatile Work Activity” and shall be performed during the Maintenance Window.
4.1.8 There are no drop length requirements for unsupported patch cords transitioning from the FPS to the network element.

4.1.9 Mining of fiber from an FPS shall not be permitted unless the fibers can be readily identifiable with no risk to network service. A minimum of two individuals shall perform that removal operation.

The utmost care and discretion shall be observed as any Fiber Protection System will always be carrying live service.

At no time shall a jumper/patch cord be pulled through an FPS system with the connector still on it.

1. If it becomes necessary to remove jumpers or patch cords from the vertical of a bay or Fiber Distribution Bay (FDB) the following procedure shall be used.

2. The fiber shall be fully identified at both ends.

3. The fiber shall be removed from the vertical fiber manager and traced up and into the horizontal FPS.

4. While still holding onto the fiber, it shall be traced into the horizontal a minimum of 6 inches and then cut at that point.

5. The remaining end of the jumper or patch cord shall be left as flat as possible within the FPS, horizontal to the remaining fibers.

6. The remaining end of the jumper or patch cord shall not be looped back into the FPS.

7. The other end of the fiber shall be treated the same way as defined in steps 1 – 5.

[ END OF SECTION ]
SECTION P -- CABLE VAULT AND CABLE ENTRANCE FACILITY

1. GENERAL

1.1. Introduction

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 installation specifications.

1.1.2 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.

1.1.3 This section covers the grounding requirements in the Cable Entrance Facility (CEF).

1.1.4 Changes in this issue of Section P are summarized in Table P-1.

1.2. Non-Insulating Joint Cable Entrance Facility (CEF) or Cable Vault

The CEF is the area of a structure where communications cables first enter from the outside plant, and serves as the interface linking the outside plant cables to the main distributing frame(s) (MDF, Mainframe, or termination frame) in Carrier Communications Space, SHO/VHO, and customer premises locations. A below ground CEF is also known as a cable vault. The paired cables that leave the CEF and attach to the connectors on the main
distributing frames are known as tip cables or stub cables. The area within the CEF where protection measures are applied is identified as the cable protection area.

1.2.2 Each lineup of cable rack in the CEF shall be equipped with at least one insulated ground bar near each point of cable entry. These ground bars (also known as CEF ground bars) define the cable protection areas. Refer to Figure P-1.

1.2.3 In a horizontal-entry CEF the protection area ground bars shall be located between the entrance conduit (point of cable entry) and the splice frame, normally between the second and third cable racks, or second bay, above the top horizontal support arms. As an alternate location, in CEF areas with a single line-up, the insulated ground bar may be mounted on the wall.

1.2.4 In a vertical-entry CEF system, the protection area ground bar is located horizontally to provide a connection point for all metallic cables.

1.2.5 All of the protection area ground bars located in all cable entrance facilities shall be bonded to each other with a minimum 1/0 AWG conductor to form a CEF grounding system.

1.2.6 The bonding conductor shall be run on the top horizontal and secured every 18 inches with cord.

1.2.7 A 1/0 AWG grounding conductor shall be installed from the Carrier Communications Space or SHO/VHO location ground system (OPGP or other main building ground bar) to the associated CEF grounding system.

1.2.8 Each lineup of cable rack in the CEF shall be bonded to the associated protection area ground bar with a #6 AWG bonding conductor. Use a two (2) hole crimp type connector, drill the upright, remove the paint and coat contact surface with a thin coat of NO-OX-ID “A”.

1.2.9 Each ST 21 Peth (polyethylene) sheath entrance cable shall be bonded to the protection area ground bar nearest its point of entry (maximum 18 cables per bar). The bonding conductor shall be a #6 AWG conductor equipped with a single hole crimp type lug for connection to the cable splicing case. Lockwashers are required to ensure a secure connection.

1.2.10 Each new or rearranged cable with lead sheath shall be bonded to the available protection area ground bar nearest its point of entry. The #6 AWG bonding conductor shall be attached to the lead sheath using a B or D bond clip. The bonding clip is normally located between the 2nd and 4th verticals. Connecting a grounding conductor to a lead sheath by soldering on existing cable is not acceptable.

1.2.11 The metallic shield and any other metallic components (other than the communications conductors) of all cables, including fiber optic, entering a structure shall be bonded to the structure's ground system. In Carrier Communications Space or SHO/VHO location cable entrance facilities, this bond is usually made at the protection area.

1.2.12 Foil-lined air pipes shall also be bonded to the nearest protection area ground bar. Airpipe fittings are available for this purpose. #6 AWG bonding conductors shall be used. Several air pipes may be connected together.
1.2.13 Connections to the protection area (CEF) ground bar shall be made using two (2) hole crimp type connectors.

1.2.14 If Cable Rearrangement Facility (CRF) cabinets are in the CEFs, a 1/0 AWG dedicated conductor shall be run from each CRF cabinet/panel to the OPGP, CO ground bar, or other main building ground bar.

1.2.15 All #6 AWG and 1/0 AWG bonding conductors shall be tinned, stranded and insulated.

1.3. **Insulating Joint CEFs**

1.3.1 Carrier Communications Spaces or SHO/VHO locations may be located in areas where stray DC currents are present in the earth from external sources such as dc powered public transportation systems, cathodic protection rectifiers or large welding establishments. The low earthing resistance of the Carrier Communications Space or SHO/VHO grounding electrode system picks up a portion of these stray currents from the earth and conducts it to the CEF, where it exists on the metallic shields of outside plant cables. At a location outside the Carrier Communications Space or SHO/VHO location, where bare metallic components of the outside plant are in direct contact with the earth, the stray DC current leaves the plant and re-enters the earth, returning to its source. This discharge of DC current causes corrosion of outside plant components at that remote location.

1.3.2 Conduction of stray DC currents to the outside plant cable shields can be prevented by installing insulating joints in all cable shields and other metallic components entering the CEF. An insulating joint is an opening in the outside plant cable or air pipe that breaks the continuity of the sheath, shield, metallic strength member and moisture barriers, which interrupts the flow of DC currents that may cause corrosion.

1.3.3 Cable corrosion protection in the CEF shall be provided by creating a minimum ¾ inch air gap in the lead sheaths of lead cable, the metallic shields of composite-sheath cable, the metallic components of optical fiber cable, and the metallic components of air pipes.

1.3.4 The metallic cable shield and other metallic components on the field side of the insulating joint shall be connected to a #6 AWG copper conductor insulated from the framing structure. This conductor shall be joined to a common #6 AWG minimum isolation bonding conductor which is also insulated from the framing structure. This conductor shall terminate on an insulated bus bar located at the top of the cable rack, constituting the field side of an isolated protection area. See Figure P-2.

1.3.5 Outside plant entry cables shall be electrically isolated from the CEF framing structure by either hardwood insulating members placed between the cable racks and framing structure or by durable insulators placed between the cables and cable hooks or cable support arms.

1.3.6 The metallic cable shield on the Carrier Communications Space or SHO/VHO office side of the insulating joint shall be connected to a second bus in the protection area which is bonded to the structure grounding system following the requirements for a Non-Insulating Joint CEF, except no bond is made between the OSP cable sheath and the tip cable sheath. See drawing P-2.
1.3.7 To maintain a path to ground for lightning and ac currents, the insulating joint shall be bridged with a bridging capacitor between the protection area bus bars or across each cable isolation gap. See Figure P-2.

**FIGURE P-1 – CEF / CABLE VAULT GROUNDING**

**Sketch A**
Connections Between Main Structure Ground and the Cable Entrance Facility

**Sketch B**
10-Position Ground Bar
(one bar required per 18 entrance cables)

**Sketch C**
Side View - Bus Bar Mounting and Bonding
SECTION Q -- EQUIPMENT REMOVAL AND CABLE MINING

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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the requirements for equipment removal activities.

1.1.4 Changes in this issue of Section Q are summarized in Table Q-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall not remove equipment from service unless authorized by the AT&T Representative. A detailed MOP shall be prepared and approved by an AT&T Equipment Engineer prior to any removal activities.

1.2.2 Removal work shall include an analysis of the equipment space ground paths. Connectivity to equipment space ground shall be maintained for frames and bays not being removed. It is the responsibility of the Installation Supplier to maintain the integrity of the ground system.

1.2.3 Before removing frames or bays from a lineup, the frame or bay ground shall be temporarily bridged to insure the ground path is not interrupted. The minimum size used for the bridge shall be a #6 AWG stranded conductor.

1.2.4 When the MGB is removed, the Installation Supplier shall maintain ground reference continuity between the battery return of the power plant and Central Office Ground (CO GRD).

1.2.5 Frame and aisle lighting, switches and appliance outlet circuits that are modified or removed will have the AC power removed and the circuit breaker or fuse tagged with an installer created “Warning Tag”, before work begins. A positive lockout device and tag at AC source shall be used to prevent any possibility of energizing circuit.

1.2.6 After removing fluorescent lighting or outlet circuits, verify that the remaining circuits have the correct polarity and the ACEG is continuous.

1.2.7 Ensure that all junction box holes produced by the removal of conduit etc. are plugged. All remaining, open-ended conduit shall be capped. All junction box cover plates shall be in place.

1.2.8 All through penetrations in fire rated walls and all floors created by removal activities shall be filled with approved fire stoppage products as listed in ATT-TP-76300, Section F.
1.2.9 The Installation Supplier shall update all databases, equipment designations, assignments, etc. for which they have responsibility to maintain to reflect any revised circuit and/or fuse assignments, per requirements in Section L.

1.2.10 All designations on equipment remaining in an office associated with removed equipment shall be updated accordingly. This includes, but is not limited to, distributing frames, end guards, fuse and power board assignments, and DSX panels.

1.2.11 The Installation Supplier shall coordinate with the trucking, hauling or scrap company, specified in job documentation, or, as instructed by the AT&T Equipment Engineer, to ensure that all scrap materials are properly removed from the job site.

1.2.12 The Installation Supplier shall adhere to ATT-TP-76300, Section D, when performing any volatile removal work in addition to the "Ask Yourself Handbook" and "Back-Out-Procedure". All materials and personnel required to enforce these procedures are to be present during the performance of all volatile removal work.

1.2.13 The Installation Supplier shall have personnel experienced in cable tracing and splicing on the job site at all times during cable cutting operations in the vicinity of working equipment.

1.2.14 The Installation Supplier shall have the appropriate type and size battery spill kit on site for all battery removal activities.

1.2.15 The Installation Supplier shall ensure that all battery vents and filling tubes are plugged with a shipping plug prior to shipment of batteries containing acid. Also, terminals shall be protected from short circuit with tape, caps, or protective packaging.

1.2.16 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed. When multiple leads are being removed, the Installation Supplier shall verify the absence of current immediately before removing each lead.

1.2.17 Before the fuse at the power source end of the cable is removed, a clamp-on ammeter shall be utilized to verify the absence of current.

1.3. **Alarm Circuits**

1.3.1 The Installation Supplier shall conduct a joint inspection of all visual and audible equipment and building alarms associated with the removal activity with the AT&T Representative prior to the start of the removal activity.

1.3.2 Alarm circuits shall be kept operational at all times, unless the current work activity dictates temporary disabling of the alarm circuit.

1.3.3 Any alarms disconnected shall be restored and verified for visual and audible accuracy at the completion of each work shift and when removal operations are completed. Alarm verification shall be confirmed for both equipment space and building alarms by the appropriate AT&T alarm monitoring group.

1.4. **Disconnecting Live Circuits From Service**
1.4.1 The Installation Supplier shall verify, via detailed steps in the removal MOP that the AT&T Representative has made the equipment busy and removed all associated fuses, patch cords, cross-connections, etc., before any removal operation is started.

1.5. Clearing Trouble

1.5.1 If trouble is encountered during removal activity, the Installation Supplier shall notify the AT&T Representative immediately.

1.5.2 It is the joint responsibility of the Installation Supplier and the AT&T Representative to promptly locate and clear service interruptions and circuit troubles.

1.6. Protection Of Working Equipment

1.6.1 The Installation Supplier shall protect working equipment during removal operations.

1.6.2 All materials used for protection shall be anti-static, fire retardant and approved by the AT&T Representative.

1.6.3 When extensive equipment removal activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be constructed and placed between working equipment and the equipment removal area to protect working equipment from airborne contaminants resulting from removal activity.

1.6.4 All applicable safety precautions shall be adhered to during cable removal and mining operations. Sharp objects shall not be used to separate cable bundles. Wedges, lifting, or separating tools shall be non-metallic and non-conductive.

1.6.5 During the mining operation, if it is observed that the ironwork, auxiliary framing or cable rack is becoming distorted, coming loose from its connecting hardware or displays unanticipated movement, the installation supplier shall immediately stop the work activity and notify the AT&T Engineer.

1.6.6 Cable cutting tools shall be equipped with a protective ring during the cable removal or mining operations in the vicinity of working equipment.

1.6.7 During cable removal or mining operations, cable ends shall be passed through the protective ring of cable cutting tools when they are to be cut.

1.6.8 Under no circumstances, shall a loop of cable or wire be inserted through the protective ring of cable cutting tool to be cut.

1.6.9 Under no circumstances shall a cable or wire be cut while on a cable rack.

1.6.10 If there is a possibility of the cut portion of cable striking working equipment when it is cut, the cable cutting activity shall be performed on the floor, or appropriate equipment protection shall be installed to ensure that the cut cable ends do not strike working equipment.

1.6.11 To avoid the possibility of cutting loops of live cables hanging off cable racks, the potentially live cables shall be temporarily separated away from the cables to be cut. When possible, the cables shall be separated on the cable rack. If due to the amount of cable on the cable rack the cables cannot be separated on the cable rack, then the cables shall be temporarily
supported with trunk straps (or equivalent) to the side of the cable rack away from the cable cutting activity.

1.7. **Disposition Of Removed Equipment**

1.7.1 All removed equipment shall be disposed of at the direction of the AT&T Equipment Engineer.

1.7.2 The Installation Supplier shall contact the AT&T Equipment Engineer to obtain shipping containers if containers are not specified in the detail specification.

1.8. **Use Of Cable Markers**

1.8.1 The Installation Supplier shall conspicuously identify cabling to be removed with colored labels or tape.

2. **HAZARDOUS MATERIAL**

2.1. **General Requirements**

2.1.1 Before the removal or shipment of any equipment, the Installation Supplier shall contact the AT&T Equipment Engineer for instructions for the identification and handling of hazardous material.

2.1.2 If the installation supplier uncovers hazardous materials during the removal and/or cable mining operation (e.g. lead cable, arsenic cable, PCB’s, etc.) the work in that area shall be stopped immediately. The AT&T Representative shall be contacted for disposition and no work in that area shall continue until AT&T has a resolution for the hazardous material identified.

3. **RETIRED IN PLACE**

3.1. **Requirements (Refer to ATT-JA-000-003-812)**

3.1.1 Hazardous material shall not be removed.

3.1.2 All equipment, retired in place (RIP), shall be identified by attaching a "RIP" label. Place the RIP label on the equipment so it does not cover any identifying designations.

The following information is required on the RIP label:

a) The words, “Retired In Place. Equipment shall not be redeployed”.

b) The date the equipment was retired (e.g. Date Retired: xx/xx/xxxx).

c) The project number (e.g. Project #: xxxxxxx).

d) TEO Order Number (e.g. TEO Order #: xxxxxxxx).

**Note-1:** If only a part of the bay is RIP’d include a description of what equipment within the bay is RIP’d (e.g. Nortel OC48, Shelf #1).
Note-2: Use “Not Applicable” if neither a Project nor a TEO Order Number is associated with the work activity.


3.1.3 Only the AT&T authorized representative shall remove power supply fuses. The far end cabling associated with the removed fuse is not required to be disconnected and/or removed from the equipment framework.

3.1.4 Dummy fuses shall be installed within each vacated open face; GMT and Type 70 fuse position(s).

3.1.5 Switchboard cable and wire terminating on the equipment frame, bay, unit or position shall not be disconnected.

3.1.6 Switchboard cable and wire associated with the far end (i.e., distributing frame, fuse boards, other frames, bays, units or positions, etc.) are not required to be disconnected.

3.1.7 Vacated frame blocks shall be removed at the distributing frame if their cabling has been disconnected.

4. REMOVALS

4.1. Removing Frame, Bays And Units

4.1.1 The Installation Supplier shall not remove power supply fuses unless authorized by the AT&T Representative in the MOP. The Installation Supplier shall disconnect and remove from the bay all cables associated with the removed fuses and insure disposition is in accordance with the TEO and/or spec.

4.1.2 The Installation Supplier shall install dummy fuses in each vacated fuse position.

4.1.3 When equipment frame(s) or bay(s) providing support to existing superstructure are to be removed proper support of remaining superstructure is to be maintained. Additional superstructure support shall be provided by means of additional ceiling support, pipe stand(s), stanchion pole(s), etc.

4.1.4 The Installation Supplier shall remove all far end wiring terminations associated with equipment being removed.

Exceptions:

a) When the removed equipment frame power return lead is terminated “Back-to-Back” at the BDFB return bar with another non-job related service providing equipment power return lead, and this non-job related power return lead cannot be safely worked on without potential disruption to network service.
b) When the removed equipment frame power lead is terminated within a BDFB but cannot be safely removed/disconnected within the BDFB due to the existing BDFB power cable congestion and physical location of lead designated to be removed.

c) When the removed equipment far end termination point is associated with a DACS system that utilizes a "paddleboard" (non-BNC) style connector. This type of termination panel utilizes a high concentration of DS3 cables and the sensitivity of the existing non-BNC connectors at the DACS III bay increases the possibility that an active DS3 circuit could be taken down while removing an inactive DS3 circuit.

Designated far end removal exceptions require the concurrence and agreement of the job Implementation and Planning Engineers responsible for said removal project. All non-removed termination cable points are to be clearly labeled and designated accordingly.

4.1.5 Opened alarm multiples shall be reconnected.

4.1.6 When distributing frame terminal strips are partially cleared, all wiring and designations associated with the removed circuits shall be removed.

4.1.7 When a frame or bay is removed, the floor fastener (e.g., Loxin, Hilti, etc.) shall not extend above the floor lines. If the floor fastener extends above the floor line, it shall be removed.

4.1.8 Removed equipment frame anchorage points are to be conditioned in accordance with ATT-812-000-713.

4.1.9 If equipment is to be reused, the Installation Supplier shall:
   a) Remove solder wire wrapped connections and excessive solder from rectangular terminals. Remove wire ends, clear wire holes and remove excessive solder from flat terminals.
   b) Remove the unit and/or frame and prepare it for shipment in accordance with Implementation Engineers direction.
   c) Not remove the hazardous material from the frame or bay.

4.1.10 When equipment frame or bay removal activities take place near open cable holes, the installation supplier shall provide adequate protection to protect personnel and equipment from the danger of material or personnel falling through the cable hole to the floor(s) below.

4.1.11 Equipment frames and bays shall be removed systematically and shall be raised or lowered with hoisting equipment of an adequate size and type to safely perform the hoisting activity. Under no circumstances shall the equipment frame or bay removal process involve dropping frames or bays to the floor.

5. CABLE MINING

5.1. Introduction

5.1.1 Cable mining is defined as the removal of non-working cable (power, switchboard, armored, etc.) from cable racks (vertical or horizontal) that may be mixed with working cables on the same rack.
5.1.2 Cable mining is an operation with a potentially high risk of service problems, equipment damage, personnel injury and fire hazards.

5.1.3 A bulk cable mining operation involves the removal of a significant number of dead cables from a cable route. A bulk cable mining operation does not imply that all the cables on a cable rack are dead and will be removed.

5.1.4 A dead cable is a cable that has been disconnected at both ends and cut back to a point on the cable rack, as a result of equipment removals, relocations, modifications, etc.

5.1.5 Refer to ATT-TP-76305 and ATT-TP-76305-001 for additional cable mining requirements. Refer to ATT-TP-76300, Section O, Requirement 4.1.16, for additional optical jumper requirements.

5.2. Requirements

5.2.1 The Installation Supplier shall immediately stop work and notify the AT&T Representative if any of the following job conditions are observed.
   a) Sparks, ashes, or other signs of arcing
   b) Cables that are warm to the touch
   c) Worn, frayed, or damaged insulation on working cables
   d) Armored cable.

5.2.2 The Installation Supplier shall exercise care when mining cable not to disturb H-tap covers. If an H-tap cover is opened, it shall be secured in accordance with manufactures guidelines.

5.2.3 Cable mining on vertical cable racks between floors where large cables or large amounts of cables are being removed shall be unsecured and removed no more than one floor at a time to prevent excessive unsecured cable hanging weight.

5.2.4 The Installation Supplier shall ensure that remaining cables are placed and secured in accordance with Section J of ATT-TP-76300.

5.2.5 The ends of dead power cables remaining after mining shall be protected with heat shrink caps.

5.2.6 If required, only a nonmetallic cable mining wedge shall be used to separate cables. The wedge shall not be driven between cables; it shall be inserted by hand.

5.2.7 Protection shall be provided for live equipment in the vicinity of cable mining and cutting operations.

5.2.8 Switchboard-type cable shall be cut initially as close to the termination of the cable at the equipment or frame as possible and mined toward its source.

5.2.9 Power cable shall be removed initially between the source protection device and the cable rack before power cable mining starts.

5.2.10 All identified cables to be removed shall be disconnected at both ends, have the ends protected, and left in place for 24 hours prior to any cutting and mining activities.
5.2.11 After the 24 hour waiting period, the Installation Supplier shall cut identified cables as follows:

a) Pull the dead cable off the cable rack until the cut end is in hand (do not, under any circumstances, cut cable loops).

b) The installer shall pass the end of the identified cable through a ring cutter.

c) The initial cut shall be at or through the cable at the colored label or tape.

d) The installer shall continue to pass the dead end of the cable through a ring cutter when making additional cuts.

e) Cables shall be cut not less than 15 inches from the cable rack, with the hanging loose end visible.

f) The Installer shall make sure the cable or wire does not fall into live equipment.

5.2.12 The Installation Supplier shall remove cables off of the cable rack by hand. Excessive force shall not be used.

[END OF SECTION]
SECTION R -- PRODUCT CHANGE NOTICES AND MISCELLANEOUS INSTALLATIONS

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TABLE R-1 – SUMMARY OF CHANGES IN SECTION R

<table>
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<tr>
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<th>Item</th>
<th>Action</th>
<th>Requirements Change Notification</th>
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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the requirements for installation suppliers performing Product Change Notice (PCN) and miscellaneous work operations not covered by a specific Telephone Equipment Order (TEO).
1.1.4 Changes in this issue of Section R are summarized in Table R-1.

2. CLASS A/AC PRODUCT CHANGE NOTICES (PCNs)

2.1. Requirements

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation that all work has been done in accordance with the product change documentation.

2.1.2 All applicable sections of ATT-TP-76300 shall be observed when applying PCNs, except that use of the Job Start Agreement and MOP shall be negotiated locally.

2.1.3 The Installation Supplier shall coordinate all hardwired class A/AC PCNs that are to be applied to AT&T equipment with the AT&T Representative, to provide the necessary coverage for removing affected equipment from service, testing and restoration of equipment to service. All spare plug-ins shall be modified.

2.1.4 The Installation Supplier shall be responsible for applying any apparatus to the plug-in. After the modification has been completed the Installation Supplier shall apply the new HECI/CLEI barcode label.

2.1.5 The Job Completion Report is not required to report PCN activity only. Instead, the Installation Supplier shall provide the location and quantity of all CLEI changes (old and new), using the Report of PCN Activity form in Figure R-1, to the address provided at the bottom of the form.

3. MISCELLANEOUS WORK OPERATIONS

3.1. Introduction

3.1.1 Miscellaneous work operations include any supplier installation activity performed at an AT&T location that is not covered by a Telephone Equipment Order (TEO) or Product Change Notice (PCN). An example of such work would be when an Installation Supplier had to return to a job site to correct errors discovered during an audit and the TEO had already been closed.

3.2. Requirements

3.2.1 Miscellaneous work operations (e.g., warranty work, engineering complaint orders, defects correction) shall be performed according to all applicable sections of the ATT-TP-76300.
FIGURE R-1 -- REPORT OF PCN ACTIVITY FORM

A reproducible copy of the Report of PCN Activity form is provided on the next page.
The following report is furnished to allow correction of AT&T records associated with the Product Change Notice (PCN) activity identified below:

<table>
<thead>
<tr>
<th>REPORT OF PCN ACTIVITY</th>
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<tbody>
<tr>
<td>Supplier: ________________________________</td>
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<td>Person performing work: ________________________________</td>
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<td>Location (11 character CLLI):</td>
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<tr>
<th>MM/DD/YYYY</th>
<th>CLEI Removed (10 character)</th>
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THIS CONCLUDES THIS REPORT

Forward the completed report to:

Mack Baul (mb1104@att.com)
675 West Peachtree Street NW
Suite 29D44
Atlanta, GA 30375
[END OF SECTION]
1. GENERAL

1.1. Introduction

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 installation specifications.

1.1.2 This section covers the requirements for correcting and updating AT&T Technical Space drawings.

1.1.3 Changes in this issue of Section S are summarized in Table S-1.

1.1.4 Additional information on updating network equipment drawings may be found in Section 4 of ATT-TP-76400.
1.2. Requirements

1.2.1 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.

1.2.2 All installations, removals or assignment changes shall be marked on all applicable drawings and by electronic application (i.e., Framemate, TAB/db, power database, etc.).

1.2.3 The Installation Supplier shall compare the drawings with the equipment layout and make corrections as necessary so the “final” drawings reflect the actual office layout.

1.2.4 The Installation Supplier shall route all associated marked drawings to the COLD engineer.

1.2.5 When corrections are required to the drawings, the changes shall be legible and marked in color. Changes to the drawings shall be made as detailed below:
   a) Red - Additions shall be marked or highlighted in red.
   b) Yellow - Removals shall be marked or highlighted in yellow.
   c) Green - New information concerning existing equipment shall be marked or highlighted in green. This indicates a “Record Only” change.

1.2.6 The Installation Supplier shall place one copy of each marked print in the electronic job folder (EJF). Color scans of marked floor plan prints may be uploaded to the electronic job folder. An alternative to color scans consists of an electronic markup of the floor plan file uploaded to the electronic job folder as a .DWG or .DWFx file. Instructions are provided to the Detail Engineer in TP-76400 Sec. 4 for performing an electronic markup.

1.2.7 When changes to the drawings are required, the affected area shall be outlined in the appropriate color. It is not necessary to color the entire area. For example, an area outlined in red indicates that everything in that area has been added.

1.2.8 When a small area is outlined, it requires straight lines that define the affected area of equipment; a loose circle that covers part of the adjacent equipment shall not be used. However, large isolated areas may be circled, for example, if a complete bay or frame is being removed from a front equipment drawing, a circle may be used.

2. DRAWING DETAILS

2.1. Floor Plan Drawing

2.1.1 The Installation Supplier shall show the following information on all updated floor plans:
   a) Bay number
   b) Bay name on front side of equipment
   c) Bay size (length and width)
   d) Clearance between adjacent bays
   e) Distance between bay and columns
f) Locating dimensions

g) Size and location of end guard

h) Size and location of spacers and glides

i) Aisle spacing (front & rear)

2.2. **Relay Rack Front Equipment Drawing**

2.2.1 The Installation Supplier shall show the following information:

a) Bay sketch with reference to the height and width of the bay, size of mounting plates and supplier (Lucent, Newton, Hendry, etc.)

b) Supplier equipment name or designation

c) Bay number

d) Circuit, shelf, panel, etc. number

e) Name of circuit or unit
SECTION T -- SYNCHRONIZATION

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   2.2. Building Integrated Timing Supply (BITS) ............................................................... T-2
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TABLE T-1 – SUMMARY OF CHANGES IN SECTION T

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1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications.

1.1.2 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.

1.1.3 This section covers the requirements for wiring in a manner to assure compliance with the AT&T synchronization rules and policies.
1.1.4 Changes in this issue of Section T are summarized in Table T-1.

2. **REQUIREMENTS**

2.1. **General**

2.1.1 BITS record books shall be maintained only where they currently exist. BITS records books shall not be created for locations for which they do not currently exist. Where BITS record books are maintained, the Installation Supplier shall attach a BITS record book (approved 8 ½ x 11 size) to the bay upright at or near the BITS/TSG clock. The Installation Supplier shall perform all cable labeling operations per Section L, and match assignment updates in the regionally approved record keeping system (ex. TAB/db, SyncTrac, or GeoLink) for all installations, rearrangements and removals. Where BITS record books are maintained, the installation supplier shall update the BITS record book as described in Section L, paragraphs 2.6.5 and 2.6.10.

2.1.2 Refer to Section J, ATT-TP-76300 for cabling requirements.

2.1.3 Refer to Section L, ATT-TP-76300 for labeling requirements.

2.1.4 Refer to Section K, ATT-TP-76300 for connecting requirements.

2.2. **Building Integrated Timing Supply (BITS)**

2.2.1 Building Integrated Timing Supply (BITS) concept is the method of providing and sustaining intraoffice synchronization. The BITS plan specifies that each office shall have one master clock signal source called the BITS/TSG (TSG = Timing Signal Generator). Under the BITS concept, every externally timed digital Network Element (NE) in the office shall derive its timing DIRECTLY from that single source within the office. A timing capable Network Element is defined as any digital equipment piece that is able to conform to the BITS concept by accepting the appropriate timing signals from an external source. A Network Element is still timing capable although it may not be currently configured or equipped to accept external timing signals, but the option exists to allow it to be so equipped.

2.3. **Synchronization Requirements**

2.3.1 The installation supplier shall wire every timing capable network element within a building directly from the BITS clock, as directed by the ATT-CO interconnection drawing. This timing shall NOT be wired through any intervening devices, other than BITS clock equipment. The Installation Supplier shall NOT run DS1 or composite clock timing leads from BITS clock OUTPUTS to the network element inputs through DSX jacks unless specifically instructed to do so in the detailed specification. Fiber optic timing leads for Network Time Protocol or Precision Time Protocol sync signals may be connected through a fiber cross connect bay as directed by the AT&T sync equipment planner.

2.3.2 Any Network Primary Reference Source (PRS) shelf shall be mounted in the same or adjacent bay to the master shelf. The installation supplier shall contact the AT&T Sync Equipment Planner if the detailed engineering specifications contain instructions for mounting this equipment in any other manner.
2.3.3 The AT&T Sync Equipment Planner shall be contacted in writing in the event of BITS DS1 output signals, DS0/composite clock signals, or E1/2048 kHz clock signals (where used) approach 80-90% exhaustion.

2.4. Diversity And Redundancy

2.4.1 Effective 1-1-2012, there are no diversity requirements for routing timing cables on overhead cable racks, under raised floor installations, or for routing Precision Time Protocol & Network Time Protocol (PTP/NTP) fiber jumpers in fiber troughs.

2.4.2 Redundant 1175A timing leads within equipment frames shall be routed on opposite sides of the frames if the NE timing input ports are on opposite sides or in the middle of the NE. If the NE timing input ports are on the same side of the NE, the timing leads may be routed on that side of the frame. Where a timing interface panel is used, (e.g.; Nortel/Ciena MG9000, Ericsson BLM-1500, Alcatel-Lucent 7750) the 1175A timing leads shall be terminated at the panel. The timing interface panel and cables interconnecting the timing interface panel with the NE input ports are part of the NE, and are outside the scope of this section.

2.5. Output Cabling Requirements

2.5.1 DS1 and composite clock timing leads from BITS clock OUTPUT ports to a network element shall be run using the approved 1175A red-jacketed shielded cable. Red jacketed 735C coaxial cable shall be used for 2048 kHz analog sync signals. Single mode fiber jumpers or category 5e (or higher) unshielded Ethernet cable shall be used for Precision Time Protocol and Network Time Protocol timing signals as specified by the sync equipment planner.

2.5.2 The Installation Supplier shall connect (DC/hard grounded) the 1175A timing cable shield/drain wire at the clock source end only.

2.5.3 The 1175A timing cable shield/drain wire shall NOT be connected via a DC/hard grounded termination at the network element.

2.5.4 The Installation Supplier shall NOT run the timing leads from the BITS clock OUTPUTs to the network element input(s) through DSX jacks unless specifically instructed to do so in the detailed specification.

2.5.5 All Critical network element timing leads shall originate from BITS/TSG shelves that have phase holdover capabilities. This includes expansion shelves associated with the Master shelf or Remote Master shelves that are equipped with Remote Track and Hold Cards (RTHC) or oscillators capable of phase holdover. Examples of critical network elements include:

a) All CCS7 related equipment (STP’s, LPP’s, FLIS, LIM, and D4 bays serving SS7 Links).

b) Slave/Remote master clock shelves.

c) Any other equipment specified by the AT&T Sync Equipment Planner or detail engineer as being “critical.”

2.5.6 The Installation Supplier shall wire all redundant timing signal leads from BITS clocks as mated pairs, odd-even or alternate group assignments within a shelf. Outputs shall be equally assigned between each matched set of cards such that both cards will be exhausted at the same time period.
2.5.7 Redundant output timing signal feeders from new or vacant card slots shall be routed from alternate sides of the BITS shelf.

2.5.8 At the rear of the BITS shelf, the Installation Supplier shall butt and strip the cable sheathing in such a manner as to not allow cable sheathing and/or heat shrink to be placed on the fanning strip or within the rear protective cover of this strip. The butts shall be protected with heat shrink tubing only and spaghetti sleeve shall be placed on the sleeve lead (ground wire). Tape shall not be used at any time for this application.

2.5.9 All alarm and alarm return leads shall be run as pairs as specified by the job documentation.

2.5.10 There shall be only one or a single termination per DS1, composite clock, or E1/2048 kHz clock port. No bridging allowed.

2.5.11 Alarms shall be wired per ATT-CO drawings, verified and tested as specified in the detailed specification and other sections of ATT-TP-76300 and ATT-TP-76900.

2.5.12 All 1175A cable terminations shall be dressed with heat shrink insulation at the butts of the cables.

2.6. Input Cabling Requirements

2.6.1 Wiring of the input timing reference shall be in accordance with the appropriate ATT-CO wiring interconnection drawing. Mini-DSX will be placed only for new master systems that employ SONET Derived DS1 signals as the input timing reference as directed by the sync equipment planner.

2.7. Power Requirements

2.7.1 Dedicated BITS fuse panel(s) shall serve only BITS/PRS equipment in the same or its adjacent bay.

2.7.2 “A” and “B” battery outputs of the fuse panel(s) shall be wired in a manner to correspond to the “A” and “B” battery inputs of the BITS equipment. This may require the mounting of two wire support brackets, one above and one below the fuse panel.

2.7.3 All battery and battery return connections from the fuse panel(s) to the BITS equipment shall be made with ring terminals at both ends.

2.7.4 Battery and battery return leads to the BITS dedicated fuse panel(s) that originates directly at the Power Plant shall be fused on different rows.

2.8. Grounding Requirements

2.8.1 Ground leads shall be individually run and properly terminated.

2.8.2 The sleeve/drain wire from the approved signal cable shall be insulated with a spaghetti-type sleeve.

2.8.3 If the timing lead to/from a network element within an isolated ground plane has an intermediate DSX appearance, the shield/drain shall be grounded at the network element and at the BITS clock wire wrap panel, but left un-terminated at the intermediate DSX. If the lead
does NOT have a DSX appearance, the shield/drain shall be grounded at the BITS clock wire wrap panel only.

2.8.4 When/where a shield/drain ground connection is required; verify that the ground termination pin/point is DC-grounded.

2.9. Cabling Requirements For Network Elements

2.9.1 Network element equipment configurations requiring BITS timing shall be individually timed from the office BITS, with primary and secondary reference signals from adjacent output cards, with odd-even or alternate group slot assignments per AT&T interconnect drawings. Timing connections at the network element shall be made per the AT&T interconnect drawings.

2.9.2 In the event of output card exhaustion, daisy-chaining to enable cascading of digital (DS1, CC, E1) synchronization reference signals to multiple network elements is NOT an AT&T option and shall not be permitted. Arrangements must be made with the AT&T synchronization planner to provide additional BITS outputs. This requirement does not apply to serial Time of Day connections when cabled as shown in AT&T interconnect drawings.

2.9.3 Each network element shall have the digital (DS1, CC, E1) “CLOCK IN” connections (PRIMARY and SECONDARY) cabled via 1175A red jacketed timing cable to the BITS. Red jacketed 735C coaxial cable shall be used for analog (2048 kHz) timing signals. Shield lead conductors of all 1175A timing input cables shall be DC-grounded at the BITS shelf wire wrap panel only and left insulated and un-terminated at the network element.

2.9.4 Network element “CLOCK OUT” connections (PRIMARY and SECONDARY) shall not be cabled, except when required for office BITS clock reference input as specified by the AT&T sync equipment planner.

2.9.5 Where a timing interface panel is used, the 1175A timing leads terminate at the panel. The interface panel and cables interconnecting the timing interface panel with the NE input ports are part of the NE, and are outside the scope of this section.

2.10. Removals

2.10.1 At the BITS/TSG, the Installation Supplier shall remove and lay back all terminations associated with removed and/or displaced network elements.

2.10.2 The Installation Supplier shall verify all input/output timing leads before they are disconnected as follows:
   a) First, Installation Supplier shall make sure that a MOP was approved prior to any cable removal
   b) Second, verify and confirm the presence of a far end ground on the un-terminated shield/drain wire at the network element.
   c) Third, identify the cable at the BITS clock end and remove the shield/drain wire.
d) Next, confirm/verify loss of ground on the shield/drain wire at the network element being removed. If ground is lost, the cable shall be disconnected at the BITS clock and the network element, in that order.

e) If ground remains after the shield/drain wire is removed at the BITS clock, an incorrect cable has been identified and the shield lead shall be reconnected. To identify the correct leads, the Installation Supplier shall trace the timing leads from the network element to the BITS clock.

f) Complete all cable removal operations, update the sync record assignment book and assure all updates match and are reflected in the regionally approved record keeping system (ex. TAB/dB, SyncTrac, or GeoLink).

[END OF SECTION]
1. GENERAL

1.1. Introduction

1.1.1 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 installation specifications (ATT-790-100-658).

1.1.2 The Installation Supplier shall assure, as part of the evaluation of the installation, that all work is performed in accordance with the detail specifications or approved changes to the detail specifications (ATT-790-100-658JP).

1.1.3 This section covers the general requirements for the installation of stand-by engine/alternator sets.

1.1.4 Changes in this issue of Section U are summarized in Table U-1.

1.1.5 For more detailed information refer to ATT-790-100-658 and ATT-790-100-658JP.
2. REQUIREMENTS

2.1. General

2.1.1 All exterior engines and associated support equipment shall be protected by bollards, covers, or other protective obstructions to prevent damage from vehicles or other traffic.

2.1.2 Only cabling directly associated with the Engine / Alternator and fuel system shall be run into and out of the Engine/Alternator room/enclosure. Examples of permitted cable includes, the grounding cable, telecommunication cables (commonly referred to as telephones), Alarm Cabling, Telemetry, power for Engine/Alternator accessories, and the AC output of the Engine / Alternator set.

2.2. Exhaust Requirements

2.2.1 Exhaust piping and duct connection joints shall not be insulated until the on-site full load testing has been completed and the bolts have been re-tightened.

2.2.2 A critical grade exhaust silencer equipped with a condensation drain, companion flanges, and a stainless steel bellows type exhaust fitting shall be provided. The flexible stainless steel bellows type exhaust fitting shall be installed within 12" of the exhaust manifold (if possible).

2.2.3 All exhaust components exposed to outside elements (module or building) shall be stainless steel.

2.3. Alarms

2.3.1 The Installation Supplier shall extend and terminate all specified alarm leads as designated by the AT&T Equipment Engineer. The terminal blocks shall be stenciled per Section L.

2.3.2 All new standby engine/alternator sets shall have the capability of forwarding alarms via TCP/IP to the appropriate alarm center. The alarms specified shall be the AT&T minimum alarms and required equipment specific alarms per AT&T drawing ATT-P-05010-E.

2.4. Grounding

2.4.1 The engine/alternator set base/skid, start battery racks, battery chargers, and fuel day tanks (when present and of metallic construction), shall be bonded to the Common Bonding Network (CBN) with stranded copper grounding conductors in conformance with ATT-TP-76416.

2.4.2 The set mounted control cabinet, meter cabinet/panel, and engine/alternator shall be bonded to the engine/alternator metallic base/skid. When present, a factory installed bond is sufficient. Such bonds shall be made with conductors designed to withstand engine/alternator vibrations.

2.4.3 When multiple parallel conduits are used a full sized grounding conductor shall be run in each conduit.

2.4.4 Equipment grounding conductors shall terminate within the engine/alternator cabinet provided for termination of phase conductors. Termination shall be made directly to a non-insulated ACEG bus bar.

2.4.5 To provide grounding continuity between the entire engine/alternator set and the equipment grounding conductors, the engine/alternator cabinet shall be electrically connected to the set frame in one of the following manners:
   a) By attachment hardware
b) By a bonding strap of cross-sectional area equal to that of the grounding conductor specified.

2.5. Connections

2.5.1 All field wire and cable connections shall be made in accordance with TP76300 section K.

2.5.2 The installation vendor shall provide means to prevent field-installed connectors from turning at termination points.

2.5.3 The standby engine/alternator set output leads (either single or three phase) shall be connected to the transfer switch, building AC or within a junction box termination point in the following manner:

a) The correct compression type splice connector shall be utilized when the conductors between the alternator and AC transfer switch are spliced or directly joined together.

b) Two-hole compression terminals may be utilized with a bus bar arrangement in the junction box or AC transfer switch when this arrangement is specified.

c) Split bolt type connectors, sometimes called kearnies, shall NOT be used.

d) The splice or junction box shall not be mounted on the engine/alternator set due to vibration.

e) Liquidtight Flexible Metal Conduit (LFMC) shall be used between the junction box and engine/alternator set due to vibration.

2.6. Fuel System

2.6.1 The AT&T Power Equipment Engineer/Capacity Manager will outline basic requirements of the fuel system, such as tank size and the need for a day tank in the ATT-790-100-658JP. CRE will design and implement the fuel system based on those requirements.

2.6.2 Fuel systems shall meet all local, state and federal permitting requirements.

2.6.3 The installation of all fuel systems shall be reviewed by AT&T EH&S. Any time the fuel system (i.e., piping, day tank, fuel storage tank, etc.) from the standby engine/alternator set to any fuel tank supporting the engine/alternator set requires work, the Installation Supplier shall contact the AT&T Environmental Health & Safety at 1-800 KNOW EHS before beginning work.

2.6.4 Fuel lines that are located outside the building and exposed shall be protected from being crushed.

2.6.5 Both the fuel and return lines shall have flexible sections connected to the engine/alternator set.

2.6.6 All field installed fuel hoses shall be of proper length without looping, sharp bends or excessive slack.

2.6.7 Pipe sealant shall be used on all fittings.

2.6.8 Day tanks, when required, shall be located in an engine room that serves as a spill containment room, or if the room does not serve as spill containment, shall be equipped with spill containment dams of adequate capacity to contain the contents of the day tank.

2.7. Guards, Labels and Nameplates

2.7.1 All phase leads between the engine/alternator set and the control board shall be marked showing the phase rotation.

2.7.2 All piping shall be directionally labeled and isolation valves shall be position labeled.
2.7.3 Installation Supplier shall ensure that all high temperature warning labels, insulation, ventilation guards, and safety guards recommended by the manufacturer and provided in accordance with TP76400 section 16 are properly affixed.

2.7.4 All set screws, bolts, keys or keyways shall have no projecting or sharp edges or be suitably guarded. All in-running gears and sprockets shall be completely enclosed or provided with band guards around the face of the gear or sprocket. Working personnel shall not be able to touch any rotating part.

2.7.5 The engine/alternator set AC panel shall have the far end destination point labeled clearly.

2.8. Testing and Acceptance

2.8.1 General testing and acceptance details are described in ATT-TP-76900. Engine/alternator set testing and acceptance details are described in ATT-790-100-658JP. The Installation Supplier shall follow the procedures and requirements set forth in these documents for testing and acceptance of engine/alternator sets.

2.8.2 The Installation Supplier shall verify the availability of lubricating oil and permanent antifreeze required for standby engine/alternator sets.

2.8.3 The Installation Supplier shall verify that the engine/alternator contains the proper levels of lubrication oils and water/antifreeze mixture before the initial test run.

2.8.4 All personnel working in the vicinity of operating engine/alternator sets shall wear ear and eye protection.

2.8.5 The engine/alternator set shall not be started until a manufacturer's representative has performed the initial start-up.

2.8.6 The Installation Supplier shall provide resistive type load bank(s) and connection cables capable of absorbing 110 % of the engine/alternator's rated output in kilowatts during shop test and on site load testing.

2.8.7 The Installation Supplier shall provide a representative to assist AT&T personnel in acceptance testing.

2.9. Start Batteries

2.9.1 The engine starting batteries shall be chosen and sized per ATT-790-100-658, sections 3.10.4.2 and 3.10.4.4.

2.9.2 Anti-corrosion coating such as NO-OX-ID-A shall be applied to all battery terminals and connections.

2.9.3 All battery cables shall be secured per section J to prevent chaffing.

2.9.4 The engine/alternator set start and control batteries shall be located so the cells are not exposed to excessive heat.

2.9.5 All batteries shall be contained in an appropriately grounded rack or other manufacturer recommended container that meets local seismic requirements.

2.10. Radiator
2.10.1 Any radiator not located on the engine/alternator base/skid shall comply with all ‘remote’ radiator requirements specified in ATT-790-100-658.

2.10.2 Radiator piping and AC conduit shall not be supported by the radiator stand.

2.10.3 All radiator piping shall be painted with a high temperature outside paint.

2.10.4 Radiator piping shall have braided stainless steel flexible lines with finished ends, flange coupled, at the engine/alternator set and radiator.

2.11. Emergency Shut Down

2.11.1 Both the generator set control cabinet and the alarm annunciator panel shall be equipped with emergency shutdown switches. See 790-100-658, 3.9.10.1 for details regarding the alarm annunciator panel.

2.11.2 The emergency shutdown switch for the engine shall be designated and covered to prevent accidental activation.
SECTION V— REGULATED WASTE MANAGEMENT

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<td>Modification</td>
<td>ATT-TP-76300-338</td>
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<td>2.1.5</td>
<td>Modification</td>
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1. GENERAL

1.1.1 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 installation specifications.

1.1.2 The Installation Supplier shall assure, 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.

1.1.3 This section covers general requirements for Hazardous Materials and Regulated Waste management in AT&T sites. This includes Hazardous Materials, Hazardous Waste, Universal Waste, and other Regulated Wastes.

1.1.4 The information in this section is not intended to be an all-inclusive guide. It is intended to provide an awareness of the types of Regulated Waste that may be present in AT&T sites.
1.1.5 Waste materials (including but not limited to Regulated Waste) resulting from work performed at AT&T facilities by the Installation Supplier shall not be left on AT&T property or placed in waste or recycling containers placed there for AT&T’s use, except as authorized by 1.1.5 a) below. Such wastes may include, for example, packaging material for new equipment, new equipment that was not installed, and/or old equipment that was removed. Waste materials resulting from work performed by the Installation Supplier must instead be removed promptly by the Installation Supplier, and disposed of or otherwise managed in compliance with all applicable legal requirements.

a) The Installation Supplier may leave such waste materials on AT&T property or in waste or recycling containers placed there for AT&T’s use only if and to the extent it receives prior written approval to do so, describing the specific types of materials, from an AT&T Director or above.

1.1.6 Employees of the Installation Supplier who handle regulated materials/wastes must be trained on the hazards associated with those materials and on the proper methods and procedures to use when handling, storing, offering for transport, transporting or disposing of such regulated materials/wastes. The level of training required is dependent on each employee’s current/future waste management job responsibilities. All employees should be able to demonstrate a general understanding of environmental issues and how they relate to their jobs.

1.1.7 Proper handling and management of Regulated Waste is necessary to:

a) Protect AT&T employee and installation supplier’s health

b) Protect public welfare, and

c) Maintain AT&T’s corporate objective to conduct, manage and maintain its operation in compliance with environmental laws and regulations with full regard to their potential impact on the environment and the community.

1.1.8 For more guidance regarding Hazardous Materials and Regulated Waste management, the AT&T Representative can refer to 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) prompt 4.

1.1.9 The Installation Supplier shall be responsible for compliance with federal, state and local environmental regulations, including those concerning Hazardous Materials, Hazardous Waste, Universal Waste, Electronic Waste, and other Regulated Wastes.

1.1.10 The Installation Supplier shall employ environmentally safe practices in the performance of its duties.

1.1.11 The Installation Supplier shall obtain the necessary environmental permits (e.g., standby engine permits), notifications (e.g., notification of regulating agency and AT&T EH&S) and training (e.g., floor drilling training) prior to initiating work activities.

1.1.12 The AT&T Representative shall monitor the Installation Supplier’s compliance with the procedures established in this section V.
1.1.13 The Installation Supplier shall coordinate with the AT&T Representative before starting any activity related to Regulated Waste.

1.1.14 Installation Supplier shall issue appropriate warnings to inform and educate its employees, agents, subcontractors, other invitees, and the employees of any of them, entering AT&T facilities of the information in this section V.

1.1.15 In the event of any of the following occurrences, the Installation Supplier shall immediately contact the AT&T Representative, who will contact the appropriate AT&T organization:

<table>
<thead>
<tr>
<th>Type of Occurrence</th>
<th>AT&amp;T Representative will contact…</th>
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<tbody>
<tr>
<td>Regulatory agency inspector visit to site</td>
<td>AT&amp;T EH&amp;S: 1-800-KNOW-EHS (1-800-566-9347)</td>
</tr>
<tr>
<td>Accidental release/spill of Regulated Waste or Hazardous Materials</td>
<td>AT&amp;T EH&amp;S: 1-800-KNOW-EHS (1-800-566-9347)</td>
</tr>
<tr>
<td>Accidental exposure of workers to Regulated Waste or Hazardous Materials</td>
<td>AT&amp;T EH&amp;S: 1-800-KNOW-EHS (1-800-566-9347)</td>
</tr>
</tbody>
</table>

2. DEFINITIONS

These definitions relate to the types of materials that can be present at AT&T sites.

2.1.1 Wastes are materials that will no longer be used for their original intended purpose and will be discarded. Examples of wastes that do not fall under the categories of Regulated Waste (defined below) include uncontaminated construction and demolition debris, office trash, garbage, rubbish and refuse or other materials such as recyclable scrap cable/wire.

2.1.2 Regulated Wastes are wastes that require special handling and disposal, including but not limited to Hazardous Waste, Universal Waste, some Electronic Wastes, PCB wastes, asbestos wastes, used oil, and radioactive wastes. Regulated waste materials could include (but are not limited to) chemicals, paint, caulking, cleaners, degreasers, adhesives, epoxies, oil, lubricants, mercury-containing lamps (MCLs), light ballasts, smoke detectors, aerosol spray cans, batteries, and electronic devices (any device that contains a circuit board, chip or digital display or screen).

2.1.3 Hazardous Wastes are waste materials that are regulated by applicable federal or state rules as “hazardous wastes”. Generally, a material becomes a waste when its owner determines it is no longer useful or valuable, and therefore intends to discard it (which includes not only disposal, but also some kinds of recycling). Federal or state rules define which wastes are hazardous based on physical characteristics such as ignitability, reactivity, corrosivity or toxicity (“characteristic wastes”) or by listing certain wastes (“listed wastes”). Some Hazardous Wastes that may be generated at AT&T facilities include spent batteries, leaking batteries, mercury and Carrier Communications Space switch components that contain mercury.

2.1.4 Universal Wastes are materials that are classified as Hazardous Waste but which are exempt from certain of the federal Hazardous Waste management requirements, as long as
the materials are intact, intended to be recycled rather than disposed in a landfill. They are required to be protectively packaged prior to transport for disposal. Currently, batteries, agricultural pesticides, thermostats, fluorescent lamps and mercury-containing lamps (MCLs) are the only wastes classified by the USEPA as Universal Wastes. Some states such as California have specified that used cathode ray tubes (“CRTs”), including those in computer monitors, be managed as a Universal Waste.

2.1.5 Electronic Waste (“e-waste”) may be defined as computers, TVs, entertainment device electronics, mobile phones, and other items containing electronic parts or electronic circuit of any kind, after they have been used and are transferred from the original owner for reuse, resale, salvage, recycling, or disposal. Some but not all e-waste is classified as Hazardous Waste, Universal Waste, or other Regulated Waste. Some states, including California, have strenuous e-waste regulations. In states where e-wastes are regulated (e.g., CRTs in California), they may be exempt from selected waste management requirements as long as they are intact and are recycled, rather than disposed in a landfill. Check with the AT&T RRC at 1-800-KNOW-EHS (1-800-566-9347), prompt 4 if unsure of proper disposal of electronic equipment.

2.1.6 Hazardous Materials are materials that are regulated by U.S. Department of Transportation (DOT) regulations when offered for transport. (These regulations apply to both wastes and non-wastes.) DOT requirements include proper packaging, labelling, and marking of the materials and placarding of the vehicle.

3. REGULATED WASTES

3.1.1 Installation Suppliers often handle Regulated Wastes in the course of their work activities. Handling of Regulated Wastes requires specialized training and knowledge. The following Regulated Wastes, not to be considered inclusive, may be encountered in AT&T facilities:

<table>
<thead>
<tr>
<th>Materials That May Be Regulated Wastes</th>
<th>Examples That May Be Found at AT&amp;T Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos</td>
<td>Floor tile, cable holes and covers, cable sheath, ceramic resistor washers, asbestos textiles, asbestos sheets, generator, boiler insulation, transite sheeting and pipe/ducts</td>
</tr>
<tr>
<td>Electrolyte (battery acid/alkali)</td>
<td>Wet-cell, gel-cell, Ni-Cd batteries</td>
</tr>
<tr>
<td>Lead</td>
<td>Lead-sheathed cable, solder and paint wastes</td>
</tr>
<tr>
<td>Mercury</td>
<td>Switches, relays, tubes and interrupters. These may be frame-mounted, plug-in units or mounted on plug-in circuit boards; fluorescent light tubes</td>
</tr>
<tr>
<td>Petroleum products</td>
<td>Fuel for emergency power generating equipment and in lubricating fluids and</td>
</tr>
</tbody>
</table>

V-4
3.1.2 The Installation Supplier is responsible for removing all waste materials used or generated during the job from AT&T property for proper disposal.

3.1.3 When the Installation Supplier will move equipment containing Hazardous Materials (e.g., 1-AESS switches, transformers, rectifiers, relays, etc) between AT&T facilities, the Installation Supplier shall notify its AT&T Representative prior to removal or transportation, to ensure compliance with environmental regulations. All Hazardous Materials and equipment containing Hazardous Materials must be protectively packaged in accordance with U.S. Department of Transportation (DOT) and any other applicable local, state or federal packaging requirements.

3.1.4 Before the Installation Supplier removes equipment that is to be sold as scrap or for salvage and which would be (or contains components that would be) Regulated Waste, the Installation Supplier shall contact the AT&T Representative. There are two options for disposal of such regulated waste:

a) An Installation Supplier may remove, store, and arrange for reclamation of Regulated Waste, if the Installation Supplier (A) is contracted by AT&T to conduct such work; (B) has agreed to and included the terms and conditions outlined in this section V; (C) agrees to forward all shipping papers to the RRC Record Keeper including certificates of recycling/reclamation; and (D) agrees to create and sign shipping papers on behalf of AT&T.

b) Alternatively, the AT&T Representative may submit a disposal request to the RRC via the EH&S Waste Tracking System (WTS) or call the RRC at 1-800 KNOW EHS (1-800-566-9347), Prompt 4. In this case, AT&T will arrange for proper disposal.

3.1.5 When batteries are removed, procedures described in this section (section V) shall be followed:

a) Batteries staged for reuse shall be prepared for shipment as noted below. Cells shall be marked and reinstalled in the same order as placed in the original installation. Miscellaneous battery items such as spark arrestors and thermometers shall be packed and stay with the cell in which they were originally installed.

b) Vents shall be covered with a shipping cap.

c) Filling tubes shall be plugged and terminals shall be protected against short circuits with tape, caps or protective packaging.
d) Each container or unit shall be marked with proper identification and address of the assignee and consignor. Also a 4" x 4" label, with the word "corrosive" shall be applied to each.

e) Batteries shall be secured during transport.

f) Batteries shall be transported in compliance with applicable DOT regulations.

g) The Installation Supplier shall have agreed to and included the terms and conditions outlined in the AT&T Battery Amendment in its contract.

4. DOCUMENTATION REQUIRED IF REGULATED WASTES SHIPPED BY INSTALLATION SUPPLIER

4.1.1 The Installation Supplier shall use the documents identified in this section V to manage Hazardous Materials, Hazardous Waste, Universal Waste, or Electronic Waste. These may include:

a) Hazardous Waste Manifests

b) Hazardous Materials Bills of Lading

c) Bills of Lading

d) Non-Hazardous Waste manifests

e) Certificates of Reclamation/Recycling

4.1.2 Material Disposition Record Forms - A Material Disposition Record (MDR) is an AT&T document completed from the point or site where Carrier Communications Space scrap is generated, itemizing the type of material, location address, and project information. A MDR shall be completed by the installation supplier prior to the removal of Carrier Communications Space material. The Installation Supplier shall place a copy of the initial shipping documents in the job folder and within three business days after pick up for those states requiring an initial copy (i.e., California, Arizona, Connecticut, Illinois, Maine, Michigan, Minnesota, New Hampshire, New York, Rhode Island, Vermont, and Wisconsin) send a copy of the initial shipping documents to the Resource Recovery Center (RRC) Record Keeper:

**AT&T Facilities Outside California**

AT&T Services Inc.  
ATTN: EH&S Record Keeper RRC  
One AT&T WAY, Room 1A111C  
BEDMINSTER, NJ 07921  
FAX: (281) 664-5145

**AT&T California Facilities:**

ATTN: RRC Record Keeper  
P.O. Box 5095 Room 4W200i  
San Ramon, CA 94583-0995  
FAX (925) 973-0584

**(If using internal distribution, use the address: 5001 Executive Park, Room 4W2001, San Ramon, CA 94583-0995)**
4.1.3 CALIFORNIA ONLY - In addition to mailing/faxing a copy of the shipping documentation as directed in section 4.1.2, in California, a copy of shipping documentation must be placed in the location’s Green Binder. The Installation Supplier shall provide a copy of the shipping documentation to the AT&T Representative or the location’s GNFO Manager for placement in the Green Binder.

4.1.4 The Installation Supplier shall keep such full and detailed records as shall be necessary to reflect the Services performed, including, when applicable, all testing, sampling and investigative Services performed by it. The Installation Supplier will create the shipping papers and associated documents (e.g., land bans, uniform manifests, bills of lading, and/or certificates of recycling or reclamation as appropriate) and shall send the documents to the RRC manager for review prior to removing such materials from AT&T Premises. If changes are necessary upon review, the responsible RRC Manager and the Installation Supplier will make the applicable changes to the document prior to removal. The Installation Supplier shall sign such documents on behalf of and as an agent of AT&T.

4.1.5 The Installation Supplier shall attempt to provide the final, completed shipping documents to AT&T (EH&S) RRC within 15 days after pick-up, and shall ensure that such documents are received by the AT&T (EH&S) RRC no later than 30 days after pick-up (RRC address in section 4.1.2).

[END OF SECTION]
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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:

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**TABLE W-1 – SUMMARY OF CHANGES IN SECTION W**

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

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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 W-2 - SEISMIC BRACING**

<table>
<thead>
<tr>
<th>Earthquake Risk Zone</th>
<th>Richter Magnitude</th>
<th>Modified Mercalli 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>
</tr>
<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 import 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 W-3 - DISTANCE SEPARATION UTP TO POWER

<table>
<thead>
<tr>
<th>Quantity of Circuits</th>
<th>Electrical Circuit Type</th>
<th>Separation Distance (mm)</th>
<th>Separation Distance (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 15</td>
<td>20A 110/240V 1 – phase shield or unshielded</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 – 30</td>
<td>20A 110/240V 1 – phase shielded</td>
<td>100 mm</td>
<td>4 in</td>
</tr>
<tr>
<td>61 – 90</td>
<td>20A 110/240V 1 – phase shielded</td>
<td>150 mm</td>
<td>6 in</td>
</tr>
<tr>
<td>91+</td>
<td>20A 110/240V 1 – phase shielded</td>
<td>300 mm</td>
<td>12 in</td>
</tr>
<tr>
<td>1+</td>
<td>100A 415V 3 – phase shielded feeder</td>
<td>300 mm</td>
<td>12 in</td>
</tr>
</tbody>
</table>

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 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 28-⅛ 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 HDA 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:

**TABLE W-4 - MDA CABLE COUNTS**

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

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 then 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 shinier 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.
8.8.6 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**

Maximum circuit distances for the typical data center configuration.

<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</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>(E – 1)</td>
<td></td>
<td></td>
<td></td>
<td></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</td>
<td>-</td>
<td>-</td>
<td>503 ft (153 m)</td>
<td>257 ft (78 m)</td>
</tr>
<tr>
<td>(E-3)</td>
<td></td>
<td></td>
<td></td>
<td></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**

Maximum backbone for the typical data center configuration.

<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>(E – 1)</td>
<td></td>
<td></td>
<td></td>
<td></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</td>
<td>-</td>
<td>-</td>
<td>126 ft (38 m)</td>
<td>0 ft (0 m)</td>
</tr>
<tr>
<td>(E-3)</td>
<td></td>
<td></td>
<td></td>
<td></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>
<thead>
<tr>
<th>Specification</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20ºC to +70ºC</td>
</tr>
<tr>
<td>Installation Temperature</td>
<td>0ºC to +70ºC</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40ºC to +70ºC</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 ARMORD 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. (Newton)</th>
<th>Maximum Vertical Rise Feet (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Loaded</td>
<td>Unloaded</td>
<td>Short Term</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
<td>14.6</td>
<td>10</td>
<td>148</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>0.5</td>
<td>14.6</td>
<td>10</td>
<td>154</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>0.5</td>
<td>14.6</td>
<td>10</td>
<td>158</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>0.5</td>
<td>14.6</td>
<td>10</td>
<td>160</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>0.5</td>
<td>14.6</td>
<td>11</td>
<td>166</td>
<td>30</td>
</tr>
<tr>
<td>18</td>
<td>0.7</td>
<td>19.7</td>
<td>19</td>
<td>294</td>
<td>30</td>
</tr>
<tr>
<td>24</td>
<td>0.8</td>
<td>20.4</td>
<td>22</td>
<td>336</td>
<td>30</td>
</tr>
<tr>
<td>36</td>
<td>0.8</td>
<td>21.7</td>
<td>28</td>
<td>420</td>
<td>30</td>
</tr>
<tr>
<td>48</td>
<td>0.9</td>
<td>23.0</td>
<td>30</td>
<td>449</td>
<td>30</td>
</tr>
<tr>
<td>60</td>
<td>1.0</td>
<td>25.5</td>
<td>35</td>
<td>524</td>
<td>30</td>
</tr>
<tr>
<td>72</td>
<td>1.1</td>
<td>26.1</td>
<td>41</td>
<td>622</td>
<td>30</td>
</tr>
<tr>
<td>96</td>
<td>1.2</td>
<td>31.9</td>
<td>56</td>
<td>847</td>
<td>30</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>125.0 ± 0.7 µm</td>
</tr>
<tr>
<td>Core/Clad Offset</td>
<td>≤ 0.5 µm</td>
</tr>
<tr>
<td>Coating Diameter</td>
<td>245 ± 10 µm</td>
</tr>
<tr>
<td>Coating Diameter (Colored)</td>
<td>245 ± 7 µm</td>
</tr>
<tr>
<td>Coating/Cladding Concentricity Error, Max</td>
<td>12 µm</td>
</tr>
<tr>
<td>Clad Non-Circularity</td>
<td>≤ 1%</td>
</tr>
<tr>
<td>Proof Test</td>
<td>100 kpsi (.96 Gpa)</td>
</tr>
<tr>
<td>Coating Strip Force</td>
<td>0.3 – 2.0 lbf (1.3 – 8.9 N)</td>
</tr>
<tr>
<td>Fiber Curl</td>
<td>≥ 4 m</td>
</tr>
<tr>
<td>Dynamic Fatigue Parameter (nd)</td>
<td>≥ 18</td>
</tr>
<tr>
<td>Macrobending, max. (100 turns)</td>
<td>0.005dB</td>
</tr>
<tr>
<td></td>
<td>(1310/1550nm @ 50mm) 0.05 dB</td>
</tr>
<tr>
<td></td>
<td>(1625NM @ 60 MM)</td>
</tr>
<tr>
<td>Marcobending, max. (1 turn @ 32 mm mandrel)</td>
<td>0.05 dB @ 1550nm</td>
</tr>
</tbody>
</table>
TABLE W-10 - SM WAVELENGTH SPECIFICATIONS

<table>
<thead>
<tr>
<th>Optical Characteristics, Wavelength Specific</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>Optical Characteristics, General</th>
<th>Environmental Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Defects, Max.</td>
<td>Temperature Dependence</td>
</tr>
<tr>
<td></td>
<td>-60 C to + 85 C</td>
</tr>
<tr>
<td>Cutoff Wavelength</td>
<td>Temperature Humidity Cycling</td>
</tr>
<tr>
<td></td>
<td>-10 C to + 58 C up to 95% RH</td>
</tr>
<tr>
<td>Zero Dispersion Wavelength</td>
<td>Water Immersion, 23+2 C</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Dispersion Slope, Max.</td>
<td></td>
</tr>
<tr>
<td>Polarization Mode Dispersion Link Design Value</td>
<td></td>
</tr>
<tr>
<td></td>
<td></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>Core Diameter</td>
<td>50.0 ± 2.5 µm</td>
</tr>
<tr>
<td>Cladding Diameter</td>
<td>125.0 ± 1.0 µm</td>
</tr>
<tr>
<td>Core/Clad Offset</td>
<td>≤ 1.5 µm</td>
</tr>
<tr>
<td>Coating Diameter (Uncolored)</td>
<td>245 ± 10 µm</td>
</tr>
<tr>
<td>Coating Diameter (Colored)</td>
<td>254 ± 7 µm</td>
</tr>
<tr>
<td>Coasting/Cladding Concentricity Error, Max.</td>
<td>6 µm</td>
</tr>
<tr>
<td>Clad Non-Circularity</td>
<td>≤ 1%</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>
<tr>
<td>Optical Characteristics, General</td>
<td>Environmental Characteristics</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------</td>
<td></td>
</tr>
<tr>
<td>Numerical Aperature</td>
<td>Temperature Dependence</td>
<td></td>
</tr>
<tr>
<td>0.200 ± 0.015</td>
<td>-60 C to +85 C ≤ 0.10 dB</td>
<td></td>
</tr>
<tr>
<td>Point Defects, max.</td>
<td>Temperature Humidity Cycling</td>
<td></td>
</tr>
<tr>
<td>0.15 dB</td>
<td>-10 C to +85 C ≤ 0.10 dB</td>
<td></td>
</tr>
<tr>
<td>Zero Dispersion Wavelength</td>
<td>Water immersion, 23 + 2 C ≤ 0.20 dB</td>
<td></td>
</tr>
<tr>
<td>1297 – 1316 nm</td>
<td>Heat Aging, 85 + 2 C ≤ 0.20 dB</td>
<td></td>
</tr>
<tr>
<td>Zero Dispersion Slope, max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.105 PS/((km-nm-nm))</td>
<td></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(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.

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

a) There shall be no less than two (2) separate, 24 strand trunks of SM 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>
<thead>
<tr>
<th>TABLE W-15 COAXIAL CABLE CONSTRUCTION</th>
</tr>
</thead>
</table>

**Coaxial Cable Construction:**

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

<table>
<thead>
<tr>
<th>TABLE W-16 - COAXIAL ELECTRICAL / PHYSICAL PROPERTIES</th>
</tr>
</thead>
</table>

**ELECTRICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Sparker Test:</th>
<th>2500 VAC</th>
</tr>
</thead>
</table>

**Dielectric Strength:**

| Conductor to Shield: | 5 Sec. @ 3500 VAC |
| Shield to Shield:    | 1200 VAC |

| Capacitance: | 17.0 pF/ft. Nom. |
| Impedance:   | 75.0 +/- 3.0 Ohms |
| Velocity of Propagation: | 80% Nom. |
| DCR:         | Conductor: 11.0 Ohms/1000 ft. |
| SRL:         | 30.0 dB Min. (15 – 95 MHz) 100% Swept Tested |

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Minimum Bend Test:</th>
<th>Loaded: 20 Time cable OD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacket Temp. Rating:</td>
<td>Unloaded: 10 Times Cable OD</td>
</tr>
<tr>
<td></td>
<td>Temperature: 125°C</td>
</tr>
</tbody>
</table>
**TABLE W-17 - COAXIAL CABLE ATTENUATION**

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

![UTP Copper Cable PIN OUT Diagram]
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 their 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 insure 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.
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.

Note: By labeling each rack and/or cabinet with a unique identification number makes it easier in found its location within an IDC.
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**

**Cable Label Example:**

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

**Label – 2 (MDA2 Side)**

| Near End: M002M5LGXB01BA1226072.145-216 |
| Far End: M001M5LGXA01AD0741072.013-084 |

Sample of a Category 6 UTP Copper cable label from the Primary MDA to a Customer and/or Managed Cage, IDF (Intermediate Distribution Frame):

**MDA/MDF to IDF Category 6 UTP Copper Cable**

**Label Example:**

<table>
<thead>
<tr>
<th>Label – 1 (MDA1 Side)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Near End: M001C6COPA01AD1222012.007-019</td>
<td></td>
</tr>
<tr>
<td>Far End: I027C6COPA01AX0344012.001-012</td>
<td></td>
</tr>
</tbody>
</table>

**Label – 2 (IDF27 Side)**

| Near End: I027C6COPA01AX036844012.001-012 |
| Far End: M001C6COPA01AD1222012.007-019 |

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 M 5 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>C6</th>
<th>COP</th>
<th>A01</th>
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</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

288 STRAND - 4RU SINGLE MODE / MULTIMODE 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**

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**
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/TIA/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 premises 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
SECTION Z — INSTALLATION REQUIREMENTS FOR OUTSIDE PLANT (OSP)

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1. INTRODUCTION

1.1 General

1.1.1 The installation supplier (All listed parties responsible for installation activities defined in section (A 1. 3) shall ensure as part of the evaluation of the installation that all work has been completed in accordance with the detailed specifications or approved changes to the detailed specification.

1.1.2 This section provides the complete applicable installation TP76300 exceptions for the AT&T Outside Plant Environment (OSP).

1.1.3 AT&T assumes no responsibility for any costs incurred by a given manufacturer or supplier in conforming to the requirements listed in TP 76300 section Z. Further, conformance to all requirements delineated in this document does not constitute a guarantee acceptance of a given supplier product/service for use in the AT&T OSP environment.

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

1.1.5 AT&T reserves the right to audit installation supplier for compliance to ATT-TP-76300 section Z.

1.2 Scope

1.2.1 Section Z establishes all installation TP76300 exceptions for the AT&T OSP.

1.2.2 The requirements contained in Section Z apply to installations in the AT&T OSP environment, which is defined as space outside the four walls of the Central Office either in stand-alone buildings (CEVs and HUTs), Cabinets, or space within shared-use buildings and customer premises

1.2.3 The intent of ATT-TP-76300 section Z is to familiarize the installation supplier with AT&T OSP environment 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 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 OSP involvement during the various aspects of the installation operation.

1.3 General Requirements

1.3.1 All applicable requirements in other ATT-TP-76300 sections apply to installations in The OSP Environment unless exceptions (clarifications, deletions, revisions or additions) are expressly stated in Section Z.

1.4 Definitions clarification on ATT-TP-76300 Section Z
1.4.1 In ATT-TP76300 Section Z all references to BDFB should be considered main power distribution panel of the power plant.

1.4.2 In ATT-TP76300 Section Z all references to SPDB should be considered subtending fuse panels served by the power plant main distribution panel.

1.5 Comments on ATT-TP-76300 Section Z

1.5.1 Questions or Comments to ATT-TP-76300 Section Z can be submitted to:

Thomas Rozanski   Alan Bradbury
Senior Network Support   Senior Network Support
tr2793@att.com    ab2348@att.com

2. GENERAL INSTALLATION REQUIREMENTS

2.1 General

2.1.1 Standards in this section relating to AT&T buildings and Central Offices shall be applicable to customer premise locations.

2.1.2 The installation supplier shall sign the AT&T or property owner’s building register, where required upon entering or exiting the facility (Section B).

2.1.3 The installation supplier shall not install ceiling inserts unless provided with a written authorization by the building owner and approved by AT&T representatives (Section B).

2.1.4 Before drilling into any basement floor, basement wall work, or any power related work, the installation supplier shall determine from the building owner and the AT&T representative whether waterproofing has been provided along with any special requirements for anchoring equipment (Section B).

2.1.5 There are no additional exceptions to the general installation requirement specific to the OSP environment for TP76300, (Section B).

3. INSTALLER SKILL LEVEL

3.1 General

3.1.1 There are no exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section C.

4. NETWORK RELIABILITY AND METHOD OF PROCEDURE

4.1 General

4.1.1 No Critical Power work activity shall begin until a detailed MOP is submitted and accepted by the OSP Equipment Engineer (Section D).

a) Critical Power may include but is not limited to the following: All activities on live power equipment that includes the addition, rearrangement or removal of power equipment, cable or terminations.
4.1.2 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section D.

5. JOB DOCUMENTATION

5.1 General

5.1.1 All Cable penetration requirements at customer or leased locations will adhere to local building laws and customer requirements (Section E).

5.1.2 The installation supplier shall complete the Cable Penetration Reporting Log (Figure E-2) to document the cable penetration activity.

5.1.3 The Cable Penetration Reporting Log shall be placed in the job folder at the completion of the job.

5.1.4 The Installation supplier is not required to provide a backup power plant configuration unless requested by the OSP Equipment Engineer (Section E).

5.1.5 The Installation supplier shall use the CEEOT Vendor Message Log to provide notification of additional information or for record purposes (Section E).

5.1.6 CEEOT Vendor Message Log shall be used for formal communications to the OSP Equipment Engineer. These communications may include but are not limited to the following (Section E)

a) Additional material
b) Additional engineering
c) A change in the TEO
d) Additional Installation supplier effort
e) Request for disposition of material
f) Document the agreement

5.1.7 The If SRV-SITESURVEY functional Driver is awarded on the project, the installation supplier shall:

a) Update scope of work in CEEOT with detailed information, grounding details, size, termination points, power details, breaker size, cable length, cable gauge and any additional job required details
b) Complete C&E Loop Electronics Power Calculator Worksheet on all bulk power projects and place completed form in Electronic Job Folder (EJF)
c) Provide type(s) and quantity of removed cables in CEEOT Scope of Work

5.1.8 The C&E OTV Task Verification Form is an alternative method to confirm the completion of required quality assurance documentation or tasks. This document does not supersede the engineering and installation requirements found in AT&T Technical Publications but does provide an acceptable alternative for the C&E TP required documentation. This form is
approved for Outside Plant C&E projects. The Task Verification Form can substitute for Test Records, Fuse Verification and Vendor Internal Audit.

5.1.9 The C&E installation supplier shall complete the Defect Correction Form (DCF) if any defects are assessed and correction is required. The DCF is required to be placed into Electronic Job Folder the business day following the defect correction due date.

5.1.10 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section E.

6. FIRE STOPPING

6.1 General

6.1.1 All fire stopping at customer or leased locations must adhere to all state regulations, local building codes and customer requirements (Section F).

6.1.2 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section F.

7. FLOOR DRILLING

7.1 General

7.1.1 The Installation supplier shall notify the Equipment Engineer when there is asbestos containing material that needs to be addressed by the customer (Section G).

7.1.2 There are no additional exceptions to the general installation requirement specific to the OSP environment for TP76300, Section G.

8. BONDING AND GROUNDING

8.1 General

8.1.1 Radio site equipment installed in AT&T OSP cabinets shall not require an Interior Ring Ground System.

8.1.2 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section H.

9. IRONWORK

9.1 General

9.1.1 Frames taller than 7’0” shall not be used in AT&T OSP (2.5).

9.1.2 Floor Plans are not required in AT&T OSP. However, when they are provided all bays and cabinets to be installed shall be measured from reference points as identified on the floor plan (Section I).

9.1.3 All end guard and end panel requirements shall only be applicable when requested by the AT&T OSP EE (Section I).

9.1.4 Rolling Ladders and Ladder tracks shall not be used in AT&T OSP facilities (Section I).
9.1.5 Hanger rods shall not be installed through ventilating ducts in the AT&T OSP environment (Section I).

9.1.6 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section I.

10. CABLING

10.1 General

10.1.1 The use of untinned copper cable can be installed in all AT&T OSP environments and applications (Section J).

10.1.2 Switchboard and power cables installations on vertical cable racks shall be limited. If cable rests against cable hole sides, it shall be protected from damage by formed fiber or two layers of sheet fiber. (Section J).

10.1.3 The installation supplier shall secure cables to the cable securing brackets, if provided, at the rear of the shelf every two inches. This is required for cables traversing across the back of the shelf (Section J).

10.1.4 CO distribution frames are not utilized in the AT&T OSP environment making these requirements non-applicable (Section J).

10.1.5 Nylon cable ties may be used for securing power, grounding and switch board cables in AT&T OSP cabinets (Section J).

10.1.6 When connecting battery return cables to the return bus bar in BDFBs/SPDUs, Power Boards (rectifier shelves, etc.), the installation supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar (Section J).

10.1.7 When connecting to BDFD/SPDU (rectifier shelves, etc.), fuse position studs, the installation supplier shall arrange cables in such a manner so as to not block access of future terminations (Section J).

10.1.8 When a cable access hole reaches capacity no more cable(s) shall be run through the cable access hole. The AT&T OSP Engineer shall be notified utilizing CEEOT Web vendor message log of the blocked condition (Section J).

10.1.9 The installation supplier shall report a blocked cable hole to the AT&T OSP Engineer utilizing CEEOT Web vendor message log with the details of the blocked condition (Section J).

10.1.10 All cable pileup conditions shall be reported to the AT&T OSP Engineer utilizing CEEOT Web vendor message log for resolution (Section J).

10.1.11 When metal clamps are used to support or secure grounding conductors, the clamps shall not completely encircle the conductor. The metallic continuity shall be interrupted by non-metallic hardware, a cable tie or 9-ply waxed polyester twine. The phrase completely encircle applies primarily to ferrous metal cable clamps. It does not apply to an opening or “ring” formed by a combination of interconnected metallic objects such as cable racks, auxiliary framing, threaded rods, etc., unless the length (l) of this opening is more than 3 times its diameter (Section J).
10.1.12 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section J.

11. WIRING AND CONNECTING

11.1 General

11.1.1 Solder connections shall not be used in the OSP environment or applications (Section K).

11.1.2 Equipment being installed with multiple loads (i.e. “A”, “B”, “C”, etc.) (K.4.8.1):
   a) Shall be installed to different load supplies on the Power shelf. If there is only a two loads available, the loads shall be split with at least one on each load supply keeping the power plant load distribution balanced as close as possible.
   b) Shall maintain separate primary protection device integrity throughout the circuit unless an AT&T technical drawing supersedes this requirement.

11.1.3 There are no additional exceptions to the general installation requirement specific to the OSP environment for TP76300, Section K

12. EQUIPMENT DESIGNATIONS

12.1 General

12.1.1 Designation terminology for power panels may differ in the OSP environment however the intent of the standards for this section remain (Section L).

12.1.2 In the OSP environment AC building loads may be commingled on distribution panels with other loads in conjunction with all local and state regulations or codes (Section L).

12.1.3 The Protected Power Service Cabinets PPSC are not utilized in the AT&T OSP environment making these requirements non-applicable (Section L).

12.1.4 Fuse and Circuit breakers shall be designated on the appropriate Label panel (Section L).

12.1.5 Fuse record Books are not utilized in the AT&T OSP environment making these requirements non-applicable (Section L).

12.1.6 Alarm fuses in BDFBs/SPDUs not mounted adjacent to the discharge fuse are not utilized in AT&T OSP environment making these requirements non-applicable (Section L).

12.1.7 AT&T OSP battery racks shall be designated with (Section L).
   a) Polarity, Voltage
   b) Battery Installed Date
   c) AT&T Job number
   d) Battery String ID (TP76301-038.).

12.1.8 The installation supplier shall designate the AT&T OSP grounding system or isolated bonding network with the functional designation of the bar in ¾ inch high lettering (Section L).

12.1.9 Cable holes shall not be designated in the AT&T OSP Environment.
12.1.10 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section L.

13. POWER

13.1 General

13.1.1 Load demand worksheets are not utilized in the AT&T OSP environment. The installation supplier should adhere to the requirements detailed on the Engineering Work Order (M1.3.9).

13.1.2 All DC Bus Bar requirements shall be exempt for installations within AT&T OSP cabinets (M2).

13.1.3 Flooded Lead Acid Batteries are not approved for use in the OSP environment and all associated requirements will be exempt (Section M).

13.1.4 Battery racks in the AT&T OSP environment shall be installed per the manufacturer documented requirements (Section M).

13.1.5 Batteries in the AT&T OSP environment shall be installed per the manufacturers documented requirements (Section M).

13.1.6 Flooded Lead Acid Batteries are not approved for use in the AT&T OSP environment and all associated requirements will be exempt (Section M).

13.1.7 Pilot Cells are not designated in the AT&T OSP environment and all associated requirements will be exempt (Section M).

13.1.8 Thermometers are not utilized in the AT&T OSP environment and all associated requirements will be exempt (Section M).

13.1.9 In the AT&T OSP environment AC power cabinets are not differentiated by PSC, PPSC, PDSC and all associated requirements will be exempt (Section M).

13.1.10 There are no additional exceptions to the general installation requirement specific to the OSP environment for TP76300, Section M.

14. ELECTROSTATIC DISCHARGE

14.1 General

14.1.1 There are no exceptions to the general installation requirement specific to the OSP environment for TP76300, Section N.

15. FIBER OPTICS

15.1 General

15.1.1 The installation supplier is permitted to install polyethylene sheathed fiber optic cable with innerduct in AT&T OSP equipment areas (Section O).

15.1.2 When the fiber optic cable is direct buried and does not enter the AT&T Equipment areas in conduit and, it cannot be pulled back into the first manhole, slack loops can be stored in the OSP environment with approval from the AT&T OSP Equipment Engineer (Section O).
15.1.3 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section O.

16. CABLE VAULT & CABLE ENTRANCE FACILITY

16.1 General

16.1.1 Cable Vaults are a structural feature used in the AT&T OSP environment and entrance facilities should be managed per the AT&T OSP Facilities guidelines ATT-002-201-713. This exempts TP76300, Section P.

17. EQUIPMENT REMOVAL AND CABLE MINING

17.1 General

17.1.1 Cable removal in AT&T OSP cabinets may require cable to be cut on the rack due to the congested environment of the cabinet (Section Q)

17.1.2 If the floor fastener is removed, the hole shall be filled. AT&T OSP Engineer must approve any exceptions, and the record of approval shall be placed in CEEOT Web vendor message log (Section Q).

17.1.3 The installation supplier shall verify that all cross connects have been removed prior to the start of all removal activities. If cross connects have been left in place, the installation supplier shall STOP all removal activities and contact the AT&T OSP Engineer responsible for the job for resolution (Section Q).

17.1.4 All identified cables to be removed shall be disconnected at both ends, have the ends protected prior to any cutting and mining activities in the AT&T OSP environment (Section Q).

17.1.5 The 24hr wait period is exempt in the AT&T OSP environment (Section Q).

17.1.6 The installation supplier shall remove cables by hand. Excessive force shall not be used (Section Q).

17.1.7 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section Q

18. PRODUCT CHANGE NOTICES AND MISCELLANEOUS

18.1 General

18.1.1 There are no exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section R.

19. MARKED DRAWING REQUIREMENTS

19.1 General

19.1.1 There are no Marked Drawing requirements in the AT&T OSP environment. The installation supplier is exempt from TP76300, Section S.

20. SYNCHRONIZATION
20.1 General

20.1.1 The installation supplier shall verify all input/output timing leads before they are disconnected as follows:

1. First, installation supplier shall make sure that a MOP was approved prior to any cable removal
2. Second, verify and confirm the presence of a far end ground on the un-terminated shield/drain wire at the network element

20.1.2 There are no additional exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section T.

21. STANDBY ENGINE/ALTERNATOR SETS

21.1 General

21.1.1 The generator installation requirements published in APEX ATT-TELCO-002-600-344 & ATT-TELCO-002-600-341 are the governing document for AT&T OSP cabinet sites with generators less than 50 KW.

21.1.2 There are no additional exceptions for to the general installation requirement specific to the AT&T OSP environment for TP76300, Section U on generators exceeding 50 KW.

22. HAZARDOUS WASTE MANAGEMENT

22.1 General

22.1.1 This section is applicable to all AT&T hazardous waste. It is the building owner’s responsibility to mitigate their hazardous waste which impact installation activities prior to the commencement of installation activities.

22.1.2 The installation supplier shall notify the AT&T OSP Engineer with concerns of Hazardous Materials, Hazardous Waste, Universal Waste, Electronic Waste, and other Regulated Wastes that pose a risk to the project.

22.1.3 There are no exceptions to the general installation requirement specific to the AT&T OSP environment for TP76300, Section V.

22.1.4 There are no additional exceptions to the general installation requirement TP76300, Section V for AT&T property in the OSP environment.

23. AT&T GDIC ENVIRONMENTS

23.1 General

23.1.1 TP76300, Section W is exempt from the AT&T OSP environment.

[END OF SECTION]