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July 1, 2005

Issue 7.0

AT&T Generic Installation Requirements

AT&T

GENERIC INSTALLATION REQUIREMENTS

Note: All AT&T documents referenced within can be found at InfoSwap for external customers and at ODMS for internal customers.



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AT&T Generic Installation Requirements

Preface

This Generic Installation Requirements practice covers AT&T's generic installation standards.

Installation Suppliers performing work in any AT&T Office shall follow rules defined in this document.

The "external" Installation Suppliers shall obtain this document by accessing InfoSwap. Internal suppliers and/or users shall obtain this document by accessing the appropriate WEB Site using information provided by AT&T.

The Installation Supplier shall review both documents in detail before performing any service purchased by AT&T.

In the event that information contained in this AT&T document conflicts with the Product Manufacturer's published information, or if the supplier determines that the rules provided are not correct and/or sufficient enough to perform the work requested by AT&T, it is the Supplier's responsibility to contact the AT&T Engineer to resolve the conflict.

The Supplier is responsible for obtaining all necessary publications, documents, and data required to perform the services purchased by AT&T.

Change History

<u>ISSUE</u>	<u>DATE</u>	<u>DESCRIPTION OF CHANGE</u>
007.0	07/01/2005	Updated of all sections

Issue 6.0 has changes to all sections.

Refer question pertaining to this document to:

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**AT&T Generic Installation Requirements**

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AT&T Generic Installation Requirements

1.0 Introduction

This document reflects the AT&T generic installation requirements.

Paragraph numbers shown herein reflect the relative position of the new/modified information with respect to the Telcordia GR-1275-CORE Issue 3.0 document.

The document "AT&T Installation Generic Requirements" provides installation service suppliers general workmanship requirements necessary to effectively interface with AT&T when equipment is installed, modified, and/or removed in AT&T Central Offices. These requirements will be used as one of the criteria for AT&T job acceptance.

In the event any requirement contained in this document conflicts with the terms and conditions of the contract between the supplier and AT&T, the contract terms and conditions shall prevail

1.1 Document Availability

R1-1 The Installation Supervisor shall have this document readily available for the installation team to reference. An electronic or paper copy meets this requirement. An online or web connection does not meet this requirement.



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2. Building Requirements

2.1 Introduction

2.2 Access to Buildings

R2-1 AT&T shall provide the Installation Supplier access to the premises as required to perform the installation activity

2.3 Building Security

R2-2 The Installation Supplier shall be responsible for the actions of the Installation Supplier's employees, representatives, or the supplier's subcontractors while on AT&T premises and properties.

R2-3 AT&T reserves the right to deny any Installation Supplier employees or subcontractors access to AT&T premises or property if it is considered to be in the best interest of AT&T.

R2-4 The Installation Supplier's employees and subcontractors shall wear their company identification badges in a visible manner on their person at all times while in or on AT&T premises or property. The ID Badges shall contain the company name, employee name and a recent photo of the employee.

R2-5 The Installation Supplier shall follow all security rules and policies while on AT&T premises or property.

R2-6 The Installation Supplier must guard against and take steps to prevent unauthorized visitors from entering that portion of the AT&T premises for which the supplier is responsible. Exterior openings (e.g., doors, windows, etc.) or interior security openings shall not be left open and unattended.

R2-7 When the Installation Supplier is responsible for work activities in unattended buildings, the Installation Supplier shall insure the premises are kept secured at all times. The Installation Supplier shall adhere to all access requirements specified by AT&T. AT&T shall not be responsible for the security of the Installation Supplier's tools, equipment, or personal possessions.

2.4 Building Conditions

Generally, all building construction or alterations will be completed before the scheduled start of the installation activity. AT&T will provide a reasonably waterproof and dust free environment within the installation activity area.

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R2-8 The Installation Supplier shall be responsible for any damage to AT&T premises or property caused by the Installation Supplier, the Installation Supplier's representative, or subcontractors. All damage shall be reported as soon as possible to an AT&T representative.

R2-9 When an Installation Supplier is engaged in any activity that presents a fire risk, the Installation Supplier shall provide additional fire-fighting equipment in addition to the existing apparatus. This equipment and its location shall be defined in the MOP. Exceptions shall be by mutual agreement between the Installation Supplier and the AT&T representative. Examples of activities that would require additional fire-fighting apparatus are:

- Engine alternator work, including fuel lines, exhaust system, etc.
- Cutting, terminating, or relocation of live power cable.
- Any other activity that may be considered a fire risk.
- The placement of any combustible materials shall require the Installation Supplier to provide additional fire extinguishers.

R2-10 Fire-fighting apparatus shall not be removed or relocated unless needed for fire-fighting purposes or authorization is obtained from an AT&T representative.

R2-11 If fire-fighting apparatus is used, the Installation Supplier shall immediately notify an AT&T representative.

2.5 Ceiling Inserts

R2-12 Ceiling inserts are generally placed during the original construction of the building. If additional inserts are required an appropriate product using the same rod size with an equal or better pull out rating shall be used. An approved waiver to add additional or replacement ceiling inserts shall be required prior to the drilling of the ceiling.

2.6 Electric Power, Heat, and Light

R2-13 AT&T shall provide electric power for all necessary purposes, with suitable outlets, in areas where work will be performed. Heat and general illumination (of a permanent, temporary, or emergency nature) in rooms in which work will be performed or material stored, will also be provided by AT&T.

R2-14 No adjustments, blockage or relocation of controls, thermostats, sensors, or vents of the heating or cooling plant shall be made by the Installation Supplier's personnel. Any adjustments needed shall be directed to an AT&T representative.

R2-15 AC receptacles mounted on equipment frames or cabinets shall not be used for power tools. These outlets are provided for test equipment use only.

R2-16 The Installation Supplier shall be aware of the susceptibility of equipment to RF fields generated by power tool use.

2.7 Administrative Space



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The amount of administrative space and its location, if available, will be specified in the MOP. This will be a matter of negotiation between the Installation Supplier and an AT&T representative prior to the start of the installation activity. AT&T will not be responsible for providing parking facilities for the Installation Supplier's vehicles (both personal and company vehicles). Tools, equipment, material, furniture, and other property belonging to the Installation Supplier not necessary for the contracted installation activity will not be allowed on AT&T premises unless approved in the MOP.

2.8 Sanitary Facilities

AT&T will allow access to and may designate certain toilet facilities, if available, in locations where work is in progress.

2.9 Building Openings

AT&T Structures have been designed with suitable building openings to allow equipment and material to be brought into the building. The Installation Supplier is not permitted to remove doors, windows, etc., without authorization in the MOP from the authorized AT&T representative.

R2-17 AT&T will also provide all necessary openings and ducts for cables and conductors in floors and walls. The Installation Supplier shall request all new opening and ducts in writing. The request shall be given to the AT&T Representative prior to the start of any installation efforts. Timelines may need to be adjusted to allow for completion of the new opening prior to the installation effort.

R2-18 The Installation Supplier shall be responsible for opening and closing existing cable holes during installation activity. Cable holes shall remain closed when cable work is not in progress. (See Section 12, "General Firestopping Considerations.")

R2-19 When a cable slot is to be converted into individual cable penetrations, AT&T will request the Installation Supplier develop individual cable penetration from an existing cable slot. The Installation supplier shall see Section 11.7, "Cable Slot Conversion," for detailed information on converting a cable slot to individual cable penetrations.

2.10 Cleaning of Premises and Equipment

General cleaning of the equipment facilities and storage areas (e.g., cleaning floors so that they are free from debris, packing material, etc.) is to be performed at least daily by the Installation Supplier during the entire installation activity period. The method of cleaning and the tools needed will be described in the MOP.

R2-20 All equipment, prior to being brought into an equipment area, shall be free of dust and foreign substances. All specific or unique housekeeping or equipment cleaning procedures or requirements shall be detailed in the MOP.

**AT&T Generic Installation Requirements****2.11 Protection of Premises and Equipment**

R2-21 The Installation Supplier shall provide adequate ESD and fire-retardant protection for buildings and equipment. Such ESD material (plastic sheets) must be of a nature to insure against any possible damage, or wear and tear to, or degradation of, operational, physical, chemical, and/or electrical properties of buildings and equipment. This protection of buildings and equipment shall be detailed in the MOP. Specific questions on building/equipment protection or suitability of specific materials (ESD/fire retardant) to be used for protection should be directed to the AT&T representative. The following examples of protection should be viewed as examples only and not the only cases where protection is required:

- Vacuum cleaning with High Efficiency Particulate Arrestor (HEPA) filtration or a similar suction disposal device shall be used while drilling floors or cutting any materials, ex. plastic, metal, wood to eliminate dust and to prevent the spread of fine mode particulate material into the CO. This type of equipment shall be specified in the MOP.
- The Installation Supplier shall be familiar with OSHA requirements associated with disturbing asbestos-containing material. See Section 11, "Workmanship Requirements - General Assembly, Cabinets, Frameworks, Units and Misc.," Section 11.3.3, "Floor Anchors," for additional information.
- Existing equipment shall be protected to prevent damage during installation activity.
- Cable reels shall be chocked, or laid flat, or otherwise secured at all times to prevent their movement due to accidental dislodgment or earthquake.
- ESD resistant and fire-retardant plastic shall be used to protect working equipment from dust and debris.
- Temporary walls or partitions may be required to protect sensitive working equipment.
- Use of pipe stanchions for temporary support of auxiliary framing.

R2-22 Fiber board (masonite) or plywood sheets shall be used to protect floors, building structures or equipment.

R2-23 Electrostatic Discharge (ESD) protective devices (wrist straps) necessary for handling circuit packs and other sensitive equipment shall be provided and used by the Installation Supplier.

R2-24 Plastic, styrofoam or any other material which may cause an ESD condition shall not be placed in equipment rooms.



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R2-25 The cutting of all material shall be strictly controlled by the Installation Supplier. Filings, dust, chips, etc., can be extremely harmful and damaging to telephone equipment. The method and location of all cutting shall be outlined in the MOP and done outside the equipment area when possible. The Installation Supplier shall protect against the particles being carried into the equipment areas.

R2-26 In the designated cutting area the installer shall place a clean piece of masonite under the material to be cut or drilled.

R2-27 The installer shall provide a stable cutting surface such as horses or a worktable, etc., for cutting material on.

R2-28 A High Efficiency Particulate Arrestor (HEPA) vacuum shall be used to collect all particles and dust generated during the cutting process.

R2-29 Electric power tools shall only be plugged into properly grounded or designated outlets and not into outlets on equipment, frames, or cabinets.

R2-30 All building and equipment protection shall be removed upon the completion of the job or when it is determined that the protection is no longer required for a particular job activity.

R2-31 The Installation Supplier shall not, under any circumstances, use any radio frequency transmitter in close proximity to or within any AT&T premises that contains working equipment. This includes, but is not limited to, mobile maintenance radios, cellular phones, walkie-talkies and two-way pagers.

2.12 Communications Requirements

R2-32 The Installation Supplier, prior to the start of work, shall agree with the AT&T representative on the usage of AT&T phones for conducting their business and the agreement shall be outlined in the MOP. A specific phone may be designated for that usage. Generally, incoming calls to the Installation Supplier personnel shall be via their personal pagers.

R2-33 The Installation Supplier, their representatives or subcontractors, shall arrange for and assume responsibility for all charges connected with telephone service.

R2-34 When telephone services are to be used only for equipment testing purposes, the AT&T representative shall arrange for the necessary services, as detailed in the MOP.

**AT&T Generic Installation Requirements****3. Regulations****3.1 Introduction**

Local laws and ordinances that are relevant to a particular AT&T must also be followed, along with all federal laws. The supplier is solely responsible to ensure compliance with all pertinent laws. Items addressed in this section may require joint AT&T and Installation Supplier review and coordination prior to, during, and after the actual installation/removal activity. The Installation Supplier should be aware that local conditions may require additional professional investigation to meet specific AT&T requirements, and in no event should this material be considered as a replacement or substitution for such additional investigatory requirement.

3.2 Regulations

R3-1 The Installation Supplier shall adhere to all federal, state, and local laws and ordinances while performing work for AT&T and shall conduct business in such a manner that it will not cause discredit to AT&T.

R3-2 The Installation Supplier shall follow all applicable national and local building, electrical, and fire codes when performing work on AT&T premises.

R3-3 The Installation Supplier shall ensure its employees adhere to all federal, state, local, Occupational Safety and Health Administration (OSHA), and AT&T regulations and requirements governing personnel safety while on AT&T property.

R3-4 The Installation Supplier shall immediately notify an AT&T representative of any OSHA inspection or visit.

R3-5 The Installation Supplier shall notify an AT&T representative promptly, in writing, of any OSHA citations issued while on AT&T premises.

R3-6 The costs of all permits, certificates, etc., required for compliance with applicable federal, state, and local codes, laws, ordinances, and regulations shall be the responsibility of the Installation Supplier unless otherwise specified by AT&T.

R3-7 The costs associated with failure to follow federal, state, or local codes, laws, ordinances, or regulations shall be the sole responsibility of the Installation Supplier.

3.3 Hazardous Materials

R3-8 Hazardous materials are those materials that are potentially hazardous to human health and the environment. The handling, packaging, storage, transportation, and disposal of these materials are governed and regulated by various federal, state, and local laws that are very specific and restrictive on the handling of materials legally classified as hazardous to health and the environment. Violations can lead to fines and/or imprisonment for AT&T,



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Installation Supplier and subcontractor employees for the illegal disposition of hazardous material. The following federal laws, acts, and regulations govern the handling and transportation of hazardous materials. This list shall not be considered all-inclusive:

- United States Department of Transportation (U. S. DOT) Title 49, Code of Federal Regulations (CFR)
- Resource Conservation and Recovery Act (RCRA), Title 40, CFR Parts 260-267 and 122-124
- Toxic Substance Control Act (TSCA), Title 40, CFR Parts 761-762
- The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), otherwise known as “the Superfund”
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- Occupational Safety and Health Act (OSHA)
- Safe Drinking Water Act (SDWA)
- Atomic Energy Act (AEA)
- Nuclear Regulatory Commission (NRC).

R3-9 Effective 10/01/96, the Hazardous Waste Process became AT&T’s Mandatory responsibility. All hazardous waste must be processed by the NATIONAL HAZARDOUS WASTE CENTER. All waste must be handled by a certified disposal company that is approved by AT&T. Call 1-800 8WASTE9 (1-800-892-7839) for all questions and advice on hazardous material/waste.

R3-10 Both AT&T and the Installation Supplier must post and provide each other with the manufacturer’s Material Safety Data Sheets (MSDSs) that are required by law. The MSDS is a standardized way of providing specific information about the identification, characterization, and proper use, handling, and storage of hazardous chemical products. Although OSHA recommends a specific format, the chemical manufacturer or chemical supplier can use any format they want as long as they provide the required information.

R3-11 The posting of MSDS shall be at all entrances to the areas where these materials/chemicals will be handled.

**AT&T Generic Installation Requirements****4. Safety**

**** (*Additional AT&T requirements are covered in the AT&T Contractor E,H & S Program Practice*) ****

These instructions are controlled by the Environmental, Health & Safety (E, H & S) organization and are covered under AT&T Practice ATTP 010-160-012.

If you have any questions on the content of this Environmental, Health & Safety Practice, please contact Allen C. Hilbert on (239) 458-1167, or E-Mail ahilbert@ems.att.com

4.1 General

R4-1 The Installation Supplier shall adhere to the safety and equipment protection precautions required to avoid the possibility of injury to personnel, service degradation, and/or interruption. The Installation Supplier shall be entirely responsible for the safety and instruction of its employees, representatives, or subcontractors (where permitted).

R4-2 The Installation Supplier shall report to the AT&T representative any hazardous condition that is discovered.

R4-3 As outlined in the MOP, the Installation Supplier shall report to the AT&T representative (Health & Safety organizations) any accidents or injuries that occur to any persons at the job site.

R4-4 The Installation Supplier shall immediately notify the AT&T representative of any OSHA inspection or visit.

R4-5 The Installation Supplier shall notify the AT&T representative promptly, in writing, of any OSHA citations issued while on AT&T premises.

R4-6 Floors and work areas shall be kept free of all potential hazards. All waste-flammable materials, such as 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). Material identified as reusable, such as but not limited to, plug-in circuit pack containers, shall be handled in accordance with the AT&T specifications. Floors shall be protected during cabling operations to prevent both damage to the floors and accidental slips or falls by employees.

R4-7 All walkways, entrance, and exit routes through the equipment area shall be kept clear of tools, equipment, packaging, and cable, etc. Caution signs shall be posted by the Installation Supplier where needed. The Installation Supplier shall consult with the AT&T representative as to the specific locations and wording of the caution signs.



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R4-8 All persons on AT&T premises shall follow the safety practices outlined in this standard, as well as any other AT&T safety practices that may apply to the installation activity.

R4-9 If the Installation Supplier or its employees have any questions in regard to safety, they must contact the AT&T representative.

4.2 Ladders and Scaffolding

R4-10 The use of conductive ladders (metallic) is strictly prohibited in CO environments. Wood or fiberglass are examples of nonconducting type ladders that shall be used. Make certain no person, loose tools, materials, or equipment are on ladders prior to moving them. Make sure all locking ladders function properly and chocks are used on ladders without brakes. Never stand on the topmost position of any stepladder. For ladders over four feet, the second level from the top is the highest step to stand on.

NOTE: The AT&T ladders shall not be used for any installation activities.

R4-11 Scaffolding shall be of the proper size, capacity, and type, and be properly assembled and in good working condition. The working surface shall be clear of all tools, equipment, supplies, and/or personnel before releasing the brake and moving is attempted.

4.3 Microwave Radiation

R4-12 Microwave radiation close to the open end of the waveguide may be sufficiently concentrated to cause injury to body tissues. Installation Suppliers shall avoid exposing any part of the body at close range to open waveguides that are connected to operating microwave transmitters. It is particularly important to avoid direct radiation into the eyes. Do not look into the end of a radiating waveguide or work in a position where direct radiation can reach the eyes.

R4-13 Installation Suppliers shall not operate a microwave transmitter unless it is connected to its antenna or to an appropriate resistive load. Do not operate a transmitter (including test oscillators) into an open-ended waveguide.

R4-14 Safeguards against microwave radiation shall include, but are not limited to, distance, proper shielding, and avoiding exposure to all known sources.

4.4 Eye Protection

Safety glasses with side shields may be plain or corrective prescription lenses depending on the employee. Only lenses made of impact-resistant materials in compliance with ANSI and or appropriate OSHA regulations may be used.



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R4-15 Safety glasses with side shields shall be worn while: • Performing or observing a work operation involving tool use. • Working in areas designated as requiring the use of safety glasses, except when work operations require special eye protection (e.g., goggles).

R4-16 Dust and splash-proof goggles shall be worn when:

- Handling battery or counter cells and their solutions or taking battery hydrometer or thermometer readings.
- Using compressed air.
- Handling air filters or fluorescent tubes and where eye-irritating dust is present.

R4-17 Impact goggles shall be worn when:

- Drilling or chipping stone, brick, masonry, etc.
- Working around grinding wheels, or any area where there is a possibility of eye injury from any flying particles.

4.5 Hearing Protection

R4-18 Ear protection shall be worn while operating or working near power tools or machinery that require the use of hearing protection (e.g., running diesel or turbine engines).

4.6 Insulating Gloves

R4-19 Insulating gloves shall be worn when the worker must handle wires, terminals, equipment, or other objects on which there is any possibility of contact with high voltage being present or introduced.

R4-20 Insulating gloves shall be provided by the Installation Supplier. The Installation Supplier is prohibited from using the AT&T's gloves.

4.7 Safety Headgear

R4-21 Hardhats shall be worn:

- Whenever conditions could result in head injuries from falling or moving objects or striking against stationary objects.
- When there is a possibility of accidental contact with electrically energized objects.
- When in a designated hardhat area.
- When required by local, state, or federal law.



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R4-22 Hardhats subject to impact shall be automatically replaced, since damage may not be identified by visual inspection.

4.8 Cable Vault

R4-23 The following precautions shall be taken before and after entering a cable vault if the vault is not monitored by a continuous sampling atmospheric monitor:

- Test the atmosphere for the presence of gas at the entrance to the vault. The instrument used shall be equipped with sensing elements calibrated to detect the presence of explosive and toxic gases. The instrument shall be capable of indicating an explosive gas concentration of 10% of the Lower Explosive Limit (LEL) for methane. The instrument shall be capable of indicating carbon monoxide concentration of 100 parts per million. Make additional tests after entering the vault, throughout the vault and around cable ducts, and any time the vault is entered after having been closed for any length of time.
- If gas is detected, do not enter. Notify the AT&T representative and proceed per local instructions.

R4-24 No open flame or items that could induce a spark shall be used in the vault area.

4.9 Fire Safety

All persons entering a building should familiarize themselves with all fire exits. Identify the types of fire extinguishers and where they are located; read the instructions on the fire extinguisher before the need arises to use them.

4.10 Lightwave Systems

Appropriate safety precautions are required to protect the employees of the Installation Supplier and the AT&T from accidental exposure to lightwave energy, fiber cable, and chemicals used to clean fibers.

4.11 Asbestos

R4-25 The Installation Supplier normally should not encounter asbestos during installation and removal activities, unless the installation necessitates building alterations or disturbing materials containing asbestos (floor drilling of asbestos tiles, cabling from power plants, diesel exhaust stacks, plumbing, piping, duct work, or sprayed on fireproofing). If during small-scale, short duration activity asbestos is encountered, the Installation Supplier shall immediately stop work and notify the AT&T representative of its location and type. The Occupational Safety and Health Administration (OSHA) defines small-scale, short duration operations as follows: "Only those demolition, renovation, repair, maintenance and removal operations that are non-repetitive, affect small surfaces or volumes of material containing



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asbestos, tremolite, anthophyllite, or actinolite, and will be completed within one work day, and are not expected to expose bystander employees to significant amounts of asbestos.”



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5. Hazardous Materials/Waste

5.1 Introduction

Effective 10/01/96, the Hazardous Waste Process became AT&T's Mandatory responsibility. All hazardous waste must be processed by the NATIONAL HAZARDOUS WASTE CENTER. ALL waste must be handled by a certified disposal company that is approved by AT&T. Call **1-800 8WASTE9 (1-800-892-7839)** for all questions and advice on hazardous material/waste.

National Hazardous Waste Center will assume responsibility for assuring that all the correct information is reported to the proper government entities in the event hazardous waste needs to be shipped. They will also prepare all the paperwork for shipping the waste, and arrange for the pickup.

Hazardous waste manifests must be signed by an AT&T employee who has been trained. It is a FELONY VIOLATION for anyone not having had the training to sign the manifests. AT&T employees are advised not to sign Hazardous Waste Manifests if they do not have the required training.

R5-1 In the event hazardous material has to be removed from the equipment, the supplier will notify AT&T's representatives to call Environment, Safety & Health Organization (EH&S) at **1-800-8 WASTE 9** for instructions on purging, separating and packaging of hazardous material.



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6. Job Start, In Process Completion, and Acceptance

**** (Additional AT&T information relating to Section 6 is covered in the AT&T ITA (Installation Test and Acceptance) Process Flows and Work Instructions)****

This section is controlled by the ITA (Installation Test and Acceptance) organization.

Questions pertaining to the contents shall be referred to:

Monica Dias
209 610-6434
E-mail mhufford@ems.att.com

6.1 Job Start Notification

R6-1 When the Installation Supplier is to perform an installation activity, the Installation Supplier shall furnish the AT&T representative, i.e., Engineering/ Operations organization, with a Job Start Notification, within the number of days specified by contract and prior to the proposed job installation start date. The Installation Supplier shall obtain the appropriate forms required for the Job Start Notification from the AT&T representative.

R6-2 The Job Start Notification, or equivalent, shall include the following information:

- AT&T representative's name, title, and address.
- Telephone Equipment Order Number (TEO).
- Control Order Number (CON) of the job.
- CLLI TM (COMMON LANGUAGE ® Location Identifier) Code set: The location identification of the building, or building part, in which installation activity is to occur.
- Street address of the building in which installation activity is to occur.
- Scheduled installation start date.
- Actual installation start date.
- Description of the installation activity to be performed (e.g., installation of an XYZ switching system, modification of an ABAC network clock frame per design change XYZ, etc.). Major items of equipment will include number of frames, bays, etc., being installed by this job, or items that are associated with the modification of the equipment.

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- The name, job telephone number, company telephone number, and emergency telephone number of the Installation Supplier's representative who will be responsible for the job.
- The Installation Supplier's company name and mailing address.

6.2 Job Plan

Consistent with AT&T requirements, the Installation Supplier may be required to provide a written job plan in addition to the Job Start Notification and Method Of Procedure (MOP) required for the job. Such a plan should contain, but is not limited to:

- A general sequence of what work will be performed.
- Identification of pertinent contacts including telephone numbers.
- Any unusual or extraordinary circumstances anticipated.

6.3 Job Information Memorandum

The JIM provides a method for communication between the Installation Supplier and the AT&T representative. The supplier may provide the information required by a mechanized means if one is available and agreed to by the AT&T representative. Refer to local practices for actual forms or information required.

R6-3 All changes to the job specifications, waiver of AT&T requirements, additional work effort, and/or other job related circumstances shall be documented using a JIM or equivalent.

R6-4 The JIM, or equivalent, shall contain the following information:

- Telephone Equipment Order Number (TEO).
- Job identification Control Order Number (CON).
- JIM number - Each job shall use unique JIM numbering. The CON number may be used with an extension (e.g., 99999999-1) to provide a unique, job-related numbering system. The numbering system used for JIMs should be coordinated by the AT&T representative.
- Date - Date the JIM was written.
- To - Person receiving the JIM. Include the address and telephone number.
- From - Person originating the JIM. Include the address and telephone number.
- Building address.
- Brief job description.
- Subject - Subject matter of the JIM (e.g., additional effort due to change in job

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specifications).

- Details - Details of the subject of the JIM. Be specific. All additional effort must be detailed in hours and cost.
- Signature of the JIM originator.
- Date of the signature.
- Response to the subject of the JIM.
- Name, title, and signature of the person responding to the JIM.

6.4 In-Process Reports

The In-Process Report is used to furnish a job progress report that includes in-process tracking records, test records, and quality audit reports used during and after the job. This report shall contain information on the tasks completed and deferred, and estimates of the remaining time to completion.

R6-5 The Installation Supplier shall provide an In-Process report to the AT&T representative as specified in the MOP.

6.5 Job Completion Report

R6-6 The Installation Supplier shall submit to the AT&T representative a Job Completion Report at the completion of each job. The report shall be submitted within the number of days specified by contract between the AT&T and the Installation Supplier.

R6-7 If there is an advance completion of job items or equipment, an advance Job Completion Report shall be sent to the AT&T representative for that part of the job that is complete.

R6-8 If there are uncompleted items at the end of the job, a preliminary Job Completion Report shall be sent to the AT&T representative. The AT&T representative shall determine if any items not completed by the scheduled complete date are to be considered exceptions. Any exception items must be completed by the Installation Supplier within the agreed upon period (normally 30 days). A final Job Completion Report shall be sent to the AT&T representative when all uncompleted work is finished. The Installation Supplier shall use a form suggested by the AT&T. Typical information includes:

- Job Identification (CON) or Equipment Order Number.
- Building CLLI.
- The Installation Supplier's identification number.



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- Building address.
- Job description.
- List of any incomplete items, why they are not complete, and when they are expected to be completed.
- Name and telephone number of the AT&T representative who approved the exception work items.
- Name and telephone number of the AT&T representative who received the job documentation and the date on which it was received. Requirement **R6-20** of this section lists the documentation types.
- If there were drawings that were marked on this job, indicate the name and telephone number of the AT&T representative who received the marked drawings, and the date on which they were received. If there were no marked drawings, enter “No marked drawings on this job.”
- The scheduled and actual completion dates.
- Installation Supplier's results concerning job quality. Include any unacceptable quality problems and the dates that they will be resolved.
- Name and telephone number of the Installation Supplier's representative who is responsible for the job quality results.
- Name, telephone number, and signature of the Installation Supplier's representative who is submitting the Job Completion Report.
- The Installation Supplier's company name and mailing address.

R6-9 If scheduled advance or main completion dates cannot be met or the AT&T representative does not accept the job, the Installation Supplier and the AT&T shall adhere to terms and conditions of the contract with regard to failure to meet schedules.

R6-10 Only written notification of job completion shall be given to the AT&T representative and the job shall then be considered ready for inspection or audit by the AT&T. A verbal notification is not considered a substitute for the written Job Completion Report, however, if verbal notification is given, the job will be assumed ready for audit by the AT&T.



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6.6 Job Acceptance

Job acceptance is an Installation Supplier and AT&T process of analysis and verification to help assure that all services and equipment contracted for have been received, properly installed, modified, or removed according to the installation job documentation and requirements. The following are primary considerations for review in job acceptance:

- Equipment Verification (See [R6-12](#))
- Workmanship Audit Results (See [R6-14](#), [R6-15](#))
- Installation Tests (See [R6-16](#))
- Acceptance Tests (See [R6-17](#))
- Review of Test Results (See [R6-19](#))
- Documentation (See [R6-20](#))
- Housekeeping/Safety (See [R6-21](#)).

AT&T may require the Installation Supplier to furnish any job progress tracking records, test records, and quality audit reports generated by the Installation Supplier during and after the job.

R6-11 The Installation Supplier shall conduct in-process audits, as well as final audits of the installation/removal activity. Refer to GR-840-CORE, *Supplier Support Generic Requirements (SSGR)*, for additional information. The Installation Supplier shall provide audit findings on a locally approved form.

R6-12 Equipment verification shall be the responsibility of the Installation Supplier. Equipment verification is a procedure to determine if the proper quantity and type of equipment has been provided, placed, modified, or removed according to the detailed engineering specifications, floor plan, equipment drawings, and other documentation associated with a job. Included is a count of spare parts, circuit packs, tools, etc., ordered with the job. Assuring that the Installation Supplier has installed the equipment ordered and has placed it properly in the office is an essential part of job acceptance.

R6-13 The Installation Supplier shall record any material or equipment requested in the AT&T's specification that was not installed or provided at the completion of the job.

R6-14 Workmanship - While the equipment verification procedure is primarily a check on quantity, the workmanship audit shall record the quality of the Installation Supplier's work.

R6-15 Workmanship audits shall include but not be limited to bonding, grounding, securing cable, proper closure of penetration etc., as outlined in the Workmanship sections of this



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standard. Specific installation requirements of the equipment manufacturer will also be verified.

R6-16 Installation Tests - Applicable test records shall be furnished by the Installation Supplier to the AT&T representative prior to job acceptance. The Installation Supplier shall correct all conditions causing unacceptable test results. The AT&T may provide an observer(s) on the job.

R6-17 Acceptance tests shall be conducted on newly installed equipment to ensure equipment performance meets the applicable specifications.

R6-18 The AT&T shall determine if, through AT&T observation and analysis, the acceptance tests are to be performed in conjunction with the installation test. All tests required will be recorded in the MOP.

R6-19 Test Results - When the product manufacturer's specifications concerning test result data differs from the AT&T specification, these differences shall be identified in the MOP and resolved prior to installation job start.

R6-20 Documentation - The Installation Supplier shall turn over all applicable documentation to the AT&T. This may include, but not be limited to, the following:

- Marked drawings and original prints.
- Initial battery charge reports.
- Office records.
- Wiring lists.
- Operating instructions.
- Test summaries and records.
- Technical and Installation Manuals where available.
- Practices where available.
- Method of Procedure (MOP).
- Engineering specifications.
- Job Activity Quality Audit Documentation.



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R6-21 Housekeeping - The Installation Supplier shall insure that its employees adhere to federal, state, local, Occupational Safety and Health Administration (OSHA), and AT&T regulations and requirements governing personal safety while on AT&T premises.

R6-22 For personal safety reasons, daily or more frequent clean up of the work area is the responsibility of the Installation Supplier. (Refer to the "Safety" section of this document for more information.)

R6-23 At the completion of a job, the Installation Supplier shall:

- Dispose of all remaining job generated waste with the exception of hazardous material/waste. Hazardous material/waste generated by the job shall be treated as indicated in the "Hazardous Material/Waste" section of this standard.
- Dispose of all non-hazardous materials leftover at the end of the job in compliance with the instructions of the AT&T representative.
- Removal of temporary floor, equipment, wall, or column protection placed by Installation Supplier.
- Removal of installation tools and all other Installation Supplier property.

6.7 Job Completion

R6-24 If, after receipt of the Job Completion Report the AT&T does not accept the job, the reasons for non-acceptance of the job shall be furnished to the Installation Supplier.



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7. Method Of Procedure (MOP)

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 010-515-170.

If you have any questions on the content of this "Ask Yourself" Practice, please contact Barbara J. Rogers on (770 785-3571) or E-Mail brogers1@ems.att.com



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8. Commonly Used Tools

8.1 General

R8-1 A tool is considered insulated (electrically) only if so rated by the manufacturer.

R8-2 The use of any tool that has been altered or modified other than manufacturer's recommended modifications or AT&T requirement shall be prohibited.

R8-3 When using tools (power as well as hand), the manufacturer's instructions for application, adjustment, and use shall be strictly adhered to.

R8-4 All measuring or testing equipment and tools with maintenance programs or procedures shall contain maintenance or calibration stickers indicating when the next calibration is due and when the piece was last calibrated.

R8-5 Heavy equipment such as tractors, fork lifts, jack hammers, etc., shall not be used for installation purposes in a Central Office (CO) or customer premise environment without prior written approval from an AT&T representative.

R8-6 The Installation Supplier shall identify and detail the intended use of any heavy equipment in a MOP.

R8-7 Gas and arc type welding or cutting devices shall not be used in a CO environment for any part of the equipment installation activities. (This is not to include exothermic weld of ground risers.)

R8-8 Internal combustion engines used to operate heavy equipment, demolition devices, portable compressors, generators, hydraulic equipment, etc., shall not be operated within a CO environment.

R8-9 The location of hoisting centers and the hoisting procedures to be used for job activities shall be outlined in an MOP and authorized by the appropriate AT&T representative.

R8-10 Hoisting equipment and the associated rigging shall be in good working condition and of the proper size and type for the equipment that is to be hoisted. At no time shall a load be left on a hoist unattended.

R8-11 The Installation Supplier shall identify the service elevators that can be used to transport material to the Installation location within the facility. This should be identified in the MOP.



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8.2 Ring Cutters

R8-12 Cable cutting tools used for cable removal or mining operations shall be equipped with a non-removable protective ring. This is intended to prevent the cutting of cables unless the cable ends are passed through the protective ring.

R8-13 The inside diameter of the protective ring shall not exceed the distance between the inside edges of the cable cutting jaws when the cable cutting tool is opened for normal cutting purposes. The intent of this requirement is to limit the inside diameter of protective rings, thus reducing the possibility of cutting loops of cables that may accidentally enter large diameter protective rings.

R8-14 The protective ring shall not be altered.

8.3 Ladders and Scaffolds

R8-15 Portable ladders and their use shall comply with all applicable federal, state, and local laws, regulations, and codes.

R8-16 Portable ladders, used or transported in the vicinity of working equipment or electrical circuits, shall be constructed of an electrically non-conductive material. Ladders constructed of non-metallic sides and metallic steps are considered acceptable.

R8-17 Scaffolds and their use shall comply with all applicable federal, state, and local laws, regulations, and codes.

R8-18 Metal scaffolding shall not be used in the vicinity of unprotected working equipment.

R8-19 The conditions and environment, where scaffolding may be used for removal operations, shall be outlined in the MOP and be approved by the appropriate AT&T representative.

8.3 Miscellaneous Tools

R8-20 Only non-metallic wedges shall be used for lifting or separating cable.

R8-21 Wedges shall not be driven into a cable bundle with the use of hammers. Wedges shall only be inserted by hand.

R8-22 Trunk straps, minimum 2 inches wide, shall be rated for the maximum load to be supported.

R8-23 Trunk straps shall be in good condition and not frayed or excessively worn.

R8-24 The locking mechanism of the trunk strap shall be in working condition as



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designed.

**AT&T Generic Installation Requirements****9. Workmanship Requirements - General Information****9.1 General**

R9-1 The Installation Supplier shall provide at least one person, fluent in English or the National Language of the country the office is located in, at the work site while the work is in progress.

R9-2 The Installation Supplier shall comply with the specific installation and operational requirements provided in the General Agreement between AT&T and Installation Supplier. The Installation Supplier shall comply with all detailed engineering specifications, job drawings, technical information, and documentation required to successfully complete an installation or removal.

R9-3 The Installation Supplier shall be responsible for handling all installation job activities in a safe and workmanlike fashion whether or not the specific activity is treated in this document.

R9-4 The Installation Supplier shall have ready access (laptop or paper copy) to required documentation including the job specifications, manufacturer's documentation, or any other documentation necessary to complete the job. The Installation Supplier shall not deviate from the job documentation or requirements stated in this standard unless the deviation is communicated to and approved by an AT&T representative in writing.

R9-5 The Installation Supplier shall make an inventory and conduct a visual inspection of all equipment and apparatus shipped to the job site prior to the installation activity. Any physical damage, defects, or problems that may prevent the proper installation, maintenance, or operation shall be identified and the AT&T representative shall be notified.

R9-6 The Installation Supplier shall touch-up all locations where painted surfaces have been marred (scraped or scratched). The touch-up paint shall be the same quality and shade as the paint used on the item being touched-up.

9.2 Electrostatic Discharge (ESD)

R9-7 Electronic equipment is vulnerable to damage caused by ESD. While newer equipment is becoming more susceptible to ESD damage, older equipment is also easily damaged. ESD wrist straps shall be snug fitting, making firm contact with the user's skin. The following shall be followed when handling or interfacing with electronic equipment:

- An approved and tested wrist strap shall be worn when working on back planes, plugging in or removing circuit packs when working on any electronic equipment or when performing battery activities.



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R9-8 Wrist straps shall be tested for continuity. There are two acceptable methods to test wrist straps. The first is with a wrist strap tester. This simply gives an acceptable or not acceptable indication. The second method is by using a Volt-Ohm-Meter (VOM). The VOM should be used to test for opens, shorts, and resistance. The acceptable resistance measurement should fall between 800 K and 1.2 Meg ohms.

R9-9 Never touch the electronic components of a circuit pack. The circuit pack shall be handled by its faceplate and latch. If no faceplate is present, a circuit board shall be handled by its edges.

R9-10 Remove a circuit pack from its antistatic protective casing only in the vicinity that it will be installed. An approved wrist strap shall be worn and connected to an appropriate ground while removing and installing the pack.

R9-11 When a circuit pack is removed from a piece of equipment it shall be handled only while wearing a wrist strap connected to an appropriate ground connection. The removed pack shall be immediately placed in antistatic packaging. Never store circuit packs in a non-electrostatic package.

R9-12 Plug-in circuit packs shall be stored in a grounded metal cabinet. Plug-in circuit packs may also be stored in their original factory anti-static containers.

R9-13 All flammable materials, such as waste paper, foam plastic, cloth bags, packing boxes, packing material, and similar materials supplied during the installation, shall be removed from the building by the Installation Supplier on a daily basis. If any accumulation of such materials creates a potential fire hazard, it must be removed more frequently. Material staged for installation containing combustibles not yet unpacked shall be stored in a fire-rated compartmentalized area. There shall not be the use of tarps of any kind at anytime by network installation suppliers to cover staged material in AT&T central office space.

9.3 Office Drawings and Records

See AT&T Office Record Specification (AORS) for office drawing requirements.

R9-14 Minor changes (ten lines or less) on fuse record sheets can be made by covering the changed line of information with correction fluid/tape. The corrected fuse assignment information shall be added by using a blue or black ballpoint pen only. Pencil or erasable ink is not permitted.

R9-15 A new fuse record sheet shall be developed by the installer and inserted into the Fuse Record Book if it is necessary to change more than ten lines of information on a fuse record sheet. In all cases, if new sheets are provided, they shall be inserted into the Fuse Record Book. Changes shall be accomplished using blue or black ball point pen legibly or with an approved label maker.



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R9-16 Changes to AC distribution cabinet circuit identification that were ink stamped shall be made by removing the old information and adding the correct information. Changes to paper identification cards shall be done with blue or black ballpoint pen legibly or with an approved label maker. Pencil or erasable ink/type is not permitted.

9.4 Job Coordination and Documentation

R9-17 The Installation Supplier shall participate in various job related meetings, as example contact meetings, installation/removal planning meetings, quality review meetings, etc. The purpose of these meetings may be, but is not limited to, such items as reviewing the job documentation, reviewing the job schedule, identification of AT&T and Installation Supplier responsibilities, review and approval of MOPs, reporting of job progress, resolution of quality concerns, etc.

R9-18 At the completion of the job, the Installation Supplier shall provide, to the AT&T representative, all job documentation specified in the contract including the documentation listed in the "Job Start, In-Process, Completion and Acceptance" section.

9.5 General Technical References and Torque Requirements

R9-19 The Installation supplier shall torque all fasteners, e.g., nuts and bolts, that have torque requirements specified by the manufacturer, the job documentation, or this standard.

R9-20 The torqued item shall be marked by the installer, e.g., across the nut, with an indelible ink mark to confirm that the torque adjustment has been made.



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10. Workmanship Requirements - Auxiliary Framing, Bracing, and Cable Rack

10.1 Introduction

10.1 See AT&T Cable Management Standards For Common Systems – Engineering Design Guidelines (ATTP800-006-100) for additional requirements.

10.2 General Assembly

R10-3 Bolts, nuts, screws, and similar parts used for fastening shall be the size and type specified in the job documentation and be properly installed and tightened.

R10-4 Piece parts used for assembly of auxiliary framing or cable rack shall not be altered. Tightening of parts shall not distort the parts.

R10-5 Bolts, cap screws, machine screws, and similar threaded parts shall be free from stripped threads, defaced heads, and sharp edges, and shall not be burred or bent to such an extent as to interfere with the placing or removal of a nut.

R10-6 The types of bolts, screws, washers, and nuts shall be uniform throughout a particular unit of equipment. The threaded end of a bolt, screw, or threaded part may extend beyond the nut or tapped part by an amount equal to the diameter of the screw or threaded part, except where such protrusion will interfere with equipment or wiring, or would present a personal injury hazard.

R10-7 When it is necessary to cut a threaded fastener to a shorter length, all exposed metal resulting from the cutting operation shall be painted to prevent corrosion. In addition, the sharp or jagged edges caused by the cutting process shall be removed.

R10-8 A sufficient number of threads shall be engaged to provide a secure fastening. Generally, this is accomplished when the ends of screws or bolts are flush with the top surface of nuts.

R10-9 Self-tapping screws and swage form screws have tapered and fluted ends to facilitate entry. In order to get full thread engagement, the screws shall be driven so that the tapered and fluted end protrudes a minimum of a full taper and a maximum of a full taper plus three threads. Screws and bolts in tapped holes shall be engaged to a depth equal to the diameter of the screw or bolt, or the thickness of the panel or part, whichever is less.

R10-10 Cut ends of auxiliary framing, cable rack, braces, etc., shall have sharp or jagged edges removed. Cut ends shall also be painted.

R10-11 Lockwashers shall be installed as specified in the job documentation and in this standard. External tooth-type or split ring lockwashers shall be used under nuts of



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“friction” fastenings where the possibility of one member of ironwork sliding on another exists.

R10-12 The tips of cotter pins shall be bent back so that they rest against the rod or bolt.

10.3 Ceiling Inserts and Fastening Arrangements

Equipment areas are usually provided with ceiling inserts, embedded ceiling channel, or other devices arranged for ceiling fastening apparatus .

Fastening apparatus is as follows:

- **Ceiling Inserts:** Ceiling inserts are embedded in the ceiling slab on the desired insert centers during building construction. Ceiling inserts are arranged for 5/8"-11 threaded rods and bolts. Office ceiling insert patterns are normally shown on the office cable rack and auxiliary framing plans or sometimes combined floor, cable rack, and auxiliary framing plans.
- **Embedded Ceiling Channel:** Continuous channel inserts are embedded in the concrete ceiling in paralleled rows above the equipment area. Spring nuts are used to fasten support material to the ceiling as illustrated in.
- **Drop-In Anchors:** Drop-in anchors 5/8"-11 are used for hanger rods, braces and similar occasional ceiling fastenings in areas not equipped with ceiling inserts. These anchors shall be capable of minimum 9600 lbs. hold strength. Refer to the job documentation and this standard for additional information on anchors.
- **Hanger Bolts:** Hanger bolts as shown in may occasionally be used for support of loads in parts of the building where other ceiling attachments have not been provided. This method requires AT&T Building Department concurrence.
- **Beam Clamps:** Beam Clamps are used to support hanger rod from ceiling “I” beams. The spindles of the sockets are tapped 5/8"-11 for use with standard threaded ceiling rods.

R10-13 If the Installation Supplier is required to install ceiling anchors the locations shall be marked on the ceiling, per the job specification, so the anchors will line up in straight rows.

R10-14 The Installation Supplier shall use a drill equipped with a support fixture to align the drill with the ceiling so the anchor holes are drilled in straight and plumb.

R10-15 The Installation Supplier shall use the drill bit size recommended by the anchor manufacturer for the correct anchor hole.

10.4 Ceiling Hanger Rods

R10-16 5/8"-11 threaded rods shall be used for support of auxiliary framing or other equipment from ceiling inserts. The rods shall be threaded their entire length.

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R10-17 Hanger rods shall be inserted into ceiling inserts to the full depth of the insert, but a minimum of seven full turns.

R10-18 Ceiling inserts sometimes become rusty or filled with concrete. If this condition is encountered, the inserts shall be cleaned out with a 5/8"-11 tap.

R10-19 A 5/8"-11 hex nut and a 1-3/4 inch Outside Diameter (OD) washer shall be used at the ceiling on all hanger rods and bolts, regardless of ceiling construction.

R10-20 When false ceilings are encountered, an additional 1-3/4 inch washer and two 5/8"-11 hex nuts shall be used on each rod as shown in.

R10-21 Hanger rods shall not be installed through ventilating ducts unless specified in the job documentation and indicated on office record drawings. When hanger rods are installed through ventilating ducts, additional 1-3/4 inch washers and two 5/8"-11 hex nuts shall be installed at the bottom of the duct.

R10-22 When used with beam clamps, threaded rods shall be screwed into the beam clamp until firmly seated, then backed away approximately one full turn to prevent binding, after which the lock nut at the clamp shall be tightened.

R10-23 Splicing of hanger rods shall be avoided when possible. When splicing of hanger rods cannot be avoided, splices shall be made with each rod contributing half of the support within the splice (meet at sight hole). Under no circumstances shall more than one splice be installed on a hanger rod. Only steel couplings with sight holes shall be used.

R10-24 In no case shall threaded rod used for the support of mezzanine platforms be spliced.

Section 10.5 Auxiliary Framing

R10-25 Steel channel 2 x 9/16 x 3/16 inch minimum shall be used for auxiliary framing. Auxiliary framing shall be used to support network equipment, cable racks, frame lighting and other apparatus. Auxiliary framing shall be installed in stock lengths of 20 feet wherever possible. Shorter lengths shall be spliced in a manner constant with the seismic zone of the location..

R10-26 When installing suspended cable rack or auxiliary framing less than the length of a building bay (nominally 20 feet), side and end bracing shall be installed to prevent sway of the new section(s) added.

R10-27 The office record drawings (T-XXXX-XX-601) shall specify the height at which auxiliary framing is to be installed. The height specified shall be measured from the floor to the bottom edge of auxiliary framing, unless otherwise stated. Auxiliary framing shall be installed within 1/8 inch of the height specified (e.g., 11 feet +1/8 inch) when measured at support locations (e.g., hanger rods, etc.).



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Auxiliary framing shall be level.

R10-28 The maximum distance between levels of auxiliary framing or between the ceiling and the first level of framing shall not exceed 4 feet 10 inches.

10.5.1 Types

Low-type auxiliary framing is channel installed closest to the floor of an equipment area. In general, when used for the support of equipment frames, auxiliary framing will be installed at frame height or up to 3-1/2 inches above the frame it supports. In offices that use an integral cable racking system (typically electronic and digital switching systems) for support of the equipment frames, the low-type framing will be the first level of framing above the integral cable racking system.

High-type framing is the level(s) of framing installed above the low-type framing. When used for support of apparatus which traverses a future equipment area, it may be the lowest level of framing for that area, but will be above any future framing requirement.

Primary auxiliary framing is the channel installed at a right angle to the present or planned equipment frame line-ups or aisles.

Secondary auxiliary framing is the channel installed at a right angle to the primary framing, and is generally a permanent component of an office auxiliary framing arrangement.

Temporary auxiliary framing is the channel installed below low-type primary framing and is parallel to omitted frames in an equipment line. This type of framing is used to provide temporary stiffening of the primary framing that is not attached directly to the top of a frame, and will be removed as frames are added.

10.5.2 Location and Spacing

R10-29 Auxiliary framing channel shall be run in pairs of equal length. In addition, auxiliary framing shall be installed with the flat side to the outside.

R10-30 Horizontal spacing of auxiliary framing shall be on centers of approximately 5 feet 0 inches with a maximum spacing not to exceed 6 feet 0 inches to complement safe loading and support requirements of cable rack and conduit.

R10-31 Primary and secondary framing shall be located under rows of ceiling inserts or embedded channel where possible to facilitate support and bracing.

R10-32 Auxiliary framing used for the direct support of vertical loads (i.e., cable rack, ladder track, high level framing supporting low level framing, etc.) shall be located so that it has no fewer than two points of support.

R10-33 Secondary framing is used to add stiffening to the primary framing and shall be installed above the primary framing where possible. Ladder type cable rack may be used as stiffening in place of secondary framing providing the cable racks are suitably braced as described in Section 10.7.8.



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R10-34 In seismic zones 3 and 4 locations, a minimum of 5 inches shall be maintained between the ends of auxiliary framing and any building surface or obstruction.

R10-35 In seismic zones 3 and 4 where 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 inch or larger bolt shall be installed through the auxiliary framing.

R10-36 In seismic zones 3 and 4 short lengths of auxiliary framing, supported with framing braces and installed to support the top of power equipment frameworks, shall be through bolted.

R10-37 The exposed ends of primary level auxiliary framing shall be equipped with rubber bumper finishing caps. Exposed ends should only be encountered when the through bolting technique is used for ending auxiliary framing used in seismic zones 3 and 4.

R10-38 Auxiliary framing shall extend a minimum of 3 inches past the last support, for splicing purposes, when it is apparent that additional framing will be installed at a future date for growth.

R10-39 The ends of auxiliary framing that do not require stiffening clips or through bolts, per [R10-34](#) and [R10-35](#), shall be cut off flush with the last auxiliary framing support or attachment clip.

R10-40 Unsupported ends of auxiliary framing, shall not extend past the last point of support more than 2 feet 6 inches.

R10-41 Unsupported ends of auxiliary framing shall not be used to support cable rack, ladder track, conduit, etc.

10.5.3 Support

R10-42 Stanchion Supported Auxiliary Framing

The preferred method of support for auxiliary framing in AT&T locations is from overhead ceiling inserts. When this cannot be achieved, a stanchion system may be used. Many CSA areas and non-traditional offices of "tilt-up" commercial construction (typically LNS, IDC, Customer Premise Locations) cannot use the overhead support system. The stanchion support system shall be considered for these types of locations.

All stanchions used shall be continuous in construction (welded, no bolt together products) for the entire height of the stanchion. Top adjusters shall be used only as leveling devices and shall be limited to no more than three inches in rise above the height of the stanchion.

Stanchions shall be square in cross section with a minimum outside dimension of 5" x 5".

"Pipe Stanchions" shall not be used as part of a permanent stanchion support system. Strut materials shall not be used as stanchions in any installation. The stanchions shall be anchored to the structural floor with a minimum of two opposing permanent anchors. When used in a



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raised floor environment the stanchion shall pass through the raised floor tile and be secured to the structural floor.

It is the intent for all stanchion support systems to use a hanging style horizontal grid. This is done by using a stanchion height that is comparable to the upper clearance limits of the area being developed. A horizontal grid is constructed tying the stanchions together. A second lower grid may then be added at an appropriate height (8'-0" Approx). The lower grid is supported from the upper grid through the use of threaded rods or commercially available strut products. Bracing may be accomplished by adding diagonal members between the two levels or from the grid to the stanchion. The system shall suspend down from the maximum height of the stanchions and not be "stubbed" up from shorter stanchions. The system should use a nominal grid spacing of six-feet by eight-feet for the stanchions. The dimensions should be applied with the six-foot dimension perpendicular to the frame lineups and the eight-foot dimension parallel to the lineup direction. This allows three rows to be installed with two foot six inch aisles and the stanchions centered in the first and third lineups. The arrangement allows three 2'-2" wide frames to be installed between stanchions down the lineup. Specific site dimensions may affect the spacing of the stanchions. The optimum spacing listed above should be sought when ever possible. **No grid spacing greater than six-foot by eight-foot shall be used.**

The materials used to create the horizontal grid may be traditional aux bars or strut products of appropriate strength. Hilti strut products have been evaluated for this application. The Hilti "HS-2716-12/PG" product and the Hilti "MS-41D" with two units mounted back to back has been test to provide strength values comparable to a traditional two bar system. Other strut products of equal dimension and thickness may be considered for these applications. Each grid level shall be of a single product and size. No mixing of materials or manufactures shall be done for a given grid level. Different levels of the grid system may be of different products (example: Aux bar primary level with a strut lower level).

Racking shall be applied in a manner consistent with traditional offices. The exception is racking may be run on top of the upper most grid level if vertical clearance is available. The racking mount on top of the upper most grid shall not be "stubbed up". All cable racking standards shall be followed when developing a "Stanchion Supported Area". Design ideas may be forwarded to the owner of this document for verification and concurrence.

R10-43 When used for the support of vertical loads, such as cable racks, the auxiliary framing shall have at least two points of support. A splice at the end of the framing is not considered a support.



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10.5.4 Splicing

R10-44 In instances where auxiliary framing running at right angles to each other are to be junctioned together.

R10-45 Splices in the same aisle of adjacent pairs of auxiliary framing shall be avoided. In no case shall more than two adjacent pairs be spliced in the same aisle. Splices shall be staggered at least one aisle apart or approximately 5 feet (on center).

R10-46 In seismic zones 0, 1, and 2 auxiliary framing shall be spliced with compression/friction type splices.

R10-47 In seismic zones 3 and 4 auxiliary framing of similar height shall be spliced with bolt through splices.

R10-48 In seismic zones 3 and 4 auxiliary framing of slightly different heights shall be Spliced with a stepped internal (between the aux bars) bolt through splice plate.

R10-49 In seismic zones 3 and 4 holes drilled or punched in auxiliary framing for splicing purposes shall be of the correct size and dimensions so as to accept the splice bolts. Splice bolt holes shall be 1/16 inch larger than the splice bolt and spaced on 2-1/4 inch centers. Splice bolt holes 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.

R10-50 The separation between spliced ends of auxiliary framing shall not exceed 1/4 inch.

10.5.5 Support of Equipment Frames

Refer to the "Workmanship Requirements - General Assembly, Cabinets, Frameworks, Units and Miscellaneous" section of this standard, and the job documentation for additional information.

Generally, auxiliary framing, which will be used for the support of equipment frames, in the 11-foot environment, would be installed at a level 3-1/2 inches above the equipment frames to facilitate the movement of frames into and out of the equipment area.

R10-51 Primary framing shall be located at the start of equipment line-ups approximately 9 inches from the end of the first frame of the line-up, but no closer than 5 inches to any building surface for lighting equipment and power feeder access considerations. Additional runs of framing shall be located on approximately 5-foot centers along the equipment line-up.

Locating primary framing over main cross-aisles should be avoided where possible to facilitate access to the overhead superstructure arrangement.

10.5.6 Floor Supported Equipment



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Generally, floor supported (unsupported at the top) equipment is considered to be 7-foot high equipment systems and not mechanically connected to an overhead superstructure arrangement. The floor supported equipment environment is normally used with electronic and digital switching systems with an integral system cable racking arrangement. Relay rack-type frames 7 feet high are also considered floor supported and should not be fastened to the overhead superstructure.

10.6 Auxiliary Framing Bracing

10.6.1 General

R10-52 Auxiliary framing braces shall be constructed of threaded rod (limited use) or angle material.

R10-53 The angle of slope, (45 degrees typically) for braces, may be changed slightly to avoid obstructions; however, the angle of slope of an installed brace shall not be less than 30 degrees or more than 60 degrees.

R10-54 When earthquake bracing is required, ceiling attachments or other building surfaces shall not be used to change the angle of slope of the earthquake braces. When a preformed angle brace is not available, a bench vice or other mechanical apparatus shall be used to form the earthquake brace foot.

R10-55 Bracing shall be accomplished using threaded rod or angle iron. In seismic zones 0, 1, and 2 bracing can be at the building column, threaded rod, or angle iron from a bracing point. In seismic zones 3 and 4, earthquake bracing is required. The Installation Supplier shall verify and install the type and method (two-, three- or four-direction bracing), required by AT&T.

10.6.2 Bracing of High- and Low-Type Auxiliary Framing

R10-56 Bracing shall be used to add rigidity to the auxiliary framing structure. Each line of auxiliary framing shall be braced at each end as near the ends as practicable. Intermediate double braces shall be used with primary and secondary framing runs and shall be located on approximate column spacing (20 feet). The slant of installed braces shall be in the opposite direction of the next brace on the same run of framing. When auxiliary framing is not located directly under a row of ceiling inserts or embedded channel, 3 inch 5 pound channel anchored to the ceiling is used for fastening the upper end of braces. In instances where it is necessary to brace a lower level of framing from an upper level of framing, and the lower level is not directly under the upper level, supplemental framing equipped with stiffening clips shall be used for fastening the upper end of braces.



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R10-57 In instances where it is necessary to fasten a brace to the ceiling at locations other than an insert or embedded channel, 5/8"-11 drop-in anchors shall be used (anchor specifications are referenced in AT&T requirements); 5/8" drop-in anchors shall not be located closer than 5 inches to existing anchors, ceiling inserts, or embedded ceiling channels to prevent spalling of cement.

Braces at ends of auxiliary framing should be attached at the row of ceiling inserts nearest the building walls. When it is necessary to use ceiling attachments other than those closest to building walls, the braces may be slanted in either or both directions as required.

When double braces are used, it is usually more practical to slant the braces in both directions from a common point (at the ceiling). Braces may be slanted from a common point when this arrangement is specified in the job documentation.

R10-58 Braces that are in-line with embedded ceiling channel shall be fastened to the ceiling with two 1/2-13 fasteners. Braces at right angles to embedded ceiling channels will be fastened with a single 5/8"-11 fastening. It is acceptable to use a 3-hole brace foot at right angles to embedded ceiling channel as long as the center 5/8" hole is used for attachment to the ceiling.

R10-59 Where structural (masonry) columns are available for bracing, columns may be used for bracing in seismic zones 0, 1, and 2 only. Where column bracing is used, the braces shall consist of additional pairs of auxiliary framing bars, placed on edge and bolted at right angles to the regular framing so as to be held flatly and tightly against the sides of the column.

R10-60 In single level buildings seismic zones 0 through 4 with ceilings not suitable for the attachment of braces, the auxiliary framing shall be continuous between walls that parallel the equipment line-ups. Auxiliary framing shall be fastened to building walls with fire-treated wooden battens with 3/8 inch · 2 inch lag screws. These wall attachments shall not be considered a point of support for auxiliary framing. Refer to Section 10.7 for bracing arrangements used in offices without auxiliary framing.

10.7 Cable Rack

10.7.1 General

The size, type, height, and arrangement of cable rack and associated bracing is shown on office record drawings (normally the cable rack and auxiliary framing plan).

R10-61 AT&T shall specify the size, type, and height of the cable rack. Cable rack shall be installed at a minimum height of 7 feet 7-1/2 inches measured between the finished floor and the bottom of the cable rack.



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R10-62 Cable rack supports, junction details, brackets, piece parts, etc., shall be properly installed and tightened as specified in the job documentation and in this standard.

R10-63 Cable rack shall be installed straight and level as per the office record drawings.

10.7.2 Planning

R10-64 The following information shall apply to the general planning and layout of cable rack for central office environments:

- Cable rack sizes and layouts shall provide for growth of the equipment.
- Cable congestion and cable lengths shall be minimized.
- Equipment requirements for cable length limitations and cable segregation shall be met.
- Cable racks shall not be located close to equipment or building conditions that may subject the cabling to damage by exposure or other detrimental conditions.
- The number of cable holes required to be open during a single installation shall be minimal.
- Power cable racks shall not exceed 1 foot 8 inches in width:
 - A clearance of 3 inches in seismic zones 3 and 4 locations should be maintained between the side of a cable rack and building columns. Refer to local AT&T requirements.
 - Four inches is the desired clearance between the ultimate cable pile-up of a cable rack and any obstruction.
 - One foot 6 inches is the desired clearance on the working side of a cable rack for installation access.
- Switchboard cable and wire leaving cable racks and entering frameworks shall not be unsupported for a distance greater than 2 feet except as follows:
 - Distributing frame cabling that passes through a cable hole under the frame may be unsupported for a distance of 4 feet.
 - Distributing frame cabling from a rack above the frame may be unsupported for a distance of 5 feet.
 - Power cables No. 00 and larger leaving a cable rack may be unsupported for a distance of 3 feet.
- Vertical power cable rack runs shall be limited to three floors (basement to third floor). If a vertical run of power cable rack must exceed three floors, a horizontal section of rack at least 20 feet in length shall be introduced at intervals not exceeding three floors. This may be accomplished by using cable



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holes that are horizontally offset from each other by at least 20 feet, or by using a horizontal loop in the cable rack if the same vertical path must be used.

10.7.3 Description and Sizes

Cable racks are ladder type steel structures consisting of two 2 inch x 3/8 inch, rectangular side rails called "stringers" between which welded on 9 inch centers are 1 inch x 1/2 inch cross members called "straps". The first and every other strap of 2 ft 1 inch wide cable rack is reinforced with 1 inch x 1/4 inch steel bar.

AT&T requires the use of solid bar type cable racks. The use of channel or tubular type is not permitted by AT&T. Cable racks are furnished in lengths of 9 ft 8-1/2 inches and various widths as shown in Figure 10-32.

**AT&T Generic Installation Requirements****10.7.4 Loads**

The material in this section has been taken from former Bell System practices. The permissible pile-up of cabling on horizontal cable racks is as follows and based on ceiling apparatus that is capable of 1200-pounds vertical load. The 1200-pound load is based on a safety margin defined in the national building codes.

SECURED SWITCHBOARD CABLE

<u>WIDTH OF RACK</u>	<u>SUPPORTS ON</u>	
	<u>5-FOOT CENTERS</u>	<u>6-FOOT CENTERS</u>
5"	5"	5"
1' 0" to 2' 1"	12"	10"

SECURED POWER CABLE

<u>WIDTH OF RACK</u>	<u>SUPPORTS ON</u>	
	<u>5-FOOT CENTERS</u>	<u>6-FOOT CENTERS</u>
5"	5"	5"
1' 0" to 1' 8"	7"	6"

UNSECURED CABLE

<u>WIDTH OF RACK</u>	<u>SUPPORTS ON</u>	
	<u>5-FOOT CENTERS</u>	<u>6-FOOT CENTERS</u>
5"	5"	5"
1' 0"	12"	12"
1' 3" to 2' 1"	15"	12"



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R10-65 The cable pile-up for vertical cable racks shall not exceed 12 inches for switchboard cable racks or 7 inches for power cable racks. Cable horns shall not be installed on vertical cable rack.

To provide the space required to properly close and firestop a cable hole, the pile-up on all vertical cable racks shall be additionally limited so that cable is not closer than 3 inches to the face and sides of the cable hole.

When estimating the weight of switchboard cable on a cable rack, it can be assumed that there is a cable density of 0.6 pounds per square inch (cross-sectional area) of unsecured cable per linear foot of cable rack, and a cable density of 0.9 pounds per square inch (cross-sectional area) of secured cable per linear foot of cable rack. These densities include an allowance for power type cables that are usually installed on switchboard cable racks.

The weight of power cable must be computed according to the actual size and number of cables used. The weight of power cable varies noticeably with diameter and no simple average exists for estimating its weight according to cable fill on a cable rack. The pile-up information for secured power cable mentioned above is based on cable racks loaded with 750,000 CM cables.

Loads for beam clamps, ceiling inserts, threaded rods, etc., for the purpose of determining the spacing of supports other than normal, may be considered as follows:

In embedded base that may be less than the present requirements; apparatus shall be upgraded to present standards.

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Apparatus	Load (in pounds)
5/8"-11 threaded rods	1200
Ceiling insert (Set in place when ceiling is poured)	1200
Acme beam clamps	800
5/8" drop-in anchors (must be capable of supporting 9600 lbs.)	1200
3/8" lag screws in wood (2 inches or more)	300
Framing channels (2" · 9/16" · 3/16" steel)	
Stanchions	1200

Span Between Supports

Up to 2' 0"	2000
2' 0" to 3' 0"	1500
3' 0" to 5' 0"	1000
5' 0" to 7' 0"	700
7' 0" to 8' 0"	500

Embedded Ceiling Channel (Unistrut)

At Any One Point	2000
Where two or more loads are within 2' 0" of each other	2000

10.7.5 Assembly, Junction, and Termination

R10-66 Clamping details used in the assembly of cable rack fabrications are shown in the manufacture's documentation. When cable rack straps or other framework details interfere with the required placement of clamping details, the cable rack shall be cut back to such a point that the straps will not interfere with the clamping details. Cable rack clamping details shall not be cut or modified. Corner clamps may be assembled in positions opposite those shown where necessary to avoid interference with cable rack stringers or straps.

R10-67 Sections of cable rack shall be assembled so that support for cable is provided approximately every 9 inches. At turns or junctions of horizontal racks where the turn of the cables is such that proper support of cables is not provided by the cable rack straps, a 1 inch · 1/8 inch bar(s) may be placed diagonally across the rack to support the cables.

R10-68 In general, the longest lengths and the fewest parts practicable shall be used in assembling cable rack.

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R10-69 No more than one junction shall be placed between any two points of support on horizontal runs. A junction shall not be used beyond the last point of support of cantilevered racks.

R10-70 The gap at cable rack junction points shall not exceed 1/8 inch between the cable rack stringer and splice bolts and/or between the junction of cable rack stringers.

R10-71 Continuous runs of cross-aisle racks fastened above and across line-up racks are permitted where ceiling heights are favorable to the additional cable pile-up this arrangement causes. The J-bolt fastening shall be installed at 5-foot to 6-foot intervals.

R10-72 At cable rack junctions where the radii of the cables are so large that additional support is required, or where cables are spread out to avoid excessive pile-up, corner brackets shall be installed.

R10-73 Cable rack fabrications / transitions shall be used when transferring cables from the horizontal to vertical plane at cable holes when the horizontal rack is at a right angle and in close proximity to the location of the cable hole.

R10-74 Cable rack fabrications transitions shall be installed when transferring cable between cable racks of different construction and height (from ladder type cable rack systems to trough style cable rack systems), or on different ground planes.

R10-75 Power cable rack turns, from the horizontal to vertical plane, shall use a 45 degree interim piece of racking as part of the transition. The length of the 45 degree piece shall be sufficient to provide a smooth and correctly sized turn radius for the power cables. At the bottom of vertical power cable racks, the intermediate cross straps of the short section of rack shall be removed if the uninterrupted rise exceeds two floors. This is to prevent damage to sagging power cables.

R10-76 When a short section of rack is held in place with clamps to obtain an offset or large turning radius the clamps shall not be subjected to any load other than the cabling at the turn or offset.

R10-77 The ends of cable rack sections and supporting bars shall be protected with finishing caps.

R10-78 Closing bars shall be used at non-attached offsets, junctions, and cable rack ends where cabling continues to equipment, or another cable rack.

R10-79 Vertical cable racks arranged to attach directly to the floor or to the tops of equipment surfaces shall be terminated directly to the surface. The cable rack feet may be turned outward at the floor on vertical cable racks if space permits and the end of the cable rack is enclosed.



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R10-80 Vertical cable racks supporting cables passing between floors shall be fastened to the cable hole sheathing using the cable rack foot secured to the top lip of the cable hole sheathing channel. A separate rack will continue from the ceiling below using a cable rack foot at the ceiling line. Continuous cable rack shall not pass through ceiling/floor openings.

R10-81 Vertical cable rack shall be terminated at the floor penetration on the channel sheathing only. The sheathing shall be caulked. If sheathing had not been installed at this penetration, the Installation Supplier shall report this to the AT&T representative.

R10-82 Vertical cable racks attaching to auxiliary framing shall be fastened using cable rack feet and splice clamps. The feet shall be secured using 3/8" framing clips and 3/8" – 16 x 3" Hex Head Cap Screws and Hex Nuts.

R10-83 Vertical changes in cable rack direction shall be via 45 degree inclines or preformed cable rack turns wherever possible to avoid sharp bends in cable; 90 degree vertical turns in cable rack runs shall be used only when absolutely necessary and/or specified in the job documentation.

10.7.6 Spirals and Vertical Offsets

R10-84 Spirals are used to form sweeping 90 and 180 degree turns in right angle cable racks that are vertically offset. These turns consist of rod stringers bent on suitable radii and channel cross straps that are clamped to the rods by split-eye bolts. Spiral cable rack assemblies shall be engineered and installed in accordance with the job documentation and this standard.

R10-85 Offsets in vertical cable racks shall be installed as specified in the manufacture's documentation or as described in the job documentation.

10.7.7 Support

R10-86 Cable racks are, in general, supported by direct attachment to auxiliary framing. Two threaded rods from auxiliary framing bars shall be installed to both sides of the cable rack. Auxiliary framing used for the support of cable rack shall not be supported from self-drilling anchors installed in the ceiling. Stanchions shall not be the primary support of cable rack, however, stanchions may be used as temporary support where frames have been removed that supported the cable rack.

R10-87 Cable racks shall be secured to threaded rod with the use of C or G clips. The "G" clips shall be placed upright or with the tab lowest in the assembly.

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R10-88 Cable racks shall be suspended by 5/8" threaded rods from auxiliary framing. The vertical distance from the bottom of the supporting auxiliary framing and the bottom of the cable rack stringer shall not exceed 4 feet 10 inches.

R10-89 In seismic zones 3 and 4, a 1/4 · 1-1/2 inch bar stock shall be installed below the G or C clip for cable racks supported by threaded rod 12 through 20 inches wide, or a 3/8 · 1-1/2 inch bar stock for cable racks 24 inches and wider.

R10-90 A support shall be provided within 30 inches of a free-end of cable rack.

R10-91 When a free-ended cable rack is joined at a right angle to a rigidly supported cable rack with corner clamps a support shall be provided on the free-ended rack not more than 5 feet from the junction of the two racks.

Cross-aisle cable racks that are attached to line-up cable racks are considered adequately supported if the cross-aisle rack is 6 feet or less in length. Cross-aisle racks longer than 6 feet require support by additional auxiliary framing being placed below the rack or by hanger rods attached to high level auxiliary framing.

R10-92 Cable racks shall be supported at a maximum of 6 feet (on center) or more often, as necessary, to carry the ultimate cabling of the rack and any equipment supported by the rack. Cable racks shall not be supported by their cross straps.

R10-93 Cable racks can be installed a maximum of 2 inches above the auxiliary framing, to clear conduit or other apparatus, or where ceiling heights or overhead obstructions prevent the installation of high-level framing. Cable racks shall not be supported upward above the 2-inch maximum as this configuration becomes unstable. In those cases where a cable rack must be raised, maximum 2 inches, the threaded rod supports shall be equipped with manufactured sleeves, 3/8 · 1 inch bar stock and washers between the intermediate 5/8"-11 nut.

R10-94 Cable racks shall be attached directly to auxiliary framing with two J-bolts at the start and end of the run as shown in Figure 10-70. At intermediate points J-bolts shall be staggered. In earthquake zones 3 and 4, an external tooth-type lockwasher may be used under the nut of each bolt. In earthquake zones 0, 1, and 2 a helical spring lockwasher may be used. The Installation Supplier shall use a Spanner J-bolt when the use of a J-bolt will not be applicable due to an obstruction, as in the case when the cable rack strap falls directly above the auxiliary framing, when rack is directly attached to the auxiliary framing.

R10-95 In instances where auxiliary framing is associated with the support of 11-foot duct type frames, and the cable rack is located 1/2 inch from the frame uprights, the cable rack shall be fastened frame support "U" bolt that encompasses the horizontal support pipe.



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R10-96 Supporting cable racks from building walls and columns shall be avoided whenever possible. In instances where vertical cable racks must be used on walls or columns to facilitate cabling to cabinets or other wall mounted equipment, they shall be supported with angle brackets secured to the wall. Each section of vertical rack shall have a minimum of two angle bracket supports with maximum spacing of the supports not to exceed 5 feet. The support arrangement is not intended for heavily loaded cable runs. Vertical racks on walls or columns that could ultimately support a large amount of cabling shall be terminated at the floor using cable rack feet.

R10-97 When it is necessary to provide for small amounts of horizontally run cable along a building wall, and facilities for an auxiliary framing grid are not available, the cable rack may be supported to the building wall. Spacing of supports shall not exceed 5 feet. Large amounts of cabling shall be run on horizontal racks that are supported by auxiliary framing.

Cable racks placed on floors require fastening to restrain possible movement during an earthquake. For safety reasons the fastenings shall be placed on the inside of the rack stringers. Cable rack runs 2 feet and longer require two sets of restraints. Locating the restraints at each end of the cable rack will require fewer restraints and assist in the alignment of long runs of rack.

10.7.8 Bracing

R10-98 Cable racks not attached directly to auxiliary framing shall be hung and braced from the auxiliary framing. Braces shall be installed to prevent swaying or whipping in both sidewise and endwise directions. Cable rack bracing may be accomplished by use of threaded rod or angle material as required based on seismic area.

R10-99 Cable rack runs that are supported only by hanger rods require a side brace at each support. The braces shall be staggered so they slope in opposite directions at alternate supports along the length of rack.

Hanger rod supports at intermediate locations of cross-aisle racks do not require side braces because the bracing action is obtained by the line-up of cable rack fastenings.

Hanger rod supported cross-aisle racks, at the ends of line-ups that are fastened to line-up racks on one side, require side braces on the outside stringer.

R10-100 One set of end braces are required for each run of hanger rod supported cable rack. The braces shall be slanted in opposite directions. As a rule, braces shall be installed on the same stringer. However, braces may be installed on opposite stringers, if an obstruction is encountered. When a hanger rod supported cable rack is attached to auxiliary framing, or to another cable rack or a frame, which is in turn supported or braced to prevent endwise movement of the cable rack, endwise bracing is not required.

**AT&T Generic Installation Requirements****10.7.9 Equipment Bracing**

The following items are for cable rack arrangements used in commercial buildings, non-traditional CO environments, etc., that do not have ceilings suitable for the support of auxiliary framing and earthquake bracing. Traditionally these types of environments use cable racks (without auxiliary framing) to provide top support of equipment frames. In this type of environment line-up cable racks are supported by direct attachment to equipment frames.

Top support of equipment frames is achieved by installing cross-aisle cable racks at the same levels as the line-up racks, and bracing line-up cable racks to building walls.

Systems that are configured in the isolated or single point ground plane will not have electrical connections to the overhead ironwork.

R10-101 Sections of 5-inch wide cable rack, or extensions of the office cross-aisle cable racks, shall be used for bracing equipment to building walls and for bracing between line-ups of equipment as shown in Figure 10-82. It is not necessary to replace angle braces already installed, however, cable rack bracing shall be provided instead of relocating any existing angle braces.

R10-102 Equipment bracing shall be continuous between walls that parallel equipment line-ups including areas above power equipment. Office cross-aisle cable racks serve as equipment bracing and should likewise be continuous between walls that parallel equipment line-ups.

Wall braces shall be located so there is an approximate spacing of 3 feet between braces at the office distributing frame, and a 5- to 6-foot space between braces of other equipment line-ups. The distance from the end of the first or last frame in an equipment line and a brace or cross-aisle cable rack fastening should not exceed 1 foot 0 inches.

R10-103 When cable racks with 2-inch stringers are attached to line-up racks having 1-1/2 inch stringers, a section of a finish cap shall be taped in place to protect switchboard cables from coming in contact with possible sharp edges of cut cable rack ends.

R10-104 A vertical support such as a pipe stanchion shall be used for cross-aisle cable rack and cable rack brace lengths exceeding 6 feet 0 inches.

R10-105 Cable Rack Horn Assemblies and Cable Rack Brackets may be attached to horizontal ladder type cable racks to provide cable pile up support and/or separation.

R10-106 Cable Rack Divider Horn Assemblies are used to divide the ladder rack into individual compartments. They should be attached to every other cross-strap at the position required to split the rack into appropriate widths.



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R10-107 Cable Rack Horns are used on the side rails of any panned cable rack level. When used for this purpose, they are normally mounted on alternate straps and alternate sides of the cable rack. Rack Horn Assemblies should be mounted turned into the rack. The space and capacity of the Rack Horn Assembly shall be subtracted from the original capacity of the rack.

R10-108 Compartment Type Cable Rack Horns may be used as required to separate various cable type such as Power, DS1/DS3 etc.... from the common cable types. When used for this purpose these horns are located on either or both sides of the cable rack at every strap. Cables located on Compartment Type Rack Horn Assemblies need to be tied with cord every other Horn Assembly. Compartment horns shall have the compartment installed into the rack.

R10-109 “ L “ Cable Rack brackets may be attached below ladder type cable racks to provide cable support and/or separation. These brackets are located on either or both sides of the cable rack at every strap. L Brackets should be mounted turned into the rack. The space and capacity of the L brackets shall be subtracted from the original capacity of the rack. Cables located on Cable Rack Brackets need to be tied with cord every other Bracket Assembly.

The height of the bottom portion of the “ L “ Cable Rack brackets shall be no lower than 7 ft. 2 in. from the floor.

**AT&T Generic Installation Requirements****11. Workmanship Requirements - General Assembly, Frameworks, Units and Misc.****11.1 General**

For the purposes of this document, the terms FRAMEWORK and FRAME are considered synonymous. (See the "Workmanship Requirements - General Information" section for additional information.) Cabinets may be considered frames or frameworks with enclosing sides, tops, and front and rear doors.

11.2 Assembly

R11-1 Bolts, nuts, screws, washers, and similar parts used for fastening shall be the size and type specified and shall be properly installed, tightened, and torqued when required by the part manufacturer. The Installation Supplier shall contact the AT&T representative if there are any questions or problems associated with torque specifications or procedures.

R11-2 Lockwashers shall be installed as specified in the job documentation and this standard. In general, external tooth-type lockwashers shall be used under nuts of "friction" fastenings where the possibility exists of one member of ironwork sliding on another. These systems have limited future use in AT&T.

R11-3 Cut portions of equipment (e.g., auxiliary framing, cable rack, braces, etc.) shall have all sharp or jagged edges removed and the exposed metal surfaces painted with a matching type paint. End caps and finishing details shall be installed as stated in the "Auxiliary Framing, Bracing, and Cable Rack" section.

R11-4 The tips of cotter pins shall be bent back so that they rest against the rod or bolt.

11.3 Equipment Framework / Cabinets

R11-5 Equipment frames/cabinets, which by design are unique to a switching system or technology, shall be installed in accordance with the documentation covering that switching system or technology, unless otherwise specified in the job documentation or this standard. This documentation shall be at the job site throughout the job.

R11-6 The placement of equipment frames/cabinets and guards are shown on office record drawings (normally the office floor plan). The Installation Supplier shall not deviate from the office record drawings and job documentation unless the deviation is communicated to, and authorized by, the appropriate AT&T representative. All communication and authorization of this type shall be in writing.



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R11-7 Equipment frames/cabinets and associated supports, junction details, floor fastenings, piece parts, apparatus, etc., shall be positioned, assembled, aligned, tightened, grounded and bonded, designated, installed, removed, modified, etc., as specified in the job documentation and this standard.

R11-8 End guards for the first or last frame in a line-up are required. Frames next to vacant spaces shall be equipped with wire shields.

R11.8A End Guards for CAA Areas

Common Access Area applications are exempt from the mandatory end guard requirement for AT&T installations. Any cabling that occupies the upright of the end frame shall be securely laced to prevent snagging or pulling by passing individuals or mobile equipment. If end guards are ordered they shall be applied. If end guards are present they should be reused if of proper size.

R11-9 Equipment frames/cabinets shall be raised or lowered with hoisting equipment of an adequate size and type to safely perform the hoisting activity.

R11-10 The method and location for hoisting/erecting equipment frames/cabinets shall be specified in an approved Method of Procedure (MOP).

R11-11 The method of transportation and route to be used shall be specified in an approved MOP when erecting and installing equipment frames in the vicinity of working equipment. When equipment frames/cabinets have to be transported down equipment aisles with working equipment, the working equipment shall be adequately protected to prevent physical damage in the event of an accident. (See the "Workmanship Requirements - General Information and Equipment Removals" sections for additional information.)

R11-12 Dollies or similar devices shall be used to transport equipment frames. Equipment frames/cabinets shall not be transported by dragging/sliding them along the floor surface.

R11-13 Equipment frames/cabinets, equipped with circuit packs, shall not be transported on their side. Protective wrapping that is ESD treated or fire retardant shall remain on the equipment until placed near its final location.

**AT&T Generic Installation Requirements****11.3.2 Alignment**

R11-14 The vertical parts of frameworks, cabinets, and casings shall be plumb to within the following deviations measured from the top of the structure to the bottom:

VERTICAL PLUMB TOLERANCES HEIGHT	MAXIMUM DEVIATION FROM PLUMB
Less than 4' 6"	1/16"
Over 4' 6", but less than 7' 0"	1/8"
7' 0" to 9' 0"	3/16"
Over 9' 0"	1/4"

R11-15 Frames, cable duct type frames, fuse, and power board frameworks shall be as level as the plumb tolerances and squareness of the structure permits. Frames shall be leveled by the use of approved shims or adjusting bolts specified by the manufacturer's requirements. Adjacent frames in a line-up may step up or down a maximum of 1/8 inch, except as specified herein.

- The difference in level of adjacent bays of power board framework shall not exceed 1/16 inch nor shall the entire difference throughout the length of the board exceed 1/2 inch.
- Where a difference in level of adjacent top angles of cable duct type frames exist, a spacer, as shown in Figure 11-3, shall be used between the junction pipe, and the underside of the top angle of the bay.

Frames, such as distributing frames, in which the uprights are attached to long horizontal members, may follow the general contours of the floor. The shelves of distributing frames shall not be more than 1/4 inch above or below a straight reference line extending the full length of the frame. The reference line may slope with the floor.

R11-16 Cabinets shall be level at the top surface of the frame. The difference in level between adjacent cabinets shall not exceed 1/8 inch. 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. Cabinets shall be leveled by the use of leveling feet or approved shims.



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R11-17 Frames fastened together at the ends shall not be more than 1/8 inch out of line with each other, nor shall any frame in the line-up be out of its normal position (in or out from a straight line extending the full length of the line-up), more than 1/8 inch, measured at the front surface of the guard rail or cabinet.

NOTE: The exception to the above, is those frames whose fronts have been designated on the office floor plan drawing to be positioned out of alignment with the rest of the frames in the line-up.

R11-18 Frames or cabinets shall not be installed over junctions of building additions.

11.3.3 Floor Anchors

In most instances the Installation Supplier will be required to drill and install floor anchors. There are many types of floor anchor bolts available on the market and approved by AT&T. The Installation Supplier shall be aware of personnel safety and protection of equipment on the floor below this installation activity. Anchors can be equipped with torque caps and are used where installation conditions and AT&T documentation specify them.

Some anchors have two numbers associated with them, preceded by the letter "M". The first number indicates the diameter of the anchor bolt in millimeters (mm) and the second number indicates the maximum thickness of material to be fastened in mm. For example, an M16/6 anchor has a bolt diameter of 16 mm (.630 in.) and can hold down material that is up to 6 mm (.236 in.) thick. To convert from millimeters (mm) to inches, divide the millimeters by 25.4.

R11-19 The Installation Supplier shall follow the requirements of AT&T for approved anchor types.

R11-20 Anchors shall be positioned, assembled, and installed as specified in the job documentation, in this standard, and in the anchor manufacturer's documentation.

R11-21 Where anchors come in metric sizes, only metric drill bits shall be used for drilling anchor holes.

R11-22 Explosive studs shall not be used for anchoring equipment or bracing details to the floor or ceiling.

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R11-23 When anchors are used, studs shall be installed to the full depth of thread in the anchor. After the hold down nut is tightened, there shall be a minimum of 1-1/2 threads showing above the nut.

These are general instructions for installing anchors:

- Drill hole with the prescribed drill bit. Use precaution to prevent dust particles from being released into the air.
- Clean the hole with a AT&T-approved vacuum cleaner.
- Using a hammer, tap the pre-assembled anchor through the object being anchored and into the hole. The anchor shall set such that the top of the anchor sleeve makes contact with and presses against shims, washers, specially constructed bushings, insulators, or frame base.
- Tighten the anchor bolt to the specified torque, using a torque wrench, and torque as specified by the manufacturer's documentation.
- Floor tiles may contain asbestos. It is required that floor tiles containing or presumed to contain asbestos be drilled in accordance with OSHA requirements and disposed of per AT&T requirements.

**Example of an
Initial Torque Table
in Millimeters (mm)**

ANCHOR DESIGNATION	STUD/BOLT DIAMETER	DRILL BIT DIAMETER	RECOMMENDED TORQUE (FT-LBS)
M8/20	8mm	12mm	20
M10/20	10mm	15mm	40
M12/25	12mm	18mm	60
M16/6	16mm	24mm	150
M20/6	20mm	28mm	300
M24/30	24mm	32mm	525

R11-24 Drilling holes in floors can cause concrete breakout to the floor below. Drilling shall be done with depth indicators. When using hammer action drills the hammer action shall be discontinued for the last inch of drilling. Holes that have broken through can still be used, if the bottom portion of the hole is not spalled (flaking). The Installation Supplier shall contact the AT&T representative for direction when breakout to the floor below occurs. If personnel safety and/or equipment service is at risk due to breakout, the drilling operation shall be discontinued until appropriate direction can be obtained from the AT&T representative. Floor thickness and breakthrough procedure shall be covered in the MOP.



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R11-25 If during the floor drilling operation, reinforcing bar (re-bar) is encountered, attempt to drill another hole at an approved alternate fastening (when provided). If relocating the hole is not possible, permission shall be required to cut the re-bar. The Installation Supplier shall contact the AT&T representative before cutting re-bar. Generally, only the AT&T Building Engineer can authorize permission to cut re-bar. If lightweight concrete is used to reduce floor weight, the aggregate or rock used is porous like lava rock, however, lightweight concrete is suitable for anchoring unless shallow floors or re-bar interference is encountered.

R11-26 All anchors shall be installed per manufacturer's requirements.

11.3.4 Floor Fastening

R11-27 Equipment frames/cabinets shall be fastened to the floor as specified in the job documentation and this standard.

R11-28 Floor fastening apparatus shall be correctly assembled, installed, and tightened as specified in the manufacturer's requirements, in the job documentation, and this standard.

NOTE: Attachment to uprights shall be at normal intervals as specified in the job documentation.

R11-29 Frames installed over unused cable holes or slots shall be fastened to the floor with the same number of fasteners as a similar frame installed over a normal concrete floor structure. The portion of the frame that is directly over a cable hole or slot equipped with a steel cover plate shall be fastened to the cover plate with 3/8"-16 x 1 inch hex head cap screws, 1/2" washer, 3/8" washer. The washers are stacked with the smaller diameter washer on top of the larger washer. An alternative is to have only a 3/8" washer with the bolt. A 3/8 inch washer shall be used with the hex head cap screw for 7-foot frame installations.

R11-30 Frameworks/cabinets shall be rigidly bolted to an adjacent frame/cabinet.

R11-31 The 7-foot and 9-foot frameworks/cabinets that are not junctioned to an adjacent frame at the top, base, and central location of each upright shall be considered standalone, and additional floor fastenings shall be installed. Four anchors shall be installed.

R11-32 Floor anchors in a line-up of frames or cabinets rigidly bolted shall be installed with four anchors on the end frameworks and staggered anchor pattern in intermediate frameworks. In seismic zones 3 and 4, four anchors per frame will be the minimum requirements.



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11.3.5 Junctioning

R11-33 Frames shall be junctioned as specified in the job documentation and this standard.

R11-34 Frame junctioning apparatus shall be correctly assembled, installed, and tightened as specified in the job documentation.

R11-35 Frames shall be junctioned with appropriate junction plate at the top, middle, and bottom of the uprights.

R11-36 In general, all frameworks in a continuous line-up shall be bolted together, where practical, regardless of equipment environment. When frameworks of different designs are to be located adjacent to, or in close proximity to each other, they shall be junctioned together. If junctioning cannot be accomplished, the Installation Supplier shall notify the AT&T representative for clarification.

11.3.6 Top Support

R11-37 Top supports for 11-foot equipment frames shall be installed as specified in the job documentation. As a minimum, two points of support for the first and last frameworks and a single point of support for all intermediate frames in a continuous line-up shall be provided. **No new 11 foot frames are to be deployed.**

R11-38 No overhead bracing or ties into the overhead suspended system shall be made.

R11-39 Stand-alone frames, which require fastening to overhead auxiliary framing for support, shall have at least two points of support. Short lengths of channel, placed at right angles to the stand-alone frame, may be used for the support of frames, and shall be fastened to the underside of suitably supported cable rack, or extend between two runs of secondary auxiliary framing.

In the case of duct type frames, short channels are required when the 1-inch frame junction pipe does not extend to the next row of primary framing, or the pipe is not rigidly fastened to the upright of an adjacent frame.

R11-40 Short channels used to support frames shall be attached to cable racks. Anti-slip fastenings shall be located on the short channels, and on the primary framing to each side of the short channels. The purpose of the anti-slip material is to prevent the cable rack fastenings from slipping.



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R11-41 Duct type frames use a 1-inch pipe for alignment, grounding, and to supplement adjacent frame junctioning requirements. The 1-inch pipe shall be clamped to the underside of the frame top angle at two locations. The V-bolts should be located to the left and right of frame center and be approximately 13 inches apart.

- Frame junction pipes are usually depicted on office record ground schematics to illustrate how and where equipment ground connections have been engineered and at what lengths the pipes are to be installed. The Installation Supplier shall install frame junction pipes at lengths and locations shown on the office record ground schematic.
- Frame junction pipes shall be fastened to primary auxiliary framing with frame support hardware (located at a maximum of 6 feet 0 inches on centers), when they are above future equipment frame locations.
- Frame junction pipes that extend beyond planned equipment frame locations shall be fastened to primary auxiliary framing with frame support hardware or with U-bolts (as shown in Figures 11-4 and 11-5) depending on the type of material provided.
- A neoprene cap shall be placed on the ends of junction pipes that extend beyond frameworks or support hardware. Pipes starting or ending within the footprint of the framework do not require an end cap.
- Grandfathered equipment may use the alignment pipe for grounding, however, all additions shall be provided with a copper ground bar or stranded #6 AWG ground wire. See the “Bonding and Grounding” section for additional information on grounding.
- Pipe splices shall be made in the middle of the frame with V-bolts in each side of the splice.

11.3.7 Grounding

R11-42 Equipment frames shall be grounded and bonded as specified in the job documentation and this standard. Building-specific bonding and grounding placement will be identified on the T(XXXX)-650 drawing.

R11-43 Equipment frame grounding/ bonding material shall be correctly installed, assembled, and tightened as specified in the job documentation and this standard. Refer to the “Workmanship Requirements - Bonding and Grounding - Integrated Ground Plane and Isolated Ground Plane” sections for grounding requirements.



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11.3.8 Designations

R11-44 Equipment frames shall be designated as specified in the job documentation. Refer to the "Workmanship Requirements - Equipment Designations" section for equipment designation requirements.

11.4 Equipment Units and Apparatus

R11-45 Units of equipment and apparatus shall be correctly installed, assembled, wired, and designated as specified in the job documentation and in this standard.

R11-46 All shelves, units and other equipment having movable parts drawers, etc., shall be mounted so there will be no interference with adjacent equipment in any direction. If interference problems are encountered during installation, they shall be brought to the attention of the AT&T representative.

11.5 Conduit, Lighting, and AC Outlets/receptacles

11.5.1 General

Personnel safety and equipment protection is critical when work is to be performed on live AC circuits. For requirements associated with AC circuits and conduit, refer to the job documentation.

R11-47 The Installation Supplier shall follow all applicable national, state, city and local electrical codes when performing work. This may require the Installation Supplier to have an Electrician's License.

R11-48 A detailed MOP shall be prepared and approved before anyone works on any live, protected or essential AC circuits or cabinets.

R11-49 Frame outlets shall be on a separate circuit and protector than the aisle lighting.

R11-50 Any work performed on live protected or essential AC circuits may require that activities be accomplished during non-standard working hours. This shall be a joint decision between the AT&T representative and the Installation Supplier, and shall be listed in the MOP.

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R11-51 The Installation Supplier shall not turn on or off any circuit breakers or install or remove any fuses on live, protected or essential AC circuits without an approved MOP outlining the activity and specifying who is responsible for turning on or off the circuit breakers or removing the fuses.

AT&T may elect to assign an observer to the job. The observer's partial responsibility may be to turn off circuit breakers or remove fuses on protected or essential AC circuits or to observe the Installation Supplier turn off circuit breakers and/or remove fuses.

R11-52 Before removing or turning off any fuses or circuit breakers, the Installation Supplier shall verify, with the appropriate AT&T representative, that there are no working circuits, test equipment, etc., associated with the circuit being removed or turned off.

R11-53 Only circuits specified in the job documentation shall be turned off. The Installation Supplier shall contact the appropriate AT&T representative if any additional circuits need to be turned off.

11.5.1A AC Convenience Outlets

R11-54 AC convenience outlets should be provided every fourth bay e.g. bays 1, 5, 9, 13 etc... .

R11-54A Customer Access Area (CAA) applications are exempt from the mandatory requirement for AC convenience outlets located in every fourth framework. It is "recommended" that AC Convenience outlets be available within the CAA area. Specific information in the AT&T order shall be followed for AC convenience outlets.

11.5.2 Safety Precautions and Equipment Protection

R11-55 When work is to be performed on live AC circuits or ringing supply circuits of 100 volts or higher, fuses shall be removed or switches opened wherever it is practical to do so without causing a service interruption.

R11-56 Frame and aisle lighting and appliance outlet circuits are not essential for maintaining equipment operation. When possible, these circuits shall never be worked on while live. This applies to other AC circuits that do not furnish power to working equipment. The Installation Supplier shall be aware of possible safety hazards caused by disconnecting AC to lighting in equipment areas.

R11-57 When it is necessary to work on, or adjacent to, live, exposed or unprotected AC circuits, two persons shall be present while the work is being performed. The persons involved must be aware of the hazards, the measures required to avoid an accident, and the action required in case of emergency.

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Conduit associated with network equipment is usually depicted on office frame and aisle lighting, and/or AC distribution office records. These records illustrate how conduit runs have been engineered for an office and how and where they are to be supported.

R11-58 The Installation Supplier shall install office conduit runs in accordance with the job documentation and office records.

R11-59 Conduit, lighting, and AC outlets shall be correctly positioned, installed, assembled, wired, and designated as specified in the National Electrical Code (NEC), job documentation, and equipment drawings.

R11-60 The Installation Supplier shall verify that AC outlets have the correct polarity and are properly grounded. The Installation Supplier shall furnish the AC test records to the AT&T representative.

R11-61 Conduit shall be placed so as not to block future frames, cabling, ladders, etc.

R11-62 Office records illustrate how conduit runs shall be supported and approximately where the supports shall be located. The Installation Supplier shall use the guidelines below when the office record or job documentation does not adequately provide conduit support location information.

- Conduit shall be rigidly and securely fastened at intervals of 10 feet or less and within 3 feet of fittings when it is installed on building surfaces.
- Conduit shall be supported at intervals of 6 feet or less when it is installed within CO ironwork arrangements.
- Conduit-serving junction boxes that do not contain devices, receptacles, or switches and do not support fixtures, shall be supported within 3 feet of the box on two or more sides. If the junction box contains devices, it shall be supported within 18 inches of the box on two or more sides.

R11-63 Conduit ends shall be closed and free of sharp burrs.

R11-64 Unused knockouts on junction boxes, frame base plates, panels, etc., shall be closed.

R11-65 Insulated couplings shall not be installed in AC conduit or raceways. All AC wiring shall be enclosed in an electrical continuous conduit or raceway.

R11-66 Connections at junction boxes, panels, etc., shall be tight.

R11-67 All AC feeds shall be equipped with an equipment ground conductor. (ACEG



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conductor, per conduit).

R11-68 New, reused, and relocated AC outlets shall be equipped with ACEG conductor.

R11-69 Wire nut connections shall be placed so as to be accessible for maintenance and inspection, and shall be made in an enclosed location (e.g., junction box). Splices shall not be made in pull boxes.

R11-70 AC neutral leads shall be white or grey or their ends painted or taped white or grey.

R11-71 ACEG conductors shall be green or their ends painted or taped green.

R11-72 AC phase leads shall not be white, grey, or green.

R11-73 Extension cords shall not be used for connection or service to any telecommunication equipment.

11.6 Rolling Ladders and Track

No new rolling ladders shall be installed in any AT&T location. The following items are for existing ladders only.

R11-74 Rolling ladders, track and track support shall be installed, supported, assembled, and secured as specified in the job documentation and in this standard.

R11-75 The ladder track shall be supported a minimum of 5 to 6 feet with the first and last sections of ladder track provided with a minimum of two points of support and shall not extend more than 30 inches beyond the last point of support.

R11-76 Ladder track installed 12 feet or more above the equipment floor, and ladder track that is suspended 10 inches or more below its supporting member, shall have a minimum of two supports per section of track. All other runs of ladder track, regardless of their height, shall have a minimum of one support per section, except the end sections that shall have a minimum of two supports.

R11-77 When existing ladder track is extended, the existing end sections of track, 5 feet 0 inches or shorter, shall be replaced with a full length section.

R11-78 The overall length of the ladder track installed shall overhang at both ends of an equipment line-up in order to allow for access to all equipment.

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R11-79 Where the ultimate length of a line-up of track is being installed initially, or when the existing lineup is being extended to the ultimate and the overall length is such that one of the track sections is less than five feet, the shorter section shall be placed at some intermediate location in the track instead of at the end.

R11-80 Where the ultimate length of a line-up of track is not installed, but the track will be extended at some later date, the shorter length of track shall be located at the growing end of the track.

R11-81 The ladder track shall be extended at the position of future frames to obtain access to distributing power terminal strips, fuse cabinets, aisle pilots, etc., located at the ultimate end of a line-up.

R11-82 The track shall be assembled and aligned to ensure the proper operation of the ladder trolley and brake.

R11-83 A minimum clearance of 1 foot 3 inches shall be maintained between the end of ladder track and walls, columns, etc., on the end toward which the ladder(s) slope.

R11-84 The gap between spliced ends of ladder track shall not exceed 1/8 inch.

R11-85 Ladder track splicing sleeves shall be assembled with lockwashers and locknuts as specified in the job documentation.

R11-86 Track support brackets shall be fitted closely to the tracks so as to hold the track as securely as practical against lengthwise movement. To prevent creeping of the track in the supports, the track shall be bolted to both end support brackets in each continuous line.

1. Where an end support is bolted to the track by means of the ladder stop bolt the 1/4 inch creeper bolt may be omitted from this end.
2. Where there is interference between the 1/4 inch creeper bolts and the hanger rod in the end ladder track supports, the creeper bolts may be located in the next to the end track support. Should similar interference also be encountered in the next to the end supports, the creeper bolt shall be located in the end support bracket. The installer shall re-drill the track support bracket. The latter arrangement also applies should interference from the bolt prevent placing a creeper bolt in the regular location in the track support below the end brace.
3. Where the ladder track is supported from high-type auxiliary framing, and end braces are required, additional creeper bolts shall be installed in the track supports of the angle braces associated with both end braces.
4. Where hanger brackets are used, clearances in excess of 1/32 of an inch may be

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encountered between the sides of the ladder track and the inside of the bracket. Shims 1/32 of an inch thick are available to ensure a tight fit of the track in the bracket in such cases.

5. When installing hanger brackets the horizontal portion of the bracket may be turned in either direction.

R11-87 Ladder track shall not be extended.

R11-88 Ladder track shall not extend more than 2 feet 6 inches beyond the last support if the trolley traverses the entire length of the extension. If the travel in the extension is limited to 3 feet 0 inches by a stop bolt and bushing, the track may extend to 4 feet 0 inches.

R11-89 Ladder stop bolts and bushings shall be installed at each end of ladder track as follows:

- A minimum of 1 inch from the end of the track that is on the incline side (or direction) of the ladder.
- A minimum of 3 feet 0 inches from the end of the track that is on the decline side (or direction).

R11-90 Ladders serving equipment on the right side only shall have their handrails relocated from the right side of the ladder to the left side.

R11-91 Ladders shall, in general, slant in a direction such that the foot is nearest the main cross-aisle.

R11-92 Ladders in a single line of frames shall slant such that the foot of the ladder is toward the right when facing the frames.

R11-93 Ladders between lines of frames, equally convenient for approach in either direction, may slant in either direction, preferably in the same direction as other adjacent ladders in the same section of the building.

R11-94 Where a ladder, slanted in accordance with the above, could not run a sufficient distance beyond the end of a row of frames to provide access to equipment in the upper portions of the end frame due to track interference, the direction of slant of the ladder shall be reversed.

R11-95 The slant of platform-type ladders shall be in the direction that permits access to the equipment at the upper portion of the end frames.



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R11-96 At frame line-ups where the guardrails have an offset to a wider guardrail at one end, the ladder shall be slanted so as the ladder will not strike apparatus due to the wheel being opposite the narrow rail. Where a reversal of the slant of the ladder is not practical, the wider guardrail shall be extended to prevent interference.

R11-97 Ladders at distributing frames shall be slanted so that a person standing on and facing the ladder will have their right side nearest the frame.

R11-98 Ladder brakes shall be adjusted per the job documentation to insure proper operation of the brake assembly.

R11-99 Ladders shall run free and clear of equipment.

R11-100 Cotter pins shall be installed through the upper and lower end of the threaded hanger rod connecting the ladder to the trolley assembly. The cotter pins shall be installed in such a way that the nuts cannot un-thread from the rod.

R11-101 Rubber end-plugs shall be installed at the end of the trolley assembly.

11.7 Cable Slot Conversion

The Installation Supplier may be requested to convert an existing cable slot into individual, standard dimension, cable penetrations. Cable slots, 12 inches wide and various lengths, are installed between columns of building bays on equipment floors for the purpose of providing through facilities to other floors, rooms and equipment. The cable slots are usually equipped with steel covers fastened to the floor line and also to the ceiling below. Cable slots under the Main Distributing Frame will usually not be used for cable penetrations to interconnect other communication equipment.

11.7.1 Developing the Individual 1-Foot x 2-Foot Standard Cable Penetration

R11-102 The Installation Supplier shall not run any cable through a cable slot until the slot has been converted to a standard individual cable penetration.

CAUTION: White bags found in old penetrations may contain asbestos. If white bags are found the Installation Supplier shall immediately stop the work and contact the AT&T representative for resolution. The work shall not continue until the matter is resolved and corrected. See Section 4 "Safety," and Section 5 "Hazardous Material/Waste," of this standard for additional information on safety and hazardous material.

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R11-103 A 1/8-inch steel partition shall be installed, segregating the remaining cable slot from the cable penetration under construction, at the position in the cable slot as outlined in the job documentation or specification. The steel partition shall be secured to the fascia angle material provided in the cable slot. If no fascia angle was provided one shall be installed at the top or bottom of the penetration to secure the partition.

R11-104 A 4-inch floor channel sheathing, constructed of formed channel material, shall be installed over the newly formed cable penetration providing a framework around the cable penetration.

R11-105 The 4-inch channel shall be installed around the 1-foot × 2-foot opening at the floor line and shall be installed making a watertight seal with the concrete floor using a AT&T-approved waterproof sealant or a formed flexible gasket-forming material.

R11-106 The remaining cable slot shall be firestopped using the left over existing blue, mineral wool, bags or by using mineral wool batts, 3-inch thick, installed in overlapping layers or as directed by AT&T or the job documentation.

R11-107 The newly created cable hole shall be firestopped using AT&T-approved intumescent firestop system. See Section 12, "General Firestopping Considerations," of this standard for detailed information on firestopping.

R11-108 The sheathing shall be drilled and tapped to accept 1/4-inch machine screws. The drilled and tapped holes shall be installed around the perimeter of the steel collar sheathing and spaced no greater than 8 inches on centers. The corner holes shall be within 1 inch of the corners and shall not be drilled/tapped in the center of the joints.

R11-109 A steel cover plate, 0.125-inch thick, shall be installed on the top of the 4-inch sheathing.

R11-110 A 1/4-inch bead of intumescent putty shall be applied to the top edge of the sheathing to provide a smoke seal.

R11-111 The installation supplier shall complete the information required and install cable hole closure adhesive tags across two opposite sides of the steel cover plate and onto the sheathing. The Installation Supplier shall review Section 12.3, "Cable Hole Labeling," for more information.



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12. Firestopping Of Penetrations

AT&T requirements covered in the AT&T Fire Stopping Penetrations Practice

These instructions are controlled by the Environment, Health and Safety organization and are covered under AT&T Practice ATTP 770-350-100.

If you have any questions on the content of this "Fire Stopping" Practice, please contact Jeffrey Betz (973) 543-0284 or E-Mail jbetz@ems.att.com.

**AT&T Generic Installation Requirements****13. Workmanship Requirements – Cabling and Wiring****13.1 Introduction**

This section provides generic requirements pertaining to cable and wire (c & w) repair, installation, protection, securing, routing, placement, and support. The workmanship generic requirements discussed in this section are general in nature and are not all inclusive or an exhaustive treatment of the subject. The Installation Supplier is responsible for the management of all aspects of their work in a safe and workmanlike fashion, whether or not the specific work activity is addressed in this section. Walking or standing on cable rack or cable troughs is strictly prohibited.

13.2 General

R13-1 Problems encountered in c & w operations not answered by this section or the job documentation shall be referred to AT&T representative for clarification.

R13-2 The appropriate section(s) of this standard shall be reviewed prior to the start of the cabling or wiring activity.

R13-3 The Installation Supplier shall utilize the Job Information Memo (or equivalent), as specified in this standard, for written response to the AT&T representative.

R13-4 The Installation Supplier shall promptly notify the AT&T representative, in writing, if additional material, which is normally supplied by AT&T, is required to complete any cabling activity.

R13-5 The Installation Supplier shall notify the AT&T representative, in writing, of conditions in the vicinity of the cabling area and associated with the cabling activity that do not meet requirements specified in the job documentation and/or this standard.

R13-6 Upon job completion and turn over to AT&T, the Installation Supplier shall identify in writing, using AT&T's job completion report, any work activities that have not been completed and/or any material that was not installed or removed as specified in the job documentation and this standard.

R13-7 C & w shall be of the correct type and gauge/size, as specified in the job documentation and/or in this standard. Only c & w that is approved for use in AT&T shall be installed.

R13-8 Caution shall be exercised when running cable. The Installation Supplier shall avoid stressing or damaging new and existing cables.

R13-9 C & w shall be installed, routed, supported, protected, and secured per the job documentation and this standard.

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R13-10 All cable running tags shall be removed prior to the equipment being turned over to AT&T unless otherwise specified and approved, in writing, by the appropriate AT&T representative.

R13-11 The Installation Supplier shall avoid stressing or damaging new and existing c & w during cabling activities. C & w shall not be twisted or bent so as to damage the conductors or the sheath.

R13-12 The Installation Supplier shall adhere to the color codes as specified in the job documentation.

R13-13 Minimum radius for a specific cable or wire type shall follow the manufacturer's specifications or contact the AT&T representative.

R13-14 The tools used for butting, stripping cable sheathing, and for the preparation of wire ends for termination shall be of the type (or equivalent type) specified by the cable manufacturer.

R13-15 C & w shall be fanned, formed, and prepared for termination as specified in the manufacturer's documentation and this standard.

R13-16 C & w shall be dressed in such a manner so as to avoid congestion, to ensure accessibility, and to maintain proper clearances.

R13-17 C & w shall be dressed so as to avoid contact with heat producing devices.

R13-18 In no case shall c & w be pulled tightly across any edges whether they are protected or not.

R13-19 When there are spare and unused leads associated with a partially terminated cable, the spare leads shall be placed in fiber tubing or sewn to the existing form.

R13-20 Spare leads associated with partially terminated cables shall be of sufficient length to serve the furthest circuit within the equipment frame or terminal block, as applicable.

13.3 Cable Openings

Refer to the appropriate paragraphs in the "Workmanship Requirements - General Firestopping Considerations" section of this standard for information on opening, closing, and firestopping stopping cable holes, slots, and sleeves.

R13-21 The Installation Supplier shall minimize the number of cable holes opened during the installation activity. Inter-floor cable holes, slots, and sleeves must be properly closed and firestopped to control possible fire and smoke propagation.

R13-22 Cable holes shall be closed at the end of each working day or whenever it is

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anticipated that no additional cable will be run that day. Local AT&T specific requirements will determine if the cable hole closure shall be permanent or temporary.

13.4 Damaged Cables

R13-23 Damaged outer jackets of polyvinylchloride (PVC) covered cables 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.

R13-24 Seriously damaged sections of outer jackets of PVC covered cables 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.

R13-25 Damaged outer jackets of power cable 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 tape shall extend a minimum of 2 inches past the damaged section.

R13-26 A run of cable shall be replaced if the number of damaged or spliced conductors exceeds 5% of total conductors.

R13-27 In some cases it may be possible to repair outer jacket with heat shrink tubing. The AT&T representative shall be consulted in these situations.

R13-28 Unless otherwise specified, c & w shall not be spliced on cable racks or troughs.

R13-29 Unless otherwise specified, splices shall be located so as to be accessible for inspection.

R13-30 Unless otherwise specified, the Installation Supplier shall follow the splice manufacturer's specification for application and assembly.

R13-31 Only splices of the proper size and type shall be utilized.

R13-32 If there is a question as to the type of splice required for a particular application, the Installation Supplier shall contact the appropriate AT&T representative for resolution.



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13.5 Installation

R13-33 The Installation Supplier shall utilize cable installation tools of an appropriate type and size to safely complete all cable installation activities.

R13-34 Cable dispensing devices (i.e., cable reel stands, lazy susans, etc.), when in use, shall be located far enough away from working equipment to avoid any possibility of the cable or cable dispensing device contacting the equipment.

R13-35 When multiple cable runs are being pulled up onto a cable rack, sheet fiber protection (or an equivalent), shall be placed so as to protect existing cable and/or the new cable from damage, at the point where the new cables are being pulled over the edge of the cable rack and/or existing cable.

R13-36 Cable guides (rings) shall be placed at turns, and along the cable runs at frequent enough intervals to prevent the cables from rubbing on the framework, cable racks, threaded rods, and other cables as they are being installed.

R13-37 When running cable in working offices, cable guides shall be placed, where possible, over non-working equipment since dirt is most likely to fall from cables where they pass through the guides. If the rings must be placed over working equipment, the equipment shall be adequately protected.

R13-38 During installation, cables shall be temporarily secured at corners. Adequate slack shall be placed in the corners so that the cables can be evenly distributed on the cable rack upon completion of the cabling activity.

R13-39 When installing cables on a multi-floor cable run, they shall be adequately secured, as required, during unattended periods and installation activities, to avoid the possibility of the cables breaking away and free falling to the floors below.

R13-40 Installed cables, hanging unterminated in equipment frameworks, shall be neatly coiled above the floor level and have their exposed ends insulated. Under no circumstances shall the cables be left on the floor.

R13-41 All cables run for future use shall be designated "for future use," contain the cable running information, and be stored in a manner that will allow future access and installation.

R13-42 All cabling shall be protected from hazardous conditions such as metal edges, excessive strain, etc.

R13-43 Cables shall not be twisted or bent so as to damage the cable or wire covering.



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R13-44 During cable running operations the exposed ends of the cable shall be insulated to prevent accidental contact with live circuits.

13.6 Cable Protection

13.6.1 General

R13-45 Cable shall be protected where it bends around or comes in contact with edges or corners of supports, auxiliary framing, cable rack stringer, cable rack cross straps, threaded rods, or other metal edges.

R13-46 Cable connected to, or adjacent to, movable parts or equipment (e.g., hinged or retractable parts) shall be protected where the cable may come in contact with surfaces such as those mentioned above.

R13-47 Polyvinylchloride (PVC) type cable if spliced shall have the splices protected with two half-lapped layers of electrical tape or heat shrinkable tubing.

R13-48 Exposed shields and ground wires, at the connection end of shielded cable, shall be protected with two half-lapped layers of electrical tape where they may come in contact with foreign grounds, voltage potentials, or metalwork.

R13-49 Exposed ends or portions of power cable shall be protected with a minimum of two layers of rubber tape and electrical tape, or covered with a heat shrink cap. Refer to the AT&T representative to determine if shellac is also needed over the tape.

R13-50 To protect cabling from abrasion, form fiber (3/4-inch diameter) or sheet fiber cut to fit and tied with 9-ply twine shall be placed on cable rack support threaded hanger rods. For a run of rack, the tubing lengths shall be uniform and provide for the maximum amount of allowable cabling.

R13-51 Fiber insulation shall be used on the stringers of cable rack where cables turn off to frames, equipment, or other cable racks.

R13-52 Fiber insulation shall be placed on the cross straps of cable racks where cables bend over and drop through the rack.

R13-53 Sheet insulation shall be used to protect c & w from contact with auxiliary supports such as framing channels and flat bars. Where practical, the sheet insulation shall be applied to the auxiliary supports rather than to the cable or wire.

13.7 Cable and Wire Protection

R13-54 All cable shall be protected from contact with edges.

R13-55 All cable shall be protected where there is the possibility of contact with

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movable parts.

R13-56 Where cables or wire pass through metal openings, protection shall be appropriately applied to either the cable, wire, and/or the metal edge.

R13-57 Sheet fiber, fiber tubing, electrical tape, friction tape, and/or rubber tape shall be used for protection at the appropriate locations.

R13-58 All power c & w that is not clearly identifiable as textile jacketed or armored shall be protected against contact with cable brackets, cable ties, and sewing twine by wrapping the c & w with sheet fiber. Those power cables and wires requiring protection include but are not limited to rubber, hypalon, plastic, thermoplastic, neoprene, propylene, and synthetic polymer.

R13-59 When coaxial cable is to be secured by sewing or banded with twine, the stitches shall not be tightened so tight as to deform the cable.

R13-60 Single fiber jumpers shall be wrapped with sheet fiber protection when they are secured by sewing or banded with twine.

13.8 Application of Protection Material

Plastic adhesive tape (electrical tape) may be used to protect cable and wire forms except where there is the possibility of chafing due to movable parts. When plastic adhesive tape is used for protection of cable a minimum of two half-lapped layers shall be applied.

Form fiber strips may be placed, for cable protection, on the edges of unequal flange cable duct type framework.

Sheet fiber protection (two sheets - 1/64 inch) may be used in place of tape for protection of cable forms.

Semi-rigid (1/64 inch) fiber tubing may be used for protection of cable forms, spare skinner lengths, spare leads, etc.

R13-61 Form fiber strips shall be securely fastened with twine so as to prevent displacement.

R13-62 Plastic adhesive tape shall not be used where it may come in contact with hot soldering irons or heat producing devices.

R13-63 Plastic adhesive tape shall not be used where it could be subjected to constant pressure, such as the weight of cable under a stitch at the top cable support bracket of an equipment frame.

R13-64 Both sides of plastic adhesive tape shall be kept as clean as possible when being used.

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R13-65 Plastic tape has a tendency to recede, therefore, the last two wraps shall be applied without any tension and at a right angle to cable or wire forms.

R13-66 Friction tape shall be wrapped tightly and the last two turns shall be at a right angle to the cable form.

R13-67 All tape used for protection shall be applied in a half-lapped layered pattern.

R13-68 Semi-rigid (1/64 inch) fiber tubing shall be slit lengthwise for installation purposes, but it shall maintain a minimum of a 1/2-inch overlap along the lengthwise slit when in contact with hazardous surfaces.

R13-69 Semi-rigid (1/64 inch) fiber tubing shall not be used at locations where it may come in contact with heat producing devices such as soldering irons.

R13-70 Sheet fiber protection shall be securely fastened with twine so as to prevent displacement.

R13-71 Protection material (sheet fiber, electrical tape, etc.) shall extend a minimum of a 1/2 inch past the areas requiring protection.

13.9 Sheet Fiber

R13-72 Sheet/formed fiber shall be placed on cable rack hanger rods where cables turn off the cable rack adjacent to the hanger rods. If practical, the formed fiber should be of uniform length and be long enough to adequately protect the cabling to the ultimate height of the cable build up.

R13-73 Sheet/formed fiber or 5/8-inch fiber tube shall be placed on any hanger rods passing through any cable rack above or below the rack it is supporting.

R13-74 Sheet/formed fiber insulation shall be placed on cable rack retaining brackets when cables turning off the cable rack are in contact or in close proximity to the cable retaining brackets. Protection can be placed initially when it is obvious that the subsequent addition of cables or other activity in the immediate area may force the cables into contact with the edges of the retaining brackets.

R13-75 Sheet/formed fiber insulation shall be placed on cable rack retaining brackets to protect cables where cables bend sharply across the cable retaining brackets.

R13-76 Sheet/formed fiber insulation shall be applied to the closing detail of a non-continuous run of cable rack when it intersects another cable rack at a lower level (see Figure 13-2).

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R13-77 Two layers of 1/64-inch or one layer of 1/32-inch thick sheet fiber insulation shall be used to protect cable from contact with metal work. The fiber, where practical, shall be secured to the metalwork rather than the cable.

R13-78 Sheet fiber shall be used instead of tape for cables that must be protected from contact with both the metalwork and twine. In this case the fiber shall be wrapped and secured around the cable to prevent the twine from cutting into the cable.

R13-79 Sheet fiber shall be securely fastened so as to prevent displacement and to avoid projecting edges or corners when wrapped around metalwork or cables.

R13-80 Fiber protection shall be placed at all locations where cables turn off the cable rack across the stringer and drop 3 inches or more, whether or not the cables are in physical contact with the stringers initially.

R13-81 Fiber protection shall be placed on the cable rack cross straps where cables pass through the middle of the cable rack. When the exact area where cables are to be turned over the strap cannot be predetermined, fiber may be placed across the entire length of the strap.

R13-82 Cables or wire shall not break off through the middle of a screened/panned and bracketed cable rack to serve equipment directly below the rack.

R13-83 Fiber protection shall be secured to the cross straps with twine.

R13-84 At "T" intersections or junctions of cross-aisle to aisle cable racks, where one of the racks is located higher than the other, fiber protection or rubber caps shall be added to the ends of the cable rack stringers.

R13-85 Fiber protection shall be placed on the cable rack cross straps at outside bends or offsets in cable racks (e.g., horizontal to vertical downward runs).

R13-86 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.

R13-87 Fiber optic jumpers and foam dielectric coaxial cable shall be wrapped with two layers of 1/64-inch sheet fiber protection when they are to be secured to cable brackets or other supports.

R13-88 All soft rubber jacketed power cable shall be protected from contact with cable brackets, cable racks, framework, nylon cable ties, and sewing twine, by wrapping the cables with two layers of 1/64-inch sheet fiber or one layer of 1/32-inch sheet fiber.



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13.10 Tape

R13-89 Electrical tape shall not be used for protection where it might come in contact with a hot soldering iron or other heat producing devices, or where it might be subjected to pressure, such as on wiring that is tied to framework.

R13-90 Tape shall be kept as clean as possible during application to assure good adhesion and to prevent unraveling. Tape shall also be applied evenly in half-lapped layers. Due to the tendency of plastic electrical tape to recede, the last two turns shall be overlapped and applied without any tension.

R13-91 Metalwork shall be protected with electrical tape, formed fiber, or sheet fiber where wire or wire forms contact its edges. The metalwork shall be wrapped evenly with two half-lapped layers of tape, or protected with formed or sheet fiber. The fiber shall be secured with twine.

13.11 Securing with Twine

R13-92 The Installation Supplier shall utilize the appropriate type sewing needle when sewing with twine.

R13-93 Nine ply waxed polyester twine shall be used for sewing and banding of cable.

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R13-94 Unless otherwise specified, two strands of twine shall be used for sewing all cable on vertical and horizontal cable runs.

CABLE TYPE	SIZE	TYPE OF CABLE RUN	
		HORIZONTAL	VERTICAL OR INVERTED
		NO. OF CABLES PER STITCH	
Round	Up to 1/2” Dia.	6	5
	Over 1/2” to 3/4” Dia.	5	2
	Over 3/4” to 1” in Dia.	3	1
	Over 1” in Dia.	2	1
Oval on edge	ALL	6	3
Oval on flat	ALL	10	5

CABLE SIZE OR TYPE	HORIZONTAL RUNS	
	STRANDS OF TWINE	CABLES PER STITCH
800 MCM to 400 MCM	4	2
350 MCM to 300 MCM	2	2
No. 0000 to No. 0	2	2
No. 2 to No. 6	2	2
No. 6 to No. 14	2	Any Number Up To 1" Dia

CABLE SIZE OR TYPE	VERTICAL/INVERTED RUNS	
	STRANDS OF TWINE	CABLES PER STITCH
800 MCM to 400 MCM	4	1
350 MCM to 300 MCM	4	1
No. 0000 to No. 0	2	1
No. 2 to No. 6	2	2
No. 6 to No. 14	2	Any Number Up To 1" Dia

R13-95 Cables shall be sewn at the start of a turn onto another cable rack, on corner cross strap iron support in the same manner in which they are sewn to cable rack cross straps, and at the first strap coming out of the turn.

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R13-96 All unused portions of twine shall be cut off as close as practical (approximately 1/4 to 1/2 inch) past the last stitch. Lengths of twine shall not be left hanging from equipment, cable securing brackets, cable racks, etc.

R13-97 When applicable, twine shall be spliced by forming a loop in the new twine. The old twin shall pass over the body of the loop, around the back up over itself and through the loop.. The knot is pulled tight at completion..

R13-98 When cable is to be sewn to cable racks, cable bracket, cable supports, etc., a Lock or Kansas City stitch shall be used.

R13-99 When cables are to be sewn to each other, a Chicago stitch shall be used.

R13-100 When securing cables on a ladder-type cable rack, fiber, power, or switchboard cable shall be sewn to every strap on vertical or inverted horizontal runs. The switchboard cable shall be secured to every third strap on horizontal runs.

13.12 Cable and Wire Forms

When referred to in this section, bracing is special wire sewed to cable or wire forms and fastened to the framework. When weak forms require stiffening and bracing, 16-gauge solid wire may be sewn into the form.

R13-101 Cable and wire forms shall be placed so as to allow for maintenance and inspection of apparatus and equipment.

R13-102 Cable form reinforcement and bracing shall be located and installed per the job documentation.

R13-103 Cable form bracing shall only be installed when it is provided in the job documentation.

R13-104 If cable form bracing is not provided in the job documentation, but is needed, the Installation Supplier shall contact the AT&T representative to obtain information for the approved methods.

R13-105 In no case shall cable or wire forms be pulled tightly across any edges whether they are protected or not.

R13-106 Stitches or ties used to superimpose one cable form to another cable form shall be placed at a maximum of 4-inch centers.

R13-107 Stitches or ties shall be placed at each break-out location on cable forms.

R13-108 When securing cable forms with a diameter greater than 3/8 inch to cable support brackets or framework details, two strands of sewing twine shall be used.



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R13-109 Chicago or Kansas City stitches shall be used to secure cable forms to cable support brackets or framework details when securing with twine.

13.13 Nylon Cable Ties

R13-110 Cable tie are only allowed as installed on original equipment from equipment manufactures.

R13-111 Tensioning and cutting of nylon cable ties shall be accomplished using an approved tensioning and cutting tool. The tool shall be a continuous variable tension type to accommodate variable size ties.

CAUTION: Diagonal wire cutters or cutting devices, other than the approved tool, shall not be used for cutting the ends of nylon ties since this may result in exposing hazardously sharp ends.

R13-112 The cut end of a nylon tie shall not protrude past the locking head.

R13-113 Under no circumstances shall nylon cable ties have sharp or jagged cut ends protruding from the locking head. A nylon tie is considered to have sharp or jagged ends when it is sharp to the touch.

R13-114 Nylon cable ties shall be tensioned around cable or wire forms just tight 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.

R13-115 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 tie, twist, or deform when pressure is applied to the head of the tie, then the tie has been applied too tightly.

R13-116 Nylon cable ties shall not be placed over starting stitches or other knots of twine, or over other nylon ties.

R13-117 The locking head of nylon cables ties shall be positioned so as not to interfere with the installation or removal of apparatus or equipment, or the superimposing of additional cable or wire forms.

R13-118 When securing cables with nylon cable ties, the locking head of the tie shall not appear between layers of cable, or directly over the heads of other cable ties (see Figures 13-17 and 13-18 for typical methods of securing cable to "U" and "L" type cable brackets using cable ties).

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R13-119 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 run.

R13-120 Unless otherwise specified, cable requiring protection when sewn with twine shall be similarly protected when secured by nylon cable ties.

R13-121 Nylon cable ties shall not be used as follows:

- For banding and securing of coaxial cable with soft foam type dielectrics.
- For banding/securing cable on or to ladder-type or panned basket-type cable racks.
- Banding or securing cable on cable racks.
- Banding or securing fiber optic jumpers or cables.
- Securing cable to the top cable securing bracket on equipment frames.
- Securing vertical cables to horizontal cables, or at any location where wiring and/or cable intersect.

13.14 Routing and Placement**13.14.1 General**

R13-122 The routing of cables, critical cable lengths, and classified cable segregation requirements shall be in accordance with the job documentation.

R13-123 Any blocked cable runs or cable penetrations encountered shall be reported to the appropriate AT&T representative immediately. All affected drawings shall be marked to agree. See Section 10.7.4, "Loads," for loading criteria.

R13-124 Cables shall be protected against damage at all locations where they come in contact with metal edges.

R13-125 In all cases, the minimum bending radius of cable (i.e., power, switchboard, coaxial, fiber, armored, etc.) shall not be less than the cable manufacturer's specification. Questions on the minimum bending radius of a particular cable shall be referred to the appropriate AT&T representative.

R13-126 Unless otherwise specified, cables shall be run on or in cable racks, compartments or ducts designated for the type of cable being installed, and shall follow the most direct path between the points of termination.



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R13-127 Congestion of cable racks shall be avoided. When the job documentation does not specify cable routes for the installation of large quantities of cable, the Installation Supplier shall use more than one route (when available) to avoid unnecessary cable pile-up. The following guidelines shall be applied in determining when additional routes may be required:

- When the cable pile-up has increased by approximately 2 inches.
- When approximately 225 cables, having a 7/16-inch diameter or larger (approximately) have been installed.
- When approximately 20% of the available cable space has been used.

R13-128 Storing excess cable on or in cable racks, compartments, or ducts shall be avoided. Except for the following reasons, excess cable shall not be placed on cable racks:

- 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.
- 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.
- When cable is equipped with apparatus that cannot be disconnected and reterminated in the field.

R13-129 Cable runs 100 feet or less, using cables manufactured with connectors at both ends of the cable assembly, shall not have slack exceeding 10% of the total cable run. Cable runs exceeding 100 feet shall not have more than 10 feet of slack.

R13-130 Cables manufactured without connectors at one or both ends shall have no slack.

R13-131 In case of an emergency where excessive cable length is unavoidable, the excess cable SHALL NOT be coiled on the cable rack. Excess shall be spread out over the cable rack to avoid future cable congestion or overload problems.

R13-132 Cables terminating at a distributing frame shall be routed to the distributing frame using the cross-aisle cable rack nearest the vertical or horizontal on which the cable will terminate.

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R13-133 Cable pile-up on vertical switchboard cable runs shall be limited so that it is not closer than 3 inches to the side of the cable hole. Cable pile-up on vertical power cable runs shall be limited to 7 inches.

R13-134 Cable horns shall not be used on vertical power or switchboard cable rack.

R13-135 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.

13.14.1A Cables carrying DS1/DS3 signal

R13-136 Cables carrying DS1/DS3 signals shall be separated from all power cables using the following choices

1. Cable bundling
2. Use of cable rack divider Horn Assemblies
3. Use of compartment type cable rack Horn Assemblies
4. Use of cable rack "L" brackets under cable racks
5. Build new cable racks

R13-137 When cable bundling is used, the DS1/DS3 cables must be separated from the power cables. In situations where a DS1/DS3 bundle must cross a power bundle/cable, the wire bundle that is on top shall be wrapped in fiber & secured with twine.

DS1 cables

R13-138 When specifically requested in the equipment order, cables carrying DS1 signal shall always be labeled in both ends at the cable butting point with one flag-type label. The label shall be marked at both ends with the proper source and destination. It shall contain the "Near End" information (located on upper portion of label), the "Far End" information (located on the bottom portion of the label), the FIC code, Jack #, and supplier's name.

**AT&T Generic Installation Requirements****DS3 cables**

R13-139 Cables carrying DS3 signals shall be labeled as follows using flag-type labels:

1. Individually run DS3 cables shall be labeled at both ends with the proper source and destination. The label information shall contain the "Near End" information (located on the upper portion of label), the "Far End" information (located on the bottom portion of the label), the FIC code, Jack #, and supplier's name.
2. In the case of multiple DS3 cables under one sheath, ex: 6 pack, 8 pack, etc, one label for each sheath/bundle will suffice. In these cases however the sheath must be butted by the bay upright at a point level with the cable terminations. The label must be applied at the point where the cable is butted (this is so that each individual cable is easily identified). If the cable sheath is butted anywhere else, the labels shall be applied to each individual cable. Anytime an individual cable is disconnected, it shall be labeled accordingly so that it can be reconnected properly

R13-140 Cables carrying Timing (Synchronization) & Critical Telemetry signals (NSDnet, TCP/IP, TiNet/LNSNet etc...) shall be individually labeled at both ends same as above.

Flag type labels

R13-141 Labels shall be the pressure sensitive type, use commercial grade adhesive and shall be fire retardant. The labels shall approximately 1 1/2" or less in width and have enough lines to print the information required. They shall be visible at all times.

13.14.2 Central Office Ground Cable

R13-142 Refer to the "Bonding and Grounding - Integrated Ground Plane" section of this standard for additional information on the installation, routing, and placement of Central Office Ground (CO GRD) cables.

R13-143 CO GRD cable shall be run exposed so as to afford visual inspection of the entire ground system and all connectors.

R13-144 CO GRD cables shall not share cable racks, supports, or openings with any other type of cable.

13.14.3 Power Cable and Wire

R13-145 Refer to "Power" section of this standard for additional information on the installation, routing, and placement of power cable.



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R13-146 Power cable within the office power plant, and/or between the office power plant and the power distribution equipment or network equipment, shall be run secured on dedicated power cable racks.

R13-147 Unfused battery leads and their associated return leads, such as those run between batteries and battery control boards, shall not be run on a rack with any other type of cable.

R13-148 Power cable connectors, taps, etc., shall be located at the sides or on a top layer of cables. It shall always be possible to access connectors and taps by hand to feel their temperature or condition.

R13-149 Battery and battery return shall be run as adjacent pairs.

R13-150 Power cable and wire shall be routed and terminated as specified in the job documentation.

R13-151 In general, the bending radius of power and armored cable shall not be less than the cable manufacturer's recommended minimum bend radius. Whenever possible, cable shall be on a radii larger than those recommended.

R13-152 Solderless, or pressure-type power cable taps, connectors, etc., shall be located so as to always be accessible for inspection by hand. Mechanical connectors shall not be used.

13.14.4 Synchronization Clock Timing Leads

R13-153 Synchronization cabling shall be installed with a non-braided shield and twisted pair of the gauge specified by AT&T.

R13-154 The Installation Supplier shall provide the specific color code to be used for the synchronizing cabling per AT&T requirements.

R13-155 Timing leads shall be routed per AT&T's diverse routing requirement as identified in the job specifications.

R13-156 The Installation Supplier shall wire timing leads to the specific BITS clock assignment as provided in the job specifications.

R13-157 The Installation Supplier shall cable to the side of the network element rack/bay as specified in the job specifications.

R13-158 The BITS clock shall be installed with diverse power feed.

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R13-159 The Installation Supplier shall ensure the BITS clock is installed in a bay not containing any other type of equipment, unless otherwise directed by AT&T.

13.15 Shielded and Coaxial Cable

R13-160 Shielded cable and wire shall be routed as specified in the job documentation.

R13-161 The shields of shielded cables shall be cut, positioned, and bonded to ground at one end only. The shield of the cable shall be wired at the isolated ground plane equipment end only.

R13-162 The shields of shielded cable shall be located within 1-1/2 inches of cable lead termination point or as close as possible, unless otherwise specified.

R13-163 The exposed shield and ground wire associated with shielded cable shall be protected with two half-lapped layers of electrical tape 1 inch above and below the butt location of the shield.

R13-164 When coaxial cable having a hard dielectric is secured by sewing or banding with twine, the stitches shall not be tightened so tight as to deform the cable.

R13-165 When coaxial cable with a soft foam dielectric center is secured or banded by sewing with twine, it shall be first wrapped with two layers of 1/64-inch sheet fiber protection then sewn. The securing stitch shall not be pulled so tightly so as to deform the sheet fiber or outer sheath of the cable.

R13-166 In general, the bending radius of coaxial cable shall not be less than five times the diameter of the cable. Whenever possible, cable should be bent on a radius larger than those recommended.

R13-167 Tools associated with butting, stripping, and termination of coaxial cable and connectors shall be of the type (or equivalent type) specified by the coaxial cable connector manufacturer.

R13-168 Unless otherwise specified, the connector manufacturer's specifications for preparation of cable ends and assembly of connectors shall be strictly adhered to. Dimensions for the preparation of the ends of coaxial cables are critical.

R13-169 Coaxial cable shall not be spliced.

R13-170 A lock stitch shall not be used when forming soft foam type dielectric coaxial cable bundles. When forming these cables, the bundle shall be protected and banded as described in [R13-165](#). The bands shall be placed no farther than 4 inches apart.

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R13-171 The size of the mini coaxial cable bundles shall not exceed 1 inch in diameter.

13.16 Supporting**13.16.1 General**

R13-172 All cable shall be placed and securely supported so that there is no appreciable sag or undue strain on connections, apparatus, etc.

R13-173 Cable shall not be unsupported for a distance greater than 2 feet, when measured along the shortest cable between the last point of support on a cable rack and the first point of support of a frame, rack, or other equipment, except as follows:

- 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.
- Cable entering a distributing frame from a cable rack at the top of the frame may be unsupported for distance of 3 feet.
- Vertical cables in floor openings do not require support within the opening.

R13-174 At turns or junctions of horizontal cable racks, where the turn of the cable is such that proper support of the cable is not provided by the cable rack cross straps, a 1/8 inch × 1 inch flat bar (cable rack corner strap) shall be placed diagonally across the rack. These bars shall be fastened securely to the cable rack by sewing with twine.

R13-175 Stilted up site built cable supports shall not be used.

R13-176 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 cable.

R13-177 Vertical cable runs 15 inches and wider extending through more than two floors shall be equipped with supplemental supports. Clamps shall be installed to accommodate the maximum pile-up of cable.

- 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 sewn at each alternate cable strap.
- 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.
- Clamps are not required if vertical cable runs are secured by sewing with twine at every cable rack cross strap.



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13.18.2 Power Cable

Power cable No. 00 or larger turning from one horizontal rack to another, into a frame or bay, or terminating at battery cells or battery terminating details, may be unsupported at the turn for a distance up to 3 feet.

R13-178 Power cable No. 00 and larger turning up from a horizontal to a vertical rack shall be installed on a rack having a 45-degree section at the turn. If the uninterrupted rise exceeds two floors, the cross straps in the horizontal portion of the run shall be covered with fiber insulators.

R13-179 In addition to the regular sewing, vertical power cable runs from unsecured horizontal cable runs shall be equipped with supplemental support if the vertical run passes through one or more floors.

R13-180 Uninterrupted vertical power cable runs shall be limited to three floors. If a run is going to exceed three floors, a horizontal run of at least 20 feet in length shall be introduced at intervals not exceeding three floors.

R13-181 Power cable leaving cable racks and supports and entering equipment frames shall not be unsupported for a distance greater than 2 feet for cables No. 0 and smaller, and 3 feet for cables No. 00 and larger.

13.16.3 Central Office Ground Cable

For cabling information refer to the "Bonding and Grounding-Integrated Ground Plane" section.

13.16.4 Fiber Optic Cable/Jumpers

R13-182 Unless otherwise specified, fiber optic jumpers shall be supported in protective compartments, enclosures or duct.

R13-183 Excessive slack in fiber optic jumpers shall be avoided, however, small amounts of slack shall be spread out in the fiber protection system.

R13-184 Excessive slack in fiber optic cables (riser type or other cables containing multiple fibers) shall be avoided. Cables from the Cable Entrance Facility (CEF) shall be installed from the fiber optic equipment floor to the CEF to avoid slack.

13.17 Unsecured Cable

Cables on horizontal bar type cable racks and on ladder-type cable racks equipped with screens and cable retaining brackets, including inclines up to 45 degrees, need not otherwise be secured, except where they exit the racks.



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R13-185 Where the cables turn off or exit the cable rack, the cables shall be secured by sewing with twine to other cables or to the cable rack so they are held securely in place.

R13-186 Unsecured cable shall be placed in an orderly manner and lie reasonably flat on cable racks.

R13-187 Unsecured cable shall be spread across the entire width of a cable rack and not installed in bundles or concentrated groupings, especially at cable rack turns and junctions.

R13-188 Wire run on unsecured cable racks shall be banded with 2 strands of twine approximately every 6 feet to prevent curling, drooping, or spreading and to allow wires to lay reasonably flat on the cable rack. Intermediate bands shall be applied where it appears the wire might have a tendency to not stay reasonably parallel to the cable with which they were run. In addition, bands shall also be applied at those points where wire changes direction, such as at turns or where they enter and leave the cable rack.

R13-189 Where ladder type racks are to be used for unsecured cable runs, the cable racks shall be equipped with removable cable **retaining horns and panning**.

Maximum cable pile up shall be 1" below the upper tip of the retaining horns.

Metal Panning or plastic panning may be used.

When plastic panning is used, the following requirements shall be met:

- The plastic material must meet AT&T requirements and have an oxygen index of 28% or greater as determined by ASTM Standard D 2863-77 and meet a UL 94 V-0 or better. The plastic panning must be strong enough to support cables between cable rack straps at a minimum capacity of 25 lbs. PSF. The name of the plastic panning manufacturer and part # must be permanently marked on the bottom of each plastic panning sheet at least every 5 ft.
- This marking must be visible to the auditors (facing downward through the cable rack between the straps). If the plastic manufacturer does not mark this information on the plastic panning, the Installation Vendor must do the marking.

Panning shall be omitted in the portion of a cable rack penetrating a wall.

Cable going through the penetration shall be tied at the first and last strap.

13.18 Secured Cable

13.18.1 General

R13-190 Wire shall be secured in the same manner as cable. It may be secured separately or under the same stitch with cable.



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R13-191 Wires shall be placed between cables, as far as practical, so that they will be protected by the cables with which they are secured.

R13-192 Cable or wire shall not be secured to conduit or ironwork.

13.18.2 Power Cable

R13-193 Horizontal power and armored cable smaller than No. 1/0 shall be sewn to cable racks at every cross strap.

R13-194 Horizontal power and armored cable No. 1/0 and larger shall be sewn to cable racks at alternate cross strap.

R13-195 Vertical and inverted horizontal power cable runs shall be sewn at every cable rack cross strap except as covered in [R13-176](#).

13.18.3 Coaxial and Shielded Cable

R13-196 Unless otherwise specified, coaxial, and shielded cable (i.e., twin conductor shielded, ABAM, multiple conductor shielded pair, etc.) shall be protected, supported, and secured to the same degree that is required for switchboard type cable.

R13-197 To preserve transmission characteristics, coaxial cable shall not be secured so tightly, by sewing with twine or with nylon ties (where approved), that the outer sheath is deformed.

R13-198 When coaxial cable with a soft foam dielectric center is secured or banded by sewing with twine, it shall be first wrapped with two layers of 1/64-inch sheet fiber protection then sewn. The securing stitch shall not be pulled so tightly as to deform the sheet fiber or outer sheath of the cable.

13.18.4 Horizontal Cable Runs

R13-199 All cable and wire run on horizontal cable racks without screens and cable retaining brackets, shall be secured by sewing with twine.

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R13-200 Cables on horizontal runs shall be sewn as shown:

Type	Size of Copper Wire	Sew at Strap	Number of Twine Strands	Ultimate Number of Layer	Wires per Stitch
Wire	750 MCM	Alternate	4	Any Number	2
	500 MCM	Alternate	4	Any Number	2
	400 MCM	Alternate	4	Any Number	2
	350 MCM	Alternate	2	Any Number	2
	No. 1/0	Alternate	2	Any Number	2
	No. 2	Every	2	Any Number	2
	No. 6	Every	2	Any Number	2
	No. 8	Every	2	Any Number	Any Number
	No. 14	Every	2	Any Number	Any Number

R13-201 On turns in the same plane, cables shall be sewn at cross straps adjacent to start and completion of the turn and at such intervals so as to ensure the cables retain their proper position.

R13-202 Cable shall be secured by sewing with twine to corner cross straps.

R13-203 Switchboard cable ran on cable racks without screens and cable retaining brackets shall be secured by sewing with twine every third strap.

13.18.5 Vertical Cable Runs

R13-204 Cable on vertical cable runs shall be secured by sewing with twine.

R13-205 Cables on vertical cable racks, which do not pass through more than two floors, shall be sewn to the rack at every strap.

R13-206 Cable runs that extend through more than two floors, and are equipped with supplemental supports per [R13-177](#), shall be sewn to the cable rack at alternate straps.

R13-207 On existing vertical runs, where supplemental supports are not provided, the cables shall be secured to the cable rack at every strap.

R13-208 Power cable shall have a minimum 20-foot horizontal run every three floors.

13.18.6 Spirals



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R13-209 All cable on vertical spiral or 90-degree double turn cable racks shall be secured by sewing with twine at every strap. In addition, clamps shall be placed as reinforcement at each spiral as follows:

- If the vertical run turns to a horizontal position near the ceiling of the floor below the one on which a spiral is located, the clamp shall be placed immediately above the spiral.
- If the vertical run turns to a horizontal immediately above the spiral, the clamp shall be placed below the spiral.
- If the spiral is in a straight vertical run, and it continues the distance between two or more floor lines in both directions, a clamp shall be placed above and below the spiral.
- Supplementary clamps are not required on horizontal spirals or 90-degree double turn.

13.18.7 Cable Rack to Equipment Location

R13-210 Cable entering equipment frames shall approach the framework in a manner that will not block access of future cable.

R13-211 Cable entering duct type frameworks shall approach the ducts in a manner that will not block access of future cable to the duct it enters, or an adjacent frame.

R13-212 Groups of cables shall be secured or banded as required between the cable rack, and the first support, when the distance between these points, or the fan arrangement, is such that the cables tend to spread apart and result in a poor appearance.

R13-213 Cables leaving cable racks and entering frames, racks, and other equipment, shall be secured so that there will be no appreciable sag in the cabling.

R13-214 When cable feeds into frames from two different directions, it shall be banded into two groups according to the direction from which it feeds.

R13-215 Cables shall not be unsupported except at distributing frames for a distance greater than 2' 0" measured along the shortest cable between the last support on the cable rack, and the first support on the switchboard, frame, bay, or rack.



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R13-216 All cables and wires shall be secured at the first cable support bracket of a frame or bay by sewing with twine. Unless otherwise specified, cables shall be secured to the remaining cable support brackets in the frame or bay by sewing with twine or nylon cable ties. The support brackets shall be on 12-inch centers (maximum).

R13-217 Sufficient slack shall be maintained where necessary to provide space for placing future cables in their proper location.

R13-218 When securing additional cables to a bracket that already contains secured cables, the added cables shall be secured to the bracket or a new layer of cable shall be started. If it is not possible to start a new layer due to cable build-up, the added cables may be banded with twine to previously secured cables in the vicinity of the top cable bracket.

R13-219 Where the cable butt location is between cable brackets, below the lowest bracket, or above the uppermost bracket on a frame, the cables shall be secured to the other cables (when in place) passing the butting point, thus providing additional support.

R13-220 When the cable butt is located below the lowest cable bracket in a frame or bay, it shall be allowed to have a length of 10 inches between the butt and the bracket.

R13-221 When cables are run on a frame or bay, and the cable butt location is close to a bracket or support, the cables shall be butted 1/4 inch to 1/2 inch below the bracket or support. When cable butts are located 2 inches or more from the last securing bracket or support, a stitch shall be placed approximately 1" above the butts to secure the butts together before fanning and forming.

13.20.8 Distributing Frames

Where cables enter a distributing frame from a cable rack at the top of the frame, the cables may be unsupported at the turn for a distance not exceeding 3 feet 0 inches.

R13-222 Cables shall be secured at all transverse arms on distributing frames having transverse arms on 13-inch (or greater) vertical centers.

R13-223 On distributing frames having transverse arms on less than 13-inch vertical centers, the Installation Supplier shall secure all cables at the first (top or bottom of frame) transverse arm, where cables enter the frame and at alternate arms, counting from the first arm. At other than alternate arms, secure only those cables that butt or turn off at these arms.

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R13-224 Cables that are run parallel to the transverse arms at the horizontal side of the distributing frame shall be secured as near to the turn of the cable as practical. A second tie shall be positioned midway between the butt and the turn, and a third tie positioned uniformly close to the butt. Where fanning rings or distributing rings are not used, place the third tie at the butt of the cable.

R13-225 At the horizontal side of the distributing frame where cables are run parallel to the transverse arms and where fanning rings or distributing rings are not used at the cable butts, a fiber detail, or a piece of fiber of 1/64-inch thickness, shall be placed between the cable butt and transverse arm to prevent the wires at the cable butt from coming in contact with the metalwork. The fiber detail shall be secured in place by sewing with twine or nylon cable tie (where approved).

R13-226 Wire run with distributing frame cable shall be placed between the cable and the transverse arm.

13.19 Cable Removal and Mining

R13-227 For additional information regarding cable removal and mining, the Installation Supplier shall refer to Section 20, "Workmanship Requirements - Cable Mining and Equipment Removals," of this standard.

13.20 Cable and Conductor Verification

R13-228 When more than one cable has been run to the same equipment location a single lead, from each cable and from each cable binder, shall be electrically verified prior to termination to ensure that the correct cable and/or cable binder has been selected for termination, and that it is serving the correct equipment. When large quantities of wire have been run to the same equipment location it may be applicable to electrically verify the leads prior to termination to insure correct wiring.

R13-229 All leads terminated by the Installation Supplier shall be electrically verified using a Volt-Ohm Meter (VOM) or AT&T-approved test device for continuity and correct wiring prior to the equipment being turned over to the AT&T representative.

R13-230 Lead verification shall include checking for shorts, wiring errors, and opens.

R13-231 Test equipment shall be of the proper type so as not to damage sensitive equipment. The Installation Supplier shall contact the appropriate AT&T representative if there is any question as to the type of test equipment required for lead verification.



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R13-232 Any lead-verification tests that have the potential for a service outage shall have the tests steps outlined in an approved Method of Procedure (MOP). Also coordination with AT&T may be required to ensure equipment operation.

R13-233 All trouble found during lead verification and any wiring errors shall be corrected daily.

R13-234 Lead verification test records shall indicate: the piece of equipment and/or equipment location, the circuit name and/or number, the trouble found and the corrective action taken on each trouble, and shall be turned over to the AT&T representative upon completion of the job.

**AT&T Generic Installation Requirements
14. Internet Data Centers****14. GENERIC DATA, VOICE AND VIDEO
EQUIPMENT AND WIRING INSTALLATION
REQUIREMENTS****14.1 General**

The items listed in this section are in addition or in place of items listed in other sections of this document. "Installation of equipment and interconnecting cabling will be performed by an approved Engineer, Furnish and Install (EF&I) services supplier that will follow the documented ITA process and AT&T Network Standards in accordance with the EF&I Services Supplier's General Purchase Agreement (GPA) ITA Amendment. The approved EF&I supplier will have been certified by SS&SP to install network equipment and cabling in compliance with the AT&T Network Standards defined or referenced by this document and AT&T Generic Installation Requirements. Each installation of equipment and/or cabling will be inspected by the EF&I supplier using ATT760-400-106, AT&T Checklist For Installation Quality Audits in accordance with ATT760-400-108, AT&T Network Installation Quality Audit Procedures. The SS&SP ITA and Network Standards documents are available in Documentation at: <http://sssp.atlprom.att.com/> " The following references must be closely adhered to and any disparities between this document and a Request for Quote must be approved:

ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard;
Part1: General Requirements; Addendum 1 – Minimum 4-Pair UTP and 4-Pair ScTP
Patch Cable Bend Radius

ANSI/TIA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard;
Part2: Balanced Twisted Pair Cabling Components; Addendum 1 – Transmission
Performance Specifications for 4-Pair 100 ~ Category 6 Cabling

ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard; Addendum 1 –
Additional Transmission Performance Specifications for 50/125-Micron Optical Fiber
Cables

ANSI/TIA/EIA-526-7 OFSTP 7 – Measurement of Optical Power Loss of Installed
Single-Mode Fiber Cable Plant

ANSI/TIA/EIA-526-14A OFSTP 14A – Optical Power Loss Measurements of
Installed Multimode Fiber Cable Plant

ANSI/TIA/EIA-569-A Commercial Building Standards for Telecommunication Pathways
and Spaces

ANSI/TIA/EIA-609-A Administration Standard for Commercial Telecommunication
Infrastructure

ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bounding
Requirements for Telecommunications

GR-139-CORE Generic Requirements for Central Office Coaxial Cable



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14.2 Building Requirements

See Section 2.0

Section 2.5 Not Applicable to Internet Hosting Facilities

14.3 Regulations

See section 3.0

14.4 Safety

See Section 4.0

14.5 Hazardous Materials/Waste

See Section 5.0

14.6 Job Start, In Process Completion, and Acceptance

Copper Cable Testing

R14-1 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 minimum Avaya guaranteed channel performance margins. Horizontal cable testing shall be a Channel test. The Category 6 cable runs shall be tested for conformance to the current specifications of EIA/TIA 568B Category 6 including all relevant Technical Service Bulletins. All Category 6 testing shall be performed with a Fluke DSP-4000. Any pairs not meeting the requirements of the standard and Avaya guaranteed channel performance margins shall be brought into compliance by the contractor, 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.

R14-2 A minimum of 10 per cent of the cabling will be tested and verified by the On Site Work Force or a third party vendor at AT&T's choice.

R14-3 Verification of GigaSPEED XL Performance with Fluke Networks DSP-4000 Series Testers.

R14-4 The GigaSPEED XL8 Solution utilizes 81A series cables, with the appropriate XL components as listed in the table below.

Test Configurations

**AT&T Generic Installation Requirements****Test Configuration**

R14-5 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.
Channel Configuration

Channel Confirmation

R14-6 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.
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.

R14-7 Field Testing of GigaSPEED XL Installations with the Fluke DSP-4000 Series. The Fluke DSP-4000 Series of hand held instruments have been qualified by SYSTIMAX SCS labs for verification of the Guaranteed GigaSPEED XL Channel Performance testing to the Category 6 specifications.

In order to perform accurate testing, it is important to ensure the following:

- Ensure the latest instrument software is installed in the tester.
- Calibrate the instrument according to the recommendations from the vendor.
- Select the correct interface adapters and test cords.
- Execute the correct Autotest for the configuration to be tested. Verification of GigaSPEED XL Channel Performance



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XL8 Channel Performance Specifications, dated April 9 2002. GigaSPEED XL guaranteed channel performance margins for 4-connector and 6-connector channels over the entire frequency range (1-250 MHz) are listed below:

	4- Connector Channel Guaranteed Margin	6-Connector Channel Guaranteed Margin
	GigaSPEED XL8 Solution	GigaSPEED XL8 Solution
Insertion Loss	7.5%	6.5%
NEXT	7 dB	5 dB
PSNEXT	8.5 dB	6.5 dB
ELFEXT	8 dB	6 dB
PSELFEXT	10 dB	8 dB
Return Loss	4 dB	2 dB

DSP-4000 Series Instrument Software

R14-8 It is very important to maintain the instrument software up-to-date. The most recent versions of DSP-4000 series software can be downloaded from the Fluke Networks web site at http://www.flukenetworks.com/us/Cabling/Copper+Cabling/DSP-4000+Series/_software.htm

DSP-4000 Series Calibration

R14-9 For accurate testing results, it is critical to ensure that the instrument is properly calibrated. Fluke Networks recommends a factory calibration every year, and field calibrations every 30 days. The calibration procedures are detailed in the User Manual provided with the tester and/or test adapters.

To perform a Self Calibration, follow these steps.

Connect the Main and Remote with the DSPCAL module provided.

Run the Self Calibration in SPECIAL FUNCTIONS.

Run the Self Test in SPECIAL FUNCTIONS.

Self Calibration Quick Check

After a self calibration, you can obtain an indication that the instrument is performing within specification with this simple sanity check:

Set the standard to TIA Cat 6 Channel

Run the AUTOTEST

Check the NEXT and RL margins: NEXT margin should be greater than 20 dB



AT&T Generic Installation Requirements

and RL margin should be greater than 19 dB

Channel Calibration Quick Check A quick check of instrument calibration may also be performed including channel adapters with a GS8E cord.

Quick check procedure:

Set the standard to TIA Cat 6 Channel

Run the AUTOTEST.

Check the NEXT and RL margins: NEXT margin should be greater than 15 dB and RL margin should be greater than 15 dB.

DSP-4000 series Channel Adapters: The DSP-4000 is shipped with two channel adapters. The DSP-LIA012 and DSP-LIA013 Channel Adapters have "RJ45" interfaces to connect to each end of the channel to be tested.

R14-10 For Channel performance testing, the LIA012 and LIA013 Channel adapters must be used with GS8E (modular to modular) or 119VP8-GS3 (modular to VisiPatch) cords. The Autotest selected can be either of the TIA/EIA, ISO/IEC or CENELEC Category 6 / Class E Channel Autotests. Compliance with the GigaSPEED XL guarantees is achieved by test results that show PASS for Category 6 autotest parameters and performance margin that is equal or better than the GigaSPEED XL Guaranteed Channel Margin for all relevant parameters.

R14-11 Documentation shall be provided in both hard copy and electronic copy to the designated point of contact. The designated point of contact may request only one type of format at his discretion.

Optical Fiber Cable Testing

R14-12 All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of a bi-directional

end to end OTDR trace performed per EIA/TIA 455-61 and/or a bi-directional end to end power meter test performed per EIA/TIA 455-53A. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode fibers and 1310 and 1550 for single mode fibers. These tests also include continuity checking of each fiber. Additionally, conformance to EIA/TIA 455-171 and EIA/TIA 526-14 are required.

R14-13 Intra-building testing may be limited to power meter testing, but any inter-building or other outside plant fiber-optic cabling requires OTDR testing.



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R14-14 The Contractor shall test all fiber-optic cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.

Loss Budget

R14-15 Fiber links shall have a maximum loss of: (Allowable cable loss per km)(Km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss.

R14-16 Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to AT&T.

R14-17 Documentation shall be provided in both hard copy and electronic copy to the designated point of contact. The designated point of contact may request only one type of format at his discretion.

14.7 Method Of Procedure (MOP)

See Section 7.0

14.8 Commonly Used Tools

See Section 8.0

14.9 Workmanship Requirements - General

See Section 9.0 for items not specifically covered in this section

Replace R9-13 with R14-18: There shall not be the use of tarps of any kind at anytime by installation suppliers to cover staged material in AT&T Internet Hosting space.

Replace R9-14 through R9-19 with R14-19: See AT&T Office Record Specification (AORS) for office drawing requirements.

**AT&T Generic Installation Requirements****14.10 Workmanship Requirements - Auxiliary
Framing, Bracing, and Cable Rack**

See AT&T Cable Management Standards For Common Systems –
Engineering Design Guidelines (ATTP800-006-100) for additional references.

See Section 10.0 of this document

Section 10.3 – 10.4 Not Applicable to “Non- Central Office” Construction**Replace R10-25 with R14-20: Auxiliary Framing Material and Mounting**

No materials used as Auxiliary Framing shall be attached or use the surface or structure of the MDF or IDF cages for support. Auxiliary framing shall be installed in stock lengths wherever possible to reduce the overall number of splices. Shorter lengths shall be spliced in a manner constant with the seismic zone of the location and the framing manufactures recommendations.

Section 10.5.1 – 10.5.2 Not Applicable to “Non- Central Office” Construction**Replace R10-41 with R14-21: Stanchion use requires the approval of the TC.**

Stanchions shall be secured to the concrete structural floor. When possible, locate pipe stanchions so the floor attachment holes will be covered by the base of future equipment or so they shall permit standard expansion of the cages in twelve foot by eight-foot blocks. Pipe stanchion floor flanges shall be fastened to the floor with a minimum of two 1/4-20 flat head machine screws and associated floor anchors. In seismic zones 3 & 4, four 1/4-20 flat head machine screws and associated floor anchors are required.

R14-22 All splicing of auxiliary framing material shall be done per the manufactures recommendations and specifications.

Section 10.6 Not Applicable to “Non- Central Office” Construction

Replace R10-60 with R14-52: The TC shall specify the size, type and height of the cable rack.

R14-23 AT&T in Internet Hosting Facilities permits the use of channel or tubular type cable racks. Tubular type cable racks may be used only within the MDF or IDF caged perimeter or for under floor via installations. Overhead via installations must use solid sidebar cable racks.

**R14-24 Usage of Cable Rack Horn Assemblies and Cable Rack “L” Brackets on
Horizontal Cable Racks**

Cable Rack Horn Assemblies and Cable Rack Brackets may be attached to horizontal ladder type cable racks to provide cable pile up support and/or separation.

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R14-25 Cable Rack Divider Horn Assemblies are used to divide the ladder rack into individual compartments. They should be attached to every other cross-strap at the position required to split the rack into appropriate widths.

R14-26 Cable Rack Horns are used on the side rails of any panned cable rack level. When used for this purpose, they are normally mounted on alternate straps and alternate sides of the cable rack.

R14-27 Compartment Type Cable Rack Horns may be used as required to separate various cable type such as Power, DS1/DS3 etc.... from the common cable types. When used for this purpose these horns are located on either or both sides of the cable rack at every strap. Cables located on Compartment Type Rack Horn Assemblies need to be tied with cord every other Horn Assembly. Compartment horns shall have the compartment installed into the rack. “ L “ Cable Rack brackets may be attached below ladder type cable racks to provide cable support and/or separation. These brackets are located on either or both sides of the cable rack at every strap. Cables located on Cable Rack Brackets need to be tied with cord every other Bracket Assembly. The height of the bottom portion of the “ L “ Cable Rack brackets shall be no lower than 7 ft. 2 in. from the floor. See Section 9.13.23 of this document for additional requirements for specific applications.

**14.11 Workmanship Requirements - General
Assembly, Frameworks, Units and Misc.**

See Section 11 of this document

Section 14.11.3 Equipment Framework/Cabinets

Replace R11-8 with R14-61: End guards are not required for Internet Hosting locations.

14.12 Firestopping Of Penetrations

See Section 12 of this Document

**AT&T Generic Installation Requirements****14.13 Workmanship Requirements – Cabling and Wiring**

See Section 13 of this document

R14-28 Cables carrying DS1/DS3 signal

Cables carrying DS1/DS3 signals shall be separated from all power cables using the following choices

1. Cable bundling
2. Use of cable rack divider Horn Assemblies
3. Use of compartment type cable rack Horn Assemblies
4. Use of cable rack “L” brackets under cable racks
5. Build new cable racks

When cable bundling is used, the DS1/DS3 cables must be separated from the power cables. In situations where a DS1/DS3 bundle must cross a power bundle/cable, the wire bundle that is on top shall be wrapped in fiber & secured with twine.

14.13.19 Unsecured Cable

R14-29 Where ladder type racks are to be used for unsecured cable runs, it is highly recommended that the cable racks be equipped with removable cable retaining horns and panning. Maximum cable pile up shall be 1” below the upper tip of the retaining horns. Metal Panning or plastic panning may be used. When plastic panning is used, the following requirements shall be met:

The plastic material must meet Telcordia NEBS GR63 CORE Mechanical Element requirement R4-25 under 4.2.3 i.e. have an oxygen index of 28% or greater as determined by ASTM Standard D 2863-77 and meet a UL 94 V-0 or better. The plastic panning must be strong enough to support cables between cable rack straps at a minimum capacity of 25 lbs. PSF. The name of the plastic panning manufacturer and part # must be permanently marked on the bottom of each plastic panning sheet at least every 5 ft. This marking must be visible to the auditors (facing downward through the cable rack between the straps). If the plastic manufacturer does not mark this information on the plastic panning, the Installation Vendor must do the marking. Panning shall be omitted in the portion of a cable rack penetrating a wall. Cable going through the penetration shall be tied at the first and last strap.

**AT&T Generic Installation Requirements****14.13.20 Secured Cable**

R14-30 Switchboard cable ran on cable racks without screens and cable-retaining brackets shall be secured every third strap.

14.13.23 Specific Internet Hosting Center Wiring Standards For Data, Voice and Video**Internal Network Connectivity****User Workstation Locations (including NOC areas)**

R14-31 All Low voltage cabling will conform to current EIA/TIA-568B standards, All copper cabling will be Avaya 1081A GigaSPEED XL8 or 2081A GigaSPEED XL8 plenum-rated cable, as required. The standard workstation configuration includes six cables –four cables for data and two for voice.

R14-32 All runs are to be run in a “home-run” fashion from the control room to the user workstations. All runs will originate from the patch panel(s), and run through plenum and ceiling spaces as needed. In locations where it is required by code, all runs will be enclosed in rigid EMT conduit to the end-user location. In most locations not requiring conduit, cable runs will be supported with cable tray and ladder rack.

R14-33 All Category 6 runs will terminate in Avaya MGS 400 series 8-position, 8-conductor Category 6 jacks. When terminating cable, no more than .5 inches of cable may be untwisted and the sheath will cover the cable up to the point it is untwisted. A minimum of four (4) data and two (2) voice jacks will be provided to each IDC user location at each site. Drops in locations for customer use, or for equipment monitoring may contain fewer cables.

R14-34 In sites that are large enough to require multiple wiring closets, multimode fiber-optic cable will be used to link the closets. Should the distance between closets exceed 2 kilometers (6560 feet), or if multimode fiber is inappropriate for an intended application, singlemode fiber-optic cable will be used to link the affected locations.

Horizontal Distribution System

R14-35 There will be no splicing of fiber or copper cable or repairing of damaged cable. Cable damaged in anyway during installation must be replaced at no expense to AT&T.

**AT&T Generic Installation Requirements**

R14-36 All copper cabling for horizontal distribution will be Avaya 1081A GigaSPEED XL8 4-pair Category 6 cable or 2081A GigaSPEED XL8 4-pair plenum Category 6 cable. All

four (4) pairs shall be used for a single connection. No “sheath sharing” will be allowed. Plenum-rated cabled will be used as required by standards and local codes. Category 6 copper wiring will be run from the MDF to each IDF in the data center to support all copper-based connectivity including 10/100/Gigabit Ethernet traffic, circuit extension (analog, DS0, DS1) and voice applications. All category 6 cable runs will terminate on Avaya GigaSpeed XL 1100GS3 patch panels in the MDF and the MULTIMAX patch panel in the IDF. When terminating cable, no more than .5 inches of cable may be untwisted and the sheath will cover the cable up to the point it is untwisted. Each patch panel will be supported by a Panduit WMP1 wire management unit.

R14-37 Multimode fiber-optic cabling shall be Avaya LazrSPEED 300 or 550 series 50-micron

multimode fiber-optic cable, and shall be terminated with Avaya LC connectors mounted in Avaya LSC/LST series fiber-optic shelves, unless otherwise specified. Armored fiber cable is the preferred method when fiber is placed in a shared copper cable tray. The singlemode fiber will be Avaya OptiSPEED 8.3/125m singlemode fiber. As technology develops it may be necessary to install the TeraSPEED singlemode fiber in order to take advantage of the “Extended” E-Band, 1360 nm. All singlemode fiber-optic cable will terminate on Avaya LC connectors unless specified otherwise. Where required all backbone fiber will be pulled through protective innerduct, which will be 1” or 1-1/4” with the proper rated innerduct or a light armored cable will be used.

R14-38 Coax cable from the MDF to each IDF is to be installed to extend DS3 or video Signals to a given IDF. The preferred cable is CommScope 734D C1P or Avaya 734D coaxial

cable. All coax cable is to be terminated in appropriate BNC connectors. The connectors will mount on Avaya M81BNC-B bulkheads, which are to be mounted in Avaya M1000P5 MULTIMAX modular patch panels on both ends. For DS3 connectivity both the MDF and the IDF will be mounted on the M1000P5 MULTIMAX modular patch panels or Avaya DSX3 cross-connect panels. The 24 port coax panel, in the MDF, will be configured to support 2 customers. The top row will support 1 customer and be labeled 1-12. The bottom row will support a different customer and be labeled 1-12. Port#1 will always be a transmit port. By definition, port 1 will be the transmit path from the MDF patch panel going out to the IDFs. So the cabling will run left to right with transmit first and receive second. Label the MDF patch panel on the left side, as you face it from the front, with the IDF number.



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R14-39 All cable runs will originate from the patch panel(s), in the MDF, and run through the

raised floor or overhead ladder rack or cable trays, as appropriate. All cable routing will be neat and orderly, and cables runs will not be combed but must be dressed in a neat and orderly fashion. It is the responsibility of the contractor to ensure there are no cable dives. It is not a requirement for the cable to be combed and it is the contractor's responsibility to prevent and or correct any 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. Where required cable ties must meet plenum-rating specifications. Cable ties will not be cinched so tightly as to deform the cable sheath and be at varying distances. It is recommended to buy bulk roles of Velcro and cut to appropriate length. GRC 1275 provides guidance for nylon ties.

R14-40 All jacks, connectors, and patch panels will utilize EIA/TIA T568B pin/pair assignments. Figure 1

R14-41 The contractor is responsible for Fire stopping according to AT&T ATTP 770-350-100 and local code.

R14-42 Raceways, conduit, trays, and/or ladder racking cable fill ratios, as stated by these references and the manufacturers, must be strictly adhered to.

R14-43 Verify the Cabling pathways are not located near the following types of EMI (Electromagnetic Interference)

Electrical power cabling and transformers.

Radio Frequency (RF) sources and transmitters.

Large motors and generators.

ARC welders.

X-ray equipment

Copiers



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Inter-MDF Cabling

R14-44 In any facility incorporating multiple MDFs, the following quantities of cable are to be run between the main MDF and all secondary MDFs:

200 Category 6 cables distance limitations permitting.

48 strands of LazrSPEED 50 micro multimode fiber

24 strands of OptiSPEED singlemode fiber

24 Avaya 734D or CommScope 734C1P coaxial DS3 cables

Copper

R14-45 Category 6 copper wiring will be run from any carrier to the MDF in the data center To support all copper-based circuit extension (analog, DS0, DS1) and voice applications.

R14-46 All copper wiring will be Avaya GigaSpeed XL8 1081A or 2081A 4-pair plenum Rated cable. Manufacturer's maximum pile limit (Avaya 6") shall not be exceeded.

R14-47 All runs will originate from the patch panel(s), and run through the raised floor or overhead ladder rack, as appropriate. All cable routing will be neat and orderly, and will be properly dressed with no cable dives in accordance with appropriate standards.

R14-48 All runs will terminate on Avaya M1000P5 series Category 6 patch panels on both ends. Each patch panel will be supported by a Panduit WMP1 wire management unit. Any requirements to deviate from the standard panels must have prior approval. On approval the runs may terminate on 110 blocks, BIX blocks, DSX panels or tie-wrap blocks at the carrier end, as required. Point of contact is Systems Solutions & Certification team at ssc@attens.com.

R14-49 The minimum bend radius for 4 pair unshielded twisted-pair (UTP) cable shall be 4 times the cable diameter or as specified by the cable manufacturer

R14-50 Jumpers, patch cords, cross connect cables, equipment cords, and work area cords must be stranded cable rated at Category 6 or higher and will be provided, by the contractor and tested during the Channel Link test.

R14-51 Straight thru cables are required for all applications with the exception of switch-to-switch connections. Figure 2



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R14-52 Cross Over Cable is required for switch-to-switch connection. Crossover cables are a 4-pair (8-wires) cable which means that pairs 2 and 3 on one end of the cable will be reversed on the other end. It will be wired to TIA/EIA-568-B and A standards for 10BASE-T Ethernet which determines what color wire is on each pin. The pinouts will be T568-A on one end and T568-B on the other end. See Figure 3

R14-53 Rollover cables can be used to connect a workstation or dumb terminal to the console port on the back of a router or Ethernet switch in order to be able to configure the router or switch. See Figure 4

Fiber

R14-54 Singlemode fiber will be installed from each carrier to the router row in the main MDF. The fiber will be Avaya OptiSPEED 8.3/125m singlemode fiber with a proper-rated jacket. The strand count for the fiber will be a minimum of 24 strands, but may be as higher as deemed necessary.

R14-55 All fiber-optic cable will terminate on Avaya LC connectors. It is the responsibility of the carrier to provide the proper patch cord. The fiber will originate and terminate in Avaya LSC/LST series fiber optic patch panels; will route through the raised floor or overhead ladder rack/fiber trough systems; and will be neatly routed. All backbone fiber will be pulled through protective innerduct, which will be 1" or 1-1/4" plenum-rated innerduct. An alternative to innerduct is lightly armored cable. Overhead fiber distribution within the MDF and Router Row will either be pulled through innerduct or a fiber trough system, as appropriate. No copper cable will be placed on top of fiber runs.

R14-56 The bend radius for optical fiber shall not be less than that recommended by the manufacturer. If no recommendation is known then the bend radius shall not be less than 10 times the cable diameter.

Coaxial

R14-57 AT&T will install coaxial cable to extend DS3 signals from each carrier space to the MDF. The approved cable is CommScope 734 C1P or Avaya 734D coaxial cable. All coaxial cable to be plenum rated where required by code. A minimum of twenty-four (24) cables (4 6-packs) are to be installed between each LEC IDF and the LEC cross-connect areas in the MDF(s). The connectors will mount on Avaya M81BNC-B bulkheads, which are to be mounted in Avaya M1000P5 MULTIMAX modular patch panels on both ends. For the carrier side, the cabling may mount on Avaya DSX3 cross-connect panels.



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Maximum Distances

R14-58 Distance Definition: From 'carrier's cage' handoff through IDF links to MDF to client's IDF patch panel. Distance calculations must include appropriate patch cords and cross-connects in carrier's cage, MDF and customer's cage.

R14-59 CAT-6: 90 meters or 295 feet between the MDF and IDF or from the MDF to the work area telecommunications outlets. The maximum physical length of the channel shall be 100 meters or 328 feet including equipment cable and patch cords.

R14-60 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.

R14-61 Coax: The maximum station-to-station cabling distance for Avaya 734D and Commscope 734C1P DS3 coaxial cable is 450 feet (137 meters). This distance must be calculated from the carrier's demark to the receiving customer.

R14-62 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.

MDFs

R14-63 The minimum acceptable size for an MDF will be determined by expected growth of the data center. This size is required to allow for proper mounting of the racks and cabinets, while providing adequate access to the equipment housed within the racks and cabinets as well as required cable diversity from LNS Carrier cage. Proper sizing of the MDF is necessary to accommodate growth of the entire IDC. The rows will be 8 racks wide with appropriate cable management. The equipment row will have separate copper and fiber management systems. As a minimum there will be a row for coax cable, a row for fiber cable, an equipment row, and 2 rows for Ethernet cabling. The amount of rows will be dependent on the space to be supported. See figure 4 & 5.

R14-64 Cable pathways will be established from the point(s) of entry into the room to the patch panels where cabling will terminate. The preferred method of supporting the cabling is via Cablofil wire trays and appropriate width and depth. Ladder racking may be required in some applications in current ladder racking may utilize horns for cable management.

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R14-65 MDF cable and equipment will be installed in 2 post open racks. The preferred rack is the Chatsworth 19" relay rack in a black finish. The configuration of the cable tray /ladder rack may be a system that bisects the room, may be a runway that circles the perimeter of the room, or a combination of the two, as needed. The contractor will install Chatsworth ladder rack sections in a black finish, with all appropriate support pieces necessary to ensure a strong, stable installation. Open relay racks will be secured to the overhead ladder rack by means of a Chatsworth rack-to-runway plate of appropriate size.

R14-66 Racks must be bolted down to the floor to provide added stability so that they cannot tip over. In addition, ladder rack and appropriate braces may be used to provide additional support in a raised floor.

R14-67 Although racks can butt against the wall on one side, all racks should maintain a minimum of 3-feet (36-inches) clearance at both the front and the rear to ensure access to the rack. Standard rack, wire management and cable runway products are those from Cablofil and/or Chatsworth Products, Inc., and are to be provided in a black finish.

R14-68 All racks must be supported by 2 diverse power strips. Each power strip will be run to two separate Remote Power Panels which in turn runs to two separate PDUs. The racks that support equipment requiring 208 volts will have an additional, 4 x 208 volts outlets for each rack.

R14-69 A L5-20 twistlock, 20A dedicated receptacle must be provided for each rack.

R14-70 Overhead fiber distribution within the MDF and Router Row(s) will be pulled through innerduct or a fiber trough system, as appropriate. An alternate method is to use armored cable that shares the copper trough.

IDF

R14-71 IDF terminates the cabling from the MDF in the customer cage. Each IDF will have an unpopulated MULTIMAX patch panel installed. AT&T will provide 6 cable runs of the type of media, fiber, Cat 6, and/or coax, that is requested by the customer. No media will be run to the IDF until a customer contract is in place.

R14-72 IDF equipment is to be housed in 2 or 4 post open racks. If enclosed cabinets are specified then APC or APW enclosed cabinets with locking doors and side panels will be used. Cable termination may be housed inside the same cabinets (in small installations) or in separate open relay racks.

R14-73 All Category 6 data runs will terminate on Avaya MULTIMAX patch panels. If there is a requirement for punchdown blocks local OPS Manager of the IDC will confirm with Systems Solutions and Certifications Team at ssc@attens.com. All cable requiring a 100 punchdown block will terminate on Avaya 110 punchdown blocks.

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R14-74 All fiber will be Avaya LazrSPEED 300 or 550 Series 50-micron multimode fiber-optic cable from the MDF to the IDF and will have LC type connectors.

Data Center Connectivity**External Connectivity (Entrance Facilities Metro/LEC/ILEC/CLEC/RBOC Connections)****General**

R14-75 Cages or rooms will need to be constructed to house equipment and network connectivity for AT&T LNS, as well as other service providers. These may be ILECs, CLECs, RBOCs or other carriers with a local presence. The alternate carrier cages/room need to be located adjacent to the IDC MDF to minimize any distance limitations for circuit delivery. If such a location is not possible then appropriate fiber connectivity must be engineered and provided to mitigate any distance limitations (EG: T1 and DS3, etc.).

R14-76 Connectivity to the outside world is paramount, and must be adequately protected. As such, redundant entrance facilities must be provided wherever possible. Entrance facilities must provide enough conduit space to allow multiple carriers to gain entrance to the facility, while remaining secure so that no other carrier may affect their presence. This may take the form of high-count duct banks, or more cost-effectively, AT&T may pre-pull multiple innerducts from the entrance facilities to the nearest manhole or vault. In addition, redundant routes from the entrance facilities to the LNS/LEC areas must be provided. The routes must utilize diverse paths to eliminate single points of failure. The diverse paths must be at least 50 feet apart in order to conform to AccuRing specifications. A minimum of three (3) 4-inch conduits are to be installed from a “meet-me” point (typically just inside the building, or in the manhole or vault) to the carrier space in the data center. Each conduit is to have four (4) 1-inch innerducts installed to provide secure pathways. From the LNS/LEC areas, the connections to the router row(s) must also use diverse routing to achieve redundancy.

LNS IDF to AENS MDF Diversity/Redundancy

R14-77 A minimum of Two (2) IDF bays must be located in the LNS cage to provide full and complete network (OC48 to the CBB) diversity & redundancy.

R14-78 All fiber runs for each IDF bay must maintain the minimal 10 (ten) foot separation rule. If the 10-foot separation is not possible a waiver must be requested and a risk analysis must be provided for exception consideration.



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14.15 Workmanship Requirements - Connecting

See Section 15 of this Document

Section 14.15.9 Coaxial Connecting

Replace R15-31 through R15-35 with R14-113 Testing of DS3/4 jacks and cables shall follow AT&T practice "Acceptance Testing of DS3/4 Jacks & DS3 cables Issue 2.0"

14.16 Frame Identification Code (FIC)

See Section 16 of this document

14.17 DC Power Systems, Engineering and Installation Standards

See Section 17 of this document

14.18 Grounding and Electrical Protection for AT&T Telecommunication Buildings and Equipment

Refer to Section 7.12 of ATTP 760-400-105

14.19 Grounding and Electrical Protection for AT&T Telecommunication Buildings and Equipment

Refer to Section 7.12 of ATTP 760-400-105.

14.20 Workmanship Requirements – Equipment Removals

See Section 20 of this Document

Replace R20-166 with R14-79 "Anchors shall not be removed during equipment removals unless specifically stated in the TEO. Anchors shall be removed if they become loose due to the removal effort. If they are removed due to either of the listed conditions the holes remaining in the concrete shall be filled with an appropriate material. Anchors remaining in the floor shall be made flush with the floor." Note: Anchor removal and floor condition assessment will be addressed during building space reclamation/construction by Building Engineering, and will be conducted consistent with and according to the following:

AT&T Standard; 760-200-020 Design Loads for Telephone Buildings

AT&T Standard; 760-200-021 Floor Design Load

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AT&T Standard; 760-200-040 Floor and Ceiling Anchors

AT&T Standard 760-200-100 Structural Floors for Network Equipment Buildings

Observations and testing of structural floors in Central Offices in California revealed that particular care should be exercised prior to the installation of new equipment. The following two conditions were observed:

Topping slabs - Structural floors incorporating a relatively thin (2" to 3" thick) topping slabs placed over the reinforced concrete structural slabs may not provide adequate media for equipment anchorage. Topping slabs that were placed to achieve adequate surface finish are typically un-reinforced. Over time, due to past cycles of equipment installation and removal, the topping slabs may have been perforated with numerous holes. These holes tend to accelerate the concrete deterioration when the buildings undergo movements during small but frequent earthquakes.

Lightweight concrete slabs - Structural floors constructed of lightweight concrete exhibit an increased tendency for cracking and deterioration. This can be particularly significant when these floors undergo movements during small but frequent earthquakes and the floors have been perforated by numerous holes due to equipment installation and removal.

In both of the above floor types typical equipment anchors may not be capable of developing their specified load capacities.

Prior to implementation of new projects on the above floor types, it is recommended that a qualified engineer perform a condition survey. The condition survey should provided the following:

- Establish guidelines regarding the adequacy of the structural floors to safely support the equipment loads specified during the original designs.

- Determine the need to augment standard equipment anchorage details.

The above information should be communicated to all relevant stakeholders. Reference is made to Seismic Zones Standard 760-200-026 Version 4.

14.21 Workmanship Requirements – Equipment Retired In Place

See Section 21 of this document



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14.22 Intra-Office Fiber Optic

See Section 22 of this Document

14.23 Installer Skill Level Assessment

See section 23 of this document

R14-80 The contractor 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. The contractor 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. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical and Category 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 years experience on similar cabling systems.

14.24 Workmanship Requirements - Raised Floor

See section 24 of this document

9.51 Alarm Standards Manual

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 154-103-101.

If you have any questions on the content of this Alarm Practice, please contact Robert P. Butler on (770) 483-2766, or E-Mail rpbutler@ems.att.com

14.52 Workmanship Requirements – AC Electrical

Refer to the following for requirements:

ATTP 760-400-101 Section 2.8, 6.5, 6.6

NEC 645-5, 210-7, 348-13, 350-18, 300-11

NFPA 72E Section 4.4.9).

If you have any questions on the content or references for these documents please contact Monty Cook on (858) 795-5516, or E-Mail cookml@ems.att.com

**AT&T Generic Installation Requirements****14.53 Earthquake & Disaster Bracing**

See section 53 of this document

14.54 Labeling

Naming standards encompass two separate criteria- equipment labels and horizontal cabling system, which includes cables, racks, rows, and panel.

Equipment Labeling Standard

R14-81 All equipment shall be labeled by Host name and include the DNS domain. For equipment hostname, the below naming convention will be followed. All alphabetic characters in hostnames will be in lowercase.

[md f#/id f#]-[equipment]-[identifier].[subdomain]

Examples:

Frontend Equipment

mdf1-bi8k-1.rwc1

mdf19-bi4k-1.nyc2

idf42-fi2-1.phx1

Backend Equipment

mdf1-fi12-1bk.nyc3

mdf1-fiwg-1bk.nyc3

Panel Labeling

R14-82 In all cabinets where there is more than one patch panel, the patch panels will not be incrementally labeled. The actual port will increment in numbers. For example: The top patch panel will count from 1-24; the second patch panel will start at 1 – 24, etc.

Cable Labeling Standard

R14-83 Cabling shall be labeled for maximum visibility not to exceed 12 inches from the terminal end. Single label for each cable, including 2 strand fibers.

R14-84 Cables terminating in Fiber Optic Shelf units shall be labeled inside the shelf (no labels to reside outside the shelf).

R14-85 All cables shall be labeled at each end with a description of the opposite termination assignment.



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R14-86 Labeling order shall be: Site ID, From, To. Ckt# will be the bottom of the label if required.

R14-87 Media identifiers shall be: c for copper, fs for single mode fiber, fm5 for 50 micron fiber, fm6 for 62.5 micron fiber, d for coax.

R14-88 All labeling shall be in lower case fonts.

R14-89 Link cabling shall specify distant end terminating point for both ends.

R14-90 Patch cables shall have both “to” and “from” information on both ends of the jumper.

The labeling schema from MDF to IDF will be: floor, IDF number, media type, row, rack, panel, port, i.e. 17i3.fm5.3.3.3.3

The labeling schema from IDF to MDF will be: floor, MDF number, media type, row, rack, panel, port, i.e. 2m2.d.3.3.3.3

The labeling schema from MDF to MDF will be: floor, MDF number, media type, row, rack, panel, port, i.e. 2m2.d.3.3.3.3

The labeling scheme for the MDF Infrastructure Equipment to and from the patch panel in the MDF will be: floor,mdf.device.row.rack.slot.port i.e. 17m19.bi8k2.10.13.7.23

R14-91 Labeling shall be created with a Brady label maker TLS 2200 (each IDC has a unit) and label part number PTL-32-427 or equivalent.

R14-92 Vendors are required to supply their own labeling equipment , with current software loaded, and labeling materials. Use of AT&T Labeling equipment will not be permitted. Contractors may use an equivalent labeler with prior approval from an IDC representative.

14.55 Manufacturer and Contractor Warranty

R14-93 Contractor shall provide a minimum of 3-year installation warranty that is separate from the product warranty. All cable tests must meet or exceed the manufacturers minimum guaranteed levels.

R14-94 Avaya provides a 20-year warranty and when using an Avaya certified installer the contractor must provide the Installation Certificate to the Operations Manager.

**AT&T Generic Installation Requirements****15. Workmanship Requirements - Connecting****15.1 Introduction**

This section provides Installation Suppliers with generic requirements for connecting (cable or wire) ends in a central office environment. The generic requirements discussed in this section are general in nature and are not all inclusive or an exhaustive treatment of the subject. Any problems or questions that may arise in the area of connecting should be directed to the AT&T representative.

15.2 General

R15-1 This connecting section shall be used in conjunction with requirements specified in the job documentation and the applicable AT&T standards.

R15-2 Terminations shall be free of corrosion and nonconductive materials at their mating surfaces. The mating surface shall be cleaned free of paint, lacquer and enamel, and coated with a corrosion resistant compound, and tightened to the proper torque. The mating surface shall be flat to ensure maximum sectional area contact.

R15-3 All connections shall be made in such a manner as to ensure proper electrical operation of equipment.

15.3 Skinning

R15-4 When skinning a wire, care shall be taken not to scrape or nick the metallic wire.

Skinning lengths for wire wrapped connections are:

Wire Gauge	Skinned Length	Terminal Type
24	1-1/2"	Embossed 0.009/0.010"
20-24	1-5/8"	Square, Rectangular, or Embossed
22,24	1-5/8"	Twisted, Coined, or Serrated
26-30	2"	Square, Rectangular, or Embossed
26-30	1-1/8"	0.025 Square
26	1-5/8"	0.009/0.010" Embossed

R15-5 When a soldered connection is to be made on a wire wrapped terminal, the wire shall be skinned to a length of 3/4 inch.

Soldered connections should be skinned:

- Standard terminals-----3/4 inch
- Perforated terminals-----1-1/2 inches

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R15-6 Connections shall not be made with previously wrapped leads.

R15-7 An approved wire skinning tool shall be used. The specific tool that will be used depends on the installation and the type of terminal.

15.4 Wire Wrapped Connections

R15-8 Wire wrapped connections shall be installed and removed with an approved tool. The quality of the connection is based on the proper number of turns, clearances, tolerances, and tension that the connection was made with; a turn shall begin at the point that the bare wire first contacts the connecting terminal.

R15-9 The following table indicates the proper number of turns required, and the maximum clearance between wire wrapping on a terminal.

Wire Gauge	Minimum Adjacent Turns	Minimum Number of Turns	Maximum Clearance (inches)
20	4	5	0.005
22	4	5	0.005
24	4	6	0.005
26	6	7	0.005
28	6	7	0.003
30	6	7	0.003

NOTE: Soldering is not an approved repair method for 28- and 30-gauge wire wraps.

NOTE: Insulation must be within 1/8" of terminal.

EXCEPTION: 28- and 30-gauge wire must have one full wrap of insulation before wire wrapping begins.

R15-10 Minimum clearance between wiring terminals and metal work shall be 1/32 inch.

R15-11 Minimum clearance between adjacent wiring terminals shall be 1/64 inch.

R15-12 Exposed un-insulated wire shall not exceed 1/8 inch. Examples of wire wrapping defects:

- Insufficient turns
- Excessive shiner length (at start or end of wrap)
- Separation exceeds maximum requirement
- Bulged turns
- Overlapping.

R15-13 Wire wrapping tools should be inspected visually before use. Bits and sleeves shall be inspected for excessive wear or other defects.



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R15-14 The initial 20 wire wrappings on a job should be inspected as to quality and conformance to specifications. If any discrepancy is found, the wire wrapping tool shall be inspected and any deficient part shall be replaced.

R15-15 An unacceptable wire wrapped connection must not be reterminated. It must either be soldered or re-skinned and reterminated.

15.5 Soldered Connections

R15-16 The most significant problem encountered in soldering is “cold soldering.” Every effort must be made to avoid this condition. Proper soldering technique is the primary method of avoiding this condition. Soldering shall provide a secure metallic connection between the parts soldered.

R15-17 Before soldering, a good mechanical connection must be made. This mechanical connection requires that at least 1-1/4 wire turns be made on the terminal.

R15-18 Wire terminals with holes or notches shall have those holes or notches filled with solder.

R15-19 A minimum clearance of 1/32 inch shall be maintained between a soldered connection and adjacent metal work. A minimum clearance of 1/64 inch shall be maintained between soldered connections.

R15-20 Exposed un-insulated wire shall not exceed 1/8 inch.

R15-21 All un-tinned wire or terminals shall be soldered unless otherwise specified in the job documentation.

15.6 Miscellaneous Connections

R15-22 When connecting to a No. 6 vertical bay ground lead on a frame or rack, the lead shall be connected with two or three closely wound turns of bare wire. In addition, either sewing twine or one wrap of insulated wire should be added to the ground lead wrap.

R15-23 On screw-type terminals, connect the wire with one complete turn around the screw. The wire shall go in a clockwise direction and may project 3/32 inch beyond the screw head. Two leads may be connected, if their wire gauge is 18 or smaller, by twisting the bare wires together then turning around the screw. If the wire gauge is greater than 18 then one lead is connected to the screw; the second is then soldered to the first. It should be noted that a maximum of two leads shall be connected to any one screw terminal. This type of termination is permissible if the job documentation does not specify the use of connectors. Compression lugs shall always be used with stranded wire.



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R15-24 For wire smaller than 24 gauge (e.g., 26, 28, etc.), the wire shall not be wrapped directly around the screw. The wire shall either have a terminal lug connected to its end or have its end sandwiched between two washers. This type of termination is permissible if the job documentation does not specify the use of connectors.

R15-25 When connecting stranded wire to screw type terminals, and terminal lugs are not provided, the strands shall be twisted together and soldered before wrapping around the screw terminal. This type of termination is permissible if the job documentation does not specify the use of connectors.

15.7 Disconnecting/Reconnecting

R15-26 When adding a second wire wrapped connection to a wire wrapped terminal that has a soldered connection, the added wire wraps also must be soldered.

15.8 Splicing

R15-27 In general, individual conductors of multi-conductor cable must not be spliced unless called for in the job documentation. In any case, a cable must be rerun if the number of splices required exceed 5% of the total cable conductors.

15.9 Coaxial Connecting

R15-28 Crimping sleeves shall be sized by color code.

R15-29 Only approved crimping tools that are safe and produce results in accordance with job specifications shall be used.

R15-30 The shield of coaxial cable shall be grounded in accordance with the requirements stated in Workmanship Requirements-Isolated Ground Planes.

R15-31 Testing of DS3/4 jacks and cables shall follow AT&T practice "Acceptance Testing of DS3/4 Jacks & DS3 cables Issue 2.0"

R15-32 The Installation Supplier shall verify the connector is physically locked into the mating connector after the testing and final installation.

15.10 Compression Connections

15.10.1 General

R15-33 When connecting to bus bars, the mating surface shall be flat to insure maximum cross-sectional area contact. Compression connectors shall be used.

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R15-34 Compression type connections shall adhere to the following guidelines:

- Listed compression connectors shall be assembled and installed per the job documentation, this standard, and connector manufacturer's specifications. The connector manufacturer's requirements and specifications for assembly (e.g., crimp pressure, crimp sequence, crimp tools, etc.) shall be strictly adhered to.
- If a compression connection is not properly made the connector shall be discarded and a new connector used. Re-crimping of the same connector shall not be done.
- Wire insulation shall be cut back so that, when inserted, the wire extends to the full length/depth of the connector barrel or groove. In addition, the wire end shall be cleaned and coated with a corrosion reducing agent prior to termination in the barrel of the connector.
- The space between the cable insulation and the body of the connector shall not exceed 1/16 inch. If the insulation exceeds 1/16 inch, it shall be taped but not to exceed 1/4 inch of the barrel.
- Compression shall not extend onto the tang area of a connector.
- In general, the compression connector should not be covered with heat shrink tubing or tape. If heat shrink tubing or tape is applied, it shall meet flame retardant requirements with an oxygen index of 28 or greater and only cover 1/4 inch of the barrel of a connector. Transparent heat shrink tubing is acceptable along the entire length of the crimp.

R15-35 Connectors shall be of the type and size specified in the job documentation and this standard. Only connectors that are listed by a nationally recognized testing laboratory and/or approved for use by AT&T shall be installed.

R15-36 Connectors shall be assembled and installed per the job documentation, this standard, and the connector manufacturer's documentation.

R15-37 Connection mating surfaces shall be flat and corrosion free to ensure maximum surface contact.

R15-38 Under no circumstances shall threaded pressure mechanical "C" or "H" taps be installed. The Installation Supplier shall notify the AT&T representative if threaded pressure mechanical "C" or "H" taps have been supplied as part of the job material. When threaded pressure mechanical "C" or "H" taps have been supplied as part of the job material, the AT&T representative shall see that the Installation Supplier has access to, and installs, the appropriate compression crimp type connector.

**AT&T Generic Installation Requirements**

R15-39 Plated metal contact surfaces forming surface connections shall be cleaned without the use of abrasives.

R15-40 Non-plated metal contact surfaces forming connections shall be cleaned with a fine abrasive paper then coated with a corrosion reducing compound.

R15-41 The plating on a plated connector, strap, cell post plate, etc., shall not be removed. If the core material (e.g., copper) under the plating is exposed, the connector, cell strap, cell post plate, etc., shall not be assembled or installed. The Installation Supplier shall notify the AT&T representative for resolution of the condition. A replacement shall be obtained and installed.

R15-42 Power cable connectors, taps, etc., when placed on cable racks, shall be located at the side of a bank of cables. It shall always be possible to access and view power cable connectors, taps, etc., without moving other wire or cable.

R15-43 All terminations used for grounding conductors shall be two hole compression connectors.

R15-44 Connectors shall not be mounted on top of each other (piggy back).

R15-45 When mounting space is limited on a bus bar, connectors can be mounted on opposite sides of the bus bar using the same mounting holes and hardware of the connector on the opposite side. See [R15-46](#) for exception

R15-46 A and B feeds shall not be mounted opposite each other on a bus bar unless authorized by AT&T.

15.11 Quick-Clip Connecting Slotted Beam Type

The success of a quick-clip termination depends upon the design of the terminal, the wire gauge and type of insulation, the use of the correct tool, and the technique used to insert the conductor into the slotted beams.

R15-47 Only one wire shall be engaged in each terminal.

R15-48 Textile insulated wire shall not be terminated in slotted beam terminals.

R15-49 Conductors shall not be placed on deformed terminals.

R15-50 Previously terminated wire ends shall not be reterminated. The Installation Supplier shall use new wire ends.

**AT&T Generic Installation Requirements****16. Frame Identification Code (FIC)**

**** (*Additional AT&T requirements for Telcordia GR1275 Section 16 are covered in the AT&T Frame Identification Code (FIC) Practice*) ****

These instructions are controlled by Network Standards organization and are covered under AT&T Practice ATTP 751-100-785AC.

If you have any questions on the content of this “Frame Identification Code”, please contact Keith Lanning (404) 770-517-8728, or E-Mail klanning@ems.att.com

16.1 Introduction

This section provides the Installation Supplier with generic requirements for the placement of equipment designations on equipment, frameworks, and terminal blocks used in the AT&T Central Office (CO). Equipment designations are defined to include bar coded labels, drawing references, cautions, aisle/bay numbering, etc. Equipment designations shall be placed in accordance with the requirements contained in this section and any other applicable section of this standard, and shall conform with the specific location and content information given in the job specifications, the Method of Procedure (MOP), AT&T requirements and the equipment manufacturer’s drawings and documentation.

16.2 General

The lettering may be applied via paint stamp, stencil, or by any AT&T-approved printed label maker.

R16-1 It is required that all equipment, or groupings of equipment, frameworks or AT&T required assemblies, shall be stamped, stenciled or labeled with a code or designation. If complete designation information is not provided, the Installation Supplier shall contact the AT&T representative to determine the required designation.

R16-2 Designations shall be legible, of the proper color and size and be placed at the proper location on the equipment.

R16-3 Legibility, accuracy and permanence shall be the primary considerations when applying designations.

The Installation Supplier will be instructed by a “Stenciling Note” contained in the job specification, “Material Listing,” section, or by notes/instructions contained in drawings, office or assignment records, or the MOP for a code, designation, or caution to be stamped on existing equipment or equipment being added.

R16-4 The surface to be stamped or labeled must be clean, free from oil and dust, and unimpaired. If necessary the surface shall be painted with a touch-up paint of an approved type and color.



AT&T Generic Installation Requirements

R16-5 Designations must be applied using a rubber stamp or stencil of the appropriate size or AT&T-approved label maker. Hand drawn representations of codes and designations are not acceptable. Label makers may be used when specified in the MOP and agreed to by the AT&T representative.

16.3 Color Codes

R16-6 The following color designations are the accepted practice for marking telecommunication equipment.

- BLACK stamping on LIGHT COLORED surfaces
- WHITE stamping on DARK COLORED surfaces
- VERMILION (red) stamping for DANGER notices
- YELLOW ink shall be used for caution notices.

**AT&T Generic Installation Requirements****16.4 Designation Sizes**

The Installation Supplier will use a stamping size sufficient such that the AT&T personnel will be able to read and recognize the designation.

Location of Stamping	CLEI Code	Group	Sub-Group	Functional	Numerical In Line W/Group Design	Numerical Elsewhere	Drawing Number	Code	Other
App Panels and MTG Plates Apparatus Side Common Carrier	3/8	3/8	3/16	3/16	3/8	3/16	3/16		3/8
Face of plate or panel	3/8	3/8	3/16	3/16	3/8	3/16	3/16	3/16	3/16
Face of large apparatus over 1-3/4 wide	3/8	3/8	3/16	3/16	3/8	3/16	3/16		
Face of small apparatus 1- 3/4 or less	3/16	3/16	3/16	3/16	3/16	3/16	3/16		
Cable Distribution System				3/4					
Term Side of Apparatus		3/16	3/16	3/16	3/16	3/16			
Wiring Side general		3/16	3/16	1/8	1/8	1/8			
Duct Type Frames Only		3/8	3/16	1/8	3/8	3/8	3/16	3/16	1/8
Fuse Panels Individually Mounted Fuse Front		3/16	3/16	3/16	3/16	3/16			3/8 – 1/8
Fuse Panels Individually Mounted Fuse Rear		3/16	3/16	1/8	1/8	1/8			3/8 – 1/8
Modular Fuse Block Front and Rear		1/8	1/8	1/8	1/8	1/8			3/8 – 1/8
Unit Framework	3/8	3/8	3/16		3/8	3/16	3/16	3/16	
Casing Doors Front		3/4	3/4		3/4	3/4	3/16		3/8
Casing Doors Inside							3/16		
Frame, Base or Cabinet	3/4	3/4			3/4	3/8		3/8	
End Guard									3/4
Upright/Cabinet	3/8				3/4	3/8	3/16	3/8	
Test Equipment.Both Portable and Frame Mounted						1/8	3/16		

R16-7 When it is necessary to reduce the expected size of a stamp due to insufficient space, the size will be reduced in 1/16-inch increments until the stamp will fit within the space. If the stamp size is reduced more than a total of 1/8 inch from the expected size, the Installation Supplier shall notify the AT&T representative and/or the Central Office Engineer to get their concurrence with the size reduction or to determine an alternate location for the stamp.

R16-8 When designating cable rack, the lettering height shall be as large as the height of the cable rack stringers.

**AT&T Generic Installation Requirements****16.5 Designation Location****16.5.1 General**

R16-9 Codes and designations shall be placed so that they will be readable from the “front” or “apparatus side” of equipment, frameworks, or terminal blocks. Refer to local AT&T practices for specialized stamping requirements.

R16-10 Re-used equipment shall have all old designations removed before new designations are applied.

Information regarding the location and content of expected equipment designations may be included as part of a stenciling note in the job specification. If the expected information is not found as part of the stencil note, the installer shall check:

- Job Specification —

- Job Summary
 - General Section
 - Work To Be Done By Installation Supplier
 - Installation Supplier Notes

- Office Records

- Standard Drawings

- Telephone Equipment Order (TEO).

R16-11 If the Installation Supplier is unable to determine the appropriate location and content for a designation from the specifications and drawings provided as part of the job, or from this generic requirements section, they shall contact the appropriate AT&T representative to determine the correct location.

16.5.2 Specific Designation

R16-12 Relay Rack Number: Relay racks must be identified both front and rear with the relay rack number.

If a Bay Designation Card is provided, the number shall be stamped in the center of the card and it must also be stamped on the rear base cover.

R16-13 CLEI TM Code: CLEI codes will normally be applied at the time of equipment manufacture. If the CLEI code is not on the equipment, the Installation Supplier will obtain the CLEI code from the equipment supplier and stencil, stamp or apply the CLEI label to the equipment.



AT&T Generic Installation Requirements

R16-14 Units, panels or shelves: Units, panels or shelves of equipment mounted in a relay rack or cabinet must have the unit pack or shelf number or alpha designation stamped on front and rear of the equipment.

16.5.3 Cabinets and Cabinetized Racks

R16-15 When equipment is mounted in cabinets, or cabinetized racks that have removable doors, covers, or finishing details, the designation must be stamped on both the relay rack or cabinet framework, and the doors, covers, or 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 rack or framework.

16.5.4 End Guards

R16-16 All equipment line-up switch power and transport shall have their end guards stamped, stenciled or labeled to indicate the frame identification in that line-up. The identification will be from top to bottom starting from the end guard to the distant end equipment frame.

16.5.5 Fuse Records/Books

R16-17 The Installation Supplier shall stamp all fuse record books with the appropriate bay location.

R16-18 For newly installed fuse panels, the assignment sheets must have the entries typewritten. For new or added circuits, the fuse panel assignments will be handwritten in blue or black ink. The assignment sheets will be retyped after ten entries have been added or deleted.

16.5.6 Dedicated Cable Racks

R16-19 Cable rack dedicated to the transport of power, grounding or light guide, etc., shall be designated for that purpose only. The Installation Supplier shall obtain the designation information from the AT&T representative. Frequency of stamping the designation shall be obtained from the AT&T representative.

R16-20 Some companies require a specific color code for A and B power feeds. The Installation Supplier shall obtain the color code required from the AT&T representative.

16.5.7 Cable Penetrations

R16-21 The Installation Supplier shall verify that cable penetrations, wall and floor, are designated. If no designation exists, the Installation Supplier shall obtain the correct designation information from the AT&T representative.

**AT&T Generic Installation Requirements****16.5.8 Battery Stand**

R16-22 The following information shall be designated on battery stands. All characters shall be a minimum of 1/4 inch, with the exception of the string identification, which shall be a minimum of 3/4 inch.

Stand:

Date Installed

String Identification

Stand Manufacturer and Model Number

Cell Number

Temperature reference cell (Pilot cell)

Installation Companies Name.

16.5.9 Fiber Optic Pathways

R16-23 The fiber optic cable racks/pathways shall be identified by the words "Fiber Optic Cable" or appropriate wording as required by AT&T. Some AT&T installations may require a color code scheme to be used in its cable rack/pathways.

R16-24 Cable rack/pathways identification shall be at 5-foot intervals. The designations shall be placed on both sides of the rack stringer and at the start and end of each run.

16.6 Designation Content

Information regarding the content of an expected equipment designation is normally provided as part of a stencil note in the job specification. If the expected information is not found, the installer should check the documentation listed in Section 16.5.1.

R16-25 If an Installation Supplier believes that some type of equipment designation is required, and no information was provided to the installer, the installer shall contact the appropriate AT&T representative to determine the correct designation.

16.7 Frequency of Stamping



AT&T Generic Installation Requirements

16.7.1 General

Designations will be stamped onto equipment in accordance with the information contained in the job specification, office records, or standard drawings, or other documentation provided to the installer.

The need to stamp a given designation more than once in a frame will vary depending on the type of designation. Normally, these variations will require stamping the same designation on both the front and rear of the equipment.

16.7.2 CLEI Codes

R16-26 When installing “like” equipment in a bay, the Installation Supplier shall stamp the CLEI code at the position of the first, middle, and last unit, shelf, or mounting of each contiguous group of equipment.

The minimum acceptable number of unit CLEI code appearances for a full bay of “like” equipment is three (top, middle, and last unit).

When adding “like” equipment to partially filled bays:

- Three or less units contiguous to existing equipment, stamp the CLEI code on the “added” unit that is mounted furthest from the existing equipment.
- Four or more units contiguous to existing equipment, stamp the CLEI code on the middle and last units.
- Three or less units that are not contiguous to existing equipment, stamp each new unit.
- Four or more units that are not contiguous to existing equipment, stamp first, middle, and last unit.

When installing “unlike” equipment in a bay, stamp the CLEI code at the position of each unit.

16.8 Adhesive Labels

R16-27 Certain equipment comes with adhesive labels that are to be used for equipment designation. If the equipment and the labels were ordered in the job documentation, the installer shall use them.



AT&T Generic Installation Requirements

R16-28 When using adhesive labels, it is the responsibility of the Installation Supplier to verify that the labels shall match the designation information provided in the:

- Job Specification
- Equipment Drawings
- Front Equipment Drawings.

R16-29 If the adhesive labels do not match the designation information contained in the job specifications and drawings, the installer shall discard the adhesive labels and place the equipment designation on the equipment using the stamp/ink method or place a AT&T-approved label.

16.9 Examples of Required Stamping

R16-30 The following is a list of typical designations that must be stamped on equipment. This list is not all inclusive, but rather is a list that may be used by the installer as a guide:

- All bays with the relay rack number (front and rear).
- All distributing frames with vertical and horizontal shelf numbers.
- All end guards to indicate added equipment.
- All aisle switches with a direction arrow.
- All AC outlets that provide voltages other than 120 volts.
- All fuse panel row designations.
- Fuse capacity at fuse position.
- All voltage designations on fuse panels.
- All fuse record book covers with relay rack location.
- All power service cabinets with name and number.
- “DISCONNECT AC BEFORE OPENING” on trolley coupling or end cap.
- “DANGER AUTO START” on all automatic start equipment.
- All designations associating alarm fuses with discharge fuses.



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- Frame number associated with battery discharge fuse.
- Direction of rotation on machines.
- Cable designation tags, with the far end information (fuse position, BDFB, frame and unit), on both ends of all power and ground terminations. AT&T also requires the origination information.
- All CLEI code set designations as required.
- All distributing frame terminal strips per office records.
- Tags for any power feed (battery and battery-return leads) with power bay and fuse location.
- Installation date on battery stand.
- All preferred/dedicated AC outlets with circuit identification and location.
- Bay name and number on the bay designation card.
- Office code designation as indicated in the installation specifications.
- Cable penetrations
- Cable distribution systems, e.g., cable rack and fiber protection systems.



AT&T Generic Installation Requirements

17. DC Power Systems, Engineering and Installation Standards

**** (*Additional AT&T requirements for Telcordia GR1275 Section 17 are covered in the AT&T DC Power Systems Practice*) ****

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 790-100-669. (MLID 9583)

If you have any questions on the content of this DC Power Practice, please contact Vernon Morris on (770) 946-5373, or E-Mail vmorris@ems.att.com

17.1 General

All sections of this standard should be reviewed prior to the start of power-related activities.

R17-1 All equipment and apparatus installed, removed or modified shall meet the requirements as specified in the manufacturer's installation job documentation, all detailed engineering job documentation and in this standard. The Installation Supplier shall notify the AT&T representative, in writing, of any conditions or items that do not meet requirements.

R17-2 If a conflict between requirements in the manufacturer's installation job documentation, the detailed engineering job documentation or this standard is encountered, the Installation Supplier shall contact the AT&T representative for resolution.

R17-3 The Installation Supplier shall not deviate from any of the job documentation or requirements unless the deviation is communicated to and authorized by the appropriate AT&T representative. All communication and authorization of this type shall be in writing. Refer to the "Job Start, In-Process, Completion, and Acceptance" section of this standard for additional information on the use of Job Information Memorandums for written communications.

R17-4 Upon job completion and turn-over to AT&T, the Installation Supplier shall identify in writing, using a job completion notification, any work activities that were not completed and/or any material that was not installed, removed, or modified as specified in the job documentation. Refer to the "Job Start, In-Process, Completion, and Acceptance" section of this standard for additional information.

17.2 Precautions

17.2.1 Power Equipment



AT&T Generic Installation Requirements

R17-5 The Installation Supplier shall not allow installers to work in a power room until they are familiar with power room hazards and proper work procedures.

R17-6 The safety requirements and suggestions in this section shall not be interpreted as a complete list of safety requirements for power installations. All Occupational Safety and Health Administration (OSHA) and local safety rules shall be complied with. The Installation Supplier is responsible for providing a safe working environment and insuring compliance to all applicable national and local safety and electrical codes.

R17-7 Low AC and DC voltages (less than 60 volts) are not normally considered as hazardous as high voltages, but can still cause serious injury or death. The Installation Supplier shall use tools insulated by the tool manufacturer and protective materials in the power room environment to prevent accidental shorts. It is recommended that rubber floor mats be used for personal protection from electrical shock while performing work on or near live equipment.

R17-8 Safety glasses with side shields shall be worn at all times during job activities.

R17-9 The installer shall remove all exposed metallic items, such as rings, watches, dangling keys, jewelry, etc., during all job activities in the area of power equipment and batteries.

R17-10 Metal measuring tapes shall not be used in power areas or in the vicinity of power equipment.

R17-11 The Installation Supplier shall exercise caution when working in the vicinity of equipment with rotating components. Loose clothing may become entangled in the equipment.

R17-12 When it is essential to work on live power circuitry, two persons shall be present. Both individuals shall be aware of the hazards involved, the measures required to avoid accidents, and the actions necessary in case of emergency.

R17-13 Prior to making any power connection, the Installation Supplier shall verify that the polarity of the cables to be connected is correct.

R17-14 Before establishing connections during live transitions, the installer shall verify that the voltage potential difference is less than 0.50 DC volts between the components being connected.



AT&T Generic Installation Requirements

R17-15 While work is being done on non-essential AC circuits or supply circuits of 60 volts or greater, fuses or protective devices shall be removed or switches opened to remove the voltage whenever it is practical to do so without causing a service interruption.

CAUTION: The Installation Supplier shall place a warning tag, per OSHA requirements, on fuse clips or protective devices when electrical potential is removed in order to work on the circuit. Before fuses are removed, verify that working equipment will not be affected.

R17-16 The Installation Supplier shall wrap live bus bars and cover live terminals and lugs near power equipment being worked on with dated rubber blankets/sheets.

17.3 Battery Plant

R17-17 All personnel involved in the handling and installation of batteries or cells shall be properly trained and familiar with procedures for safety and first aid, particularly eye safety.

R17-18 Shipping plugs for cells shall be firmly in place while moving or handling cells.

R17-19 Prior to charging, explosion proof vents and dust caps shall be installed on the cells.

R17-20 The installer shall follow the manufacturer's installation guidelines.

R17-21 The Installation Supplier shall provide all first aid supplies that must be on the site before the job begins. Particular attention shall be paid to EYE WASH SOLUTIONS! Portable eye drenching facilities are required.

R17-22 Installation Supplier provided protective gloves, aprons, and face shields shall be worn when acid or battery cells are being handled.

R17-23 Open flames or spark producing equipment shall be prohibited in power rooms or near battery cells. Smoking in the power room is strictly prohibited.

**AT&T Generic Installation Requirements**

R17-24 The Installation Supplier shall have a spill containment kit on site capable of absorbing the electrolyte from the largest cell in the area. These supplies shall be on hand and in close proximity to the cells being worked on or otherwise handled. This requirement shall apply from the time any new cells enter a facility through the completion of a job, including the removal of any old cells from the facility. The use of neutralizers can be dangerous and hazardous to human health. Suggested materials include, but are not limited to AT&T-approved materials:

- Absorbent (minimum two 32-gal. drums)
- Vermiculite
- Clay grease sweep (kitty litter)
- Rice hull ash
- Synthetic absorbers.

R17-25 A roll of resistant tape (e.g., all weather corrosion resistant PVC tape, or a AT&T-approved equivalent) shall be available to seal a cracked cell in an emergency.

R17-26 The procedures outlined below shall be followed in the event of a spill or breakage of a cell/battery:

- Take care of any injuries to personnel.
- Contain the spill.
- Absorb the liquid.
- Place all debris and contaminated absorbent in approved containers (plastic or plastic lined metal). Avoid making containers too heavy.
- Notify appropriate AT&T personnel (refer to the MOP).
- Do not dispose of waste without consulting with the AT&T Power Engineer and the AT&T Environmental management representative (emergency contacts must be in the MOP).

CAUTION: Lead and lead oxide are hazardous to your health when ingested or absorbed through the skin. Care shall be taken to avoid inhaling dust particles. Use an OSHA approved mask to prevent inhalation (or ingestion) of lead dust when cleaning lead and lead coated parts (i.e., posts, straps). Wash your hands regularly, especially before eating, drinking, or smoking.

**AT&T Generic Installation Requirements****17.4 Prevention of Service Interruption or Degradation**

R17-27 Prevention of service interruption or degradation shall be the joint responsibility of AT&T and the Installation Supplier. Refer to the "Method of Procedure" section in this standard for additional information.

17.5 Cable Hole/Opening Firestoppage

The Installation Supplier, when performing power installation and removal activities, is accountable for meeting all cable hole closure and firestoppage requirements outlined in the section on General Firestopping Considerations.

17.6 Equipment Protection

R17-28 The Installation Supplier shall provide protection for power panels and bus bars with insulating materials such as dated and approved rubber mats or protective sheet fiber (two layers of 1/64" or one layer of 1/32") when running cables or wires in the power area.

R17-29 When working on power boards or cabinets with metallic enclosures, the adjacent metal structures shall be protected with insulating material.

R17-30 Equipment and/or metallic objects that would be in close proximity to live bus bar(s) and having a difference in voltage potential, shall be insulated when work activities are to be performed.

R17-31 Equipment protection, i.e., fiber board, plywood, and/or insulating materials, as specified by AT&T, shall be installed when working at the rear of live power boards, bays, panels, etc.

17.7 Waterproof and Sealed Floors

R17-32 The Installation Supplier shall contact the AT&T representative before drilling into any basement floor or wall. The AT&T representative will determine whether an area has been waterproofed. In an area that has been waterproofed, the AT&T representative will determine the specific method of securing equipment to the walls or floor.

R17-33 If a floor is sealed as part of an acid containment system, any penetration of the sealed area of the floor must be provided with the same level of protection as the original coating. The products used for the patching of a sealed floor shall be approved for use by the manufacturer of the original sealant or the AT&T representative.

**AT&T Generic Installation Requirements****17.8 Assembly****17.8.1 General**

R17-34 All power equipment shall be positioned, assembled, aligned, grounded and bonded, designated, and installed as specified in the manufacturer's installation specification, job documentation and in this standard.

R17-35 All power equipment fasteners shall be tight, with no stripped threads. All power equipment fasteners shall be properly torqued when such information is provided. The Installation Supplier shall contact the AT&T representative if there are any questions or problems associated with torque specifications or procedures.

R17-36 The Installation Supplier shall refer to the section on General Assembly, Cabinets, Frameworks, Units, and Misc., and the job documentation for additional information.

R17-37 Lighting and appliance outlets shall be on separate circuits.

17.8.2 Equipment Frameworks (Frames/Bays/Cabinets/Boards)

The Installation Supplier shall review the section on General Assembly, Cabinets, Frameworks, Units, and Misc., of this standard, for additional information pertaining to equipment frameworks.

R17-38 Power equipment floor anchors shall be torqued to the floor as specified in the job documentation and in this standard.

R17-39 Normally power equipment frames shall be secured to the floor with a minimum of four anchors. The Installation Supplier shall install additional/fewer anchors when required by the job documentation and/or manufacturer's specifications. Exceptions to these requirements shall be authorized by the AT&T Representative.

R17-40 When fastening power equipment to the floor, only AT&T specified and approved anchors shall be used. Refer to Section 17.9.4, "Anchors," for additional information.

R17-41 In general, power equipment frameworks having an overall minimum depth of 23 inches or less and floor supported power boards over 7 feet high require bracing. The Installation Supplier shall refer to the section on Auxiliary Framing, Bracing, and Cable Rack, of this document and the job documentation for bracing information.

**AT&T Generic Installation Requirements**

R17-42 When determining the number and location of floor anchors in an equipment line-up that has different types of frameworks, each group of like frameworks shall be considered as a separate line-up.

R17-43 Adjacent frames shall be junctioned together as specified in the job documentation.

17.8.3 Battery Stands/Racks

R17-44 Battery stands and racks shall be installed as specified in job documentation, this standard, and the stand/rack manufacturer's specifications.

R17-45 The following shall be the minimum distances between a stand and other objects.

- Adjacent or parallel stands — 36 inches
- Double row stands and a wall — 36 inches
- Equipment or bays — 48 inches
- Walls — 36 inches. This applies to the end of a stand or a single row stand parallel to a wall.

CAUTION: If this is not possible because of space limitations contact the AT&T representative for resolution.

17.8.4 Anchors

The Installation Supplier shall refer to the section on General Assembly, Cabinets, Frameworks, Units, and Misc. (Floor Anchors).

17.8.5 Bus Bar

R17-46 Aluminum bus bar shall not be installed on new jobs.

R17-47 Bus bars shall be installed as specified in the job documentation and this standard.

R17-48 Bus bar joint, fastening and support bolts, screws, nuts, washers, clips, etc., shall be either zinc plated or copper finished.

R17-49 Bus bar runs shall be supported at 5 feet 0 inches on center, 6 feet 0 inches on center maximum.

R17-50 Bus bar runs supported by ceiling inserts, threaded rod and/or auxiliary framing channels shall be braced, both sideways and lengthwise.

**AT&T Generic Installation Requirements**

R17-51 Horizontal bus bar runs installed over passage/walking areas shall be at a minimum height of 8 feet 0 inches from the floor.

R17-52 Bus bar runs shall be run paired, on 3-inch centers, or as close as the plant equipment permits.

R17-53 Bus bar runs shall be installed at least 4 inches from metal pipes, cable racks, auxiliary framing channels, etc., with the exception of the support insulators.

R17-54 Bus bar 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 have each bus bar and its associated power cable connectors equipped with noncombustible covers.

R17-55 Bus bar interconnections shall follow the guidelines listed below:

- Bus bar and bus bar clamps shall be installed as specified in this section and the job documentation.
- Bus bar clamp bolts shall be equipped with pal nuts.

CAUTION: The installer shall verify that the regular nuts are torqued properly before applying a pal nut.

- High spots shall be removed from all electrical contact areas before assembly. If the high spot is on the contact area of a plated material, it shall not be installed. The Installation Supplier shall notify the AT&T representative for resolution if this condition is encountered.
- Sharp edges and burrs shall be removed from all surfaces.
- Plated contact surfaces shall be cleaned without using abrasives.
- Non-plated contact surfaces shall be buffed clean then coated with a corrosion reducing agent.
- Bus bars of dissimilar materials shall not be connected together, example: aluminum to copper bus bars. Should this situation occur, the Installation Supplier must contact the AT&T representative for resolution.
- A plated or unplated copper bus bar may be connected to either a plated or unplated copper bus bar.
- There shall be no new installation growth to an existing aluminum bus bar.



AT&T Generic Installation Requirements

17.8.6 Bus Bar Drop Plates, Cell Post Plates, and Cell Post

R17-56 Compression connectors shall be required at cell post plates, bus drop plates, and cell posts.

R17-57 Cell posts, straps, connectors, and plates shall be prepared, cleaned, and protected, prior to connection, as specified in Section 17.13.4.

R17-58 Bus drop and cell post plates shall be of the proper size and type, and assembled and installed per the job documentation and this standard.

R17-59 The proper size and type bolts, nuts and washers shall be installed at all connections to bus drop plates and cell post plates and cell posts per the job documentation and this standard.

R17-60 Bus drop plates shall be capable of accepting a minimum of 4 double-hole connectors horizontally in-line and fastened with 1/2-inch bolts, nuts, and washers.

R17-61 Cell post plates shall be constructed of lead plated copper, capable of accepting and supporting 4 double-hole bolt connectors and their associated cable, horizontally, or diagonally, and fastened with 1/2-inch bolts, nuts, and washers. Double hole connectors may be terminated back to back on cell post plates.

R17-62 Connections to cell posts shall be made with lead plated single hole connectors. The bolts, nuts, and washers that secure the connection shall match the diameter of the cell post hole.

R17-63 When making cell connections, the Installation Supplier shall wipe the corrosion reducing coating (applied during manufacturing) from contact surfaces and make the connection as specified in the job documentation and in this standard. The exposed surfaces (non-contact surfaces) shall not have the corrosion reducing coating wiped off.

R17-64 Connections at cell posts shall be treated with corrosion reducing coating approved by the cell manufacturer.

R17-65 The Installation Supplier shall always use washers on both sides of cell post, strap, and plate connecting bolts. In general, flat washers have one side with rounded edges and the other side has squared edges. Place washers so that the side with the rounded edges contact cell straps, posts, or plates to prevent the squared edge side from cutting into the lead plating.

R17-66 Cell post connections shall be torqued as specified by the cell manufacturer. If this torque information is not specified in the job documentation, the Installation Supplier shall contact the AT&T representative for resolution.



AT&T Generic Installation Requirements

R17-67 Cell posts, cell post plates, and cell straps shall not be drilled out for fastening or connecting purposes. Cells, plates, and straps with exposed copper shall not be installed.

17.9 Cabling

17.9.1 General

R17-68 The Installation Supplier shall refer to the "Cabling" section and the job documentation for additional information on various cabling methods, procedures, and requirements.

R17-69 Battery and battery return leads shall be run as pairs adjacent to each other and have identification tags. The far end termination shall be recorded on the tag. EXCEPTION: In AT&T installations, the "near" end termination shall be recorded also.

R17-70 Some companies require specific color codes for "A" and "B" power feeds. The Installation Supplier shall obtain the specific color code from the AT&T representative.

R17-71 A "DO NOT DISCONNECT" tag may be required by AT&T on power cables.

R17-72 The ends of power cable shall be insulated during cable running activities to protect against accidental contact with live circuits.

R17-73 All power cable shall be run and secured on dedicated power cable rack.

R17-74 Unfused battery leads and their associated return leads, such as those run between batteries and the input to the primary distribution board, shall not be run on a rack with any other type of cable.

R17-75 Non-insulated and insulated armored AC power cable shall not be installed within a cable rack containing any other insulated type cable. Separation shall be maintained by using a separate cable rack for armored [insulated or non-insulated] AC power cables, or using conduit for AC power cables, or by partitioning an existing cable rack.

Power cable that is not clearly identifiable as textile jacketed or documented as not susceptible to polymer creep [cold flow] by the cable manufacturer or a nationally recognized testing laboratory shall be protected against contact with cable brackets, cable ties, and twine. Protection is accomplished only by wrapping cables with two layers of 1/64-inch sheet fiber or one layer of 1/32-inch sheet fiber. Refer to the "Cabling" section for additional information.

**AT&T Generic Installation Requirements**

R17-76 Power cable runs must be continuous and shall not be spliced without AT&T authorization. However, H-taping for drops is permitted.

R17-77 Cables and/or wire of a calibrated length (i.e., ammeter and ammeter relay leads) shall not be cut (shortened or lengthened). The excess length shall be properly stored.

R17-78 Pile-up on vertical and horizontal power cable racks shall be limited to 7 inches. The Installation Supplier shall notify the AT&T representative in writing when the pile-up is to exceed 7 inches. Also, the office cable drawing shall be marked by the installer as blocked.

R17-79 Cables leaving cable racks shall not be unsupported for a distance greater than:

- 2 feet for No. 1/0 or smaller wire.
- 3 feet for No. 2/0 or larger wire.

R17-80 The minimum bending radius of all power cables (DC/AC) shall not exceed the manufacturer's bending radius requirements.

R17-81 When power cable is formed into turns or curves, care shall be exercised to avoid damaging the cable sheathing.

R17-82 Grounding conductors connected to battery return bars shall be equipped with ground cable destination tags. The tags shall be designated with the far end termination information (i.e., equipment frame number or location and circuit identification) and also include a "Do Not Disconnect" tag.

17.9.2 Batteries/Cells

The information addressed in **R17-86** and **R17-87** pertain to cabling from bus bar drop plates to cell post plates or cell posts and from cell post to cell post.

R17-83 Size 4/0, flexible type cable, shall be used on all sizes and types of cells. Size 350 MCM, flexible type cable, shall be used on 3500 amp-hour cells if connections are made directly to the cell posts (not to cell post plates).

R17-84 Insulation on flexible type cable shall be Underwriters' Laboratory (UL) listed, rated RHW or RHH.

R17-85 Cable runs, from bus bar drop plates to cell post plates or cell posts and from cell post to cell post, shall have a minimum of 1-inch slack between connections.

**AT&T Generic Installation Requirements**

R17-86 When installing cells that have 4 posts or 2 terminals per polarity, the same quantity of conductors, run between the cell post plates and the bus drop plates, shall be installed for inter-tier and inter-shelf connections. Table below shows the standard quantity of cables used per cell size.

Cells AMP-HOUR CAP.	Conductors Inter-Tier and Shelf		Conductors Between Bus and Plate	
420	1	4/0	1	4/0
420	2	4/0	2	4/0
840	2	4/0	2	4/0
840	4	4/0	4	4/0
1680	4	4/0	4	4/0
2525	6	4/0	6	4/0
3500	6	4/0	6	4/0
3500	4	350MCM	4	350MCM

17.10 Fusing and Overcurrent Protection

R17-87 The installer shall inspect each cabinet, switch, and fuse mounting for defects that are readily apparent. Normally this is a visual inspection for damage, defects of finish, and a check of fuse clip or switch clip alignment.

R17-88 The power source shall be disconnected whenever possible from switches, fuses, clips, or connections before they are worked on. If the voltage cannot be removed, protect adjacent equipment parts of opposite polarity with insulating materials.

R17-89 If service permits, frame or unit main fuses or protected devices and the associated alarm fuses shall be removed from the equipment bay or unit before connecting any power feeder to a live power source.

R17-90 Fuses or protective devices shall be installed as specified in the job documentation.

R17-91 Fuses or protective devices shall be of the specified type and ampacity as indicated in the job documentation.

R17-92 Fuses or protective device positions shall be designated to indicate their ampacity and the equipment served.

R17-93 Fuse ampacity designation pins shall be installed at all fuse positions provided for their use. The pins shall be color coded to match the fuse installed and located directly adjacent to the associated fuse.



AT&T Generic Installation Requirements

R17-94 Dummy fuses shall be installed at all vacant fuse positions. In addition, dummy fuses shall be installed initially when the fuse positions or panels are installed.

R17-95 All alarm pilot fuse positions shall be connected initially and tested whether or not the associated non-indicating fuse position is fused or unassigned.

R17-96 Cartridge and knife type fuses and fuse position contacts shall be cleaned and coated with a thin film of corrosion resistant compound.

R17-97 Spare fuse holder assemblies shall be secured to walls, columns, or equipment as specified in the job documentation. In addition, they shall be equipped with spare fuses of each type used in the power plant and/or equipment for which it was provided.

R17-98 When utilizing an unassigned spare position in a primary or secondary overcurrent protection distribution board, the wiring for the alarm fuse shall be verified for continuity.

R17-99 Spare fuses shall be turned over to the AT&T representative at job completion.

R17-100 Fuse record sheets, if provided as part of the job documentation, shall be inserted in fuse record books. If new fuse record sheets are provided and a fuse record book does not exist and/or was not provided, the Installation Supplier shall contact the AT&T representative for resolution. Refer to the "Workmanship Requirements - General Information" section for additional information on changes to fuse record sheets.

17.11 Connecting

17.11.1 General

R17-101 Refer to the "Connecting" section and the job documentation for additional information on various connecting methods, procedures, and requirements.

17.11.2 Live Feeders

R17-102 All work performed on a live power plant or on live equipment shall be done only at times agreed upon by the AT&T representative.



AT&T Generic Installation Requirements

17.12 Batteries

17.12.1 General

R17-103 Cells shall be positioned, assembled, aligned, connected, designated, and installed as specified in the manufacturer's specifications, job documentation and this standard.

R17-104 Cells shall be of the correct size and type as specified in the job documentation and this standard.

R17-105 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.

R17-106 Only matched cells shall be installed at the job site.

R17-107 Cells from different manufacturers shall not be placed in the same string. Cells from different manufacturers may be placed in parallel strings.

R17-108 While working on a battery string the Installation Supplier shall be grounded. Wrist straps are recommended. The wrist straps shall be connected to an appropriate ground source (e.g., battery stand, ironwork, provided ground lug).

R17-109 The Installation Supplier shall avoid working on or near any battery cell until it has been floated or kept on open circuit for at least 72 hours after the initial or boost charge is terminated.

CAUTION: Cells develop explosive gases during and after boost charging.

17.12.2 Cell Unpacking, Cleaning, and Inspection

R17-110 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. Any such defects shall be reported to the AT&T representative prior to starting the installation activity.

R17-111 When uncrating cells the Installation Supplier shall check for stains or discoloration in the packing material to locate damaged or defective cells. The Installation Supplier shall notify the appropriate AT&T representative.

R17-112 Newly received cells shall be wiped down on all sides per manufacturer's installation guidelines.



AT&T Generic Installation Requirements

R17-113 The initial cleaning process is an appropriate time to closely inspect the cells. 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 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.

17.12.3 Hardware and Accessories

R17-114 Hardware and accessories shall be of the type, size, grade, etc., specified in the manufacturer's guidelines, job documentation and this standard.

R17-115 All hardware and accessories shall be positioned, assembled, aligned, designated, and installed as specified in the job documentation and this standard.



AT&T Generic Installation Requirements

R17-116 All connection hardware (bolts, nuts, and washers) on cell post connections shall be:

- Stainless steel, grade 316 and marked 316 accordingly.
- Washer thickness shall be 1/8 inch nominally.
- The washer inside diameter shall allow the nut and bolt head to properly contact the designated surface area.
- The Installation Supplier shall use the battery manufacturer's recommended bolt sizes for post connections.
- Lead-coated copper or brass connectors can be used if available and AT&T approved.

R17-117 The recommended bolt size for cable connections at bus drop and to cell post plates is 1/2 inch. These bolts shall be SAE grade 5.

R17-118 Straps for connecting cells shall be lead plated copper.

- Nominal strap sizes by cross-sectional area:
- 1680 amp-hr or smaller — $1/8 \times 1$ inch (for use with seismic type commercial racks).
- 1680 amp-hr or smaller — $1/16 \times 1$ inch (for use with pre-divestiture type battery stands).
- Larger than 3000 amp-hr — $1/4 \times 2$ inches.

R17-119 Each cell or battery string shall be supplied with the following accessories:

- Explosion proof vents with dust caps.
- Two thermometers per string (non-mercury, with specific gravity correction scale).
- One hydrometer with holder per string (scale: 1 point/division).
- Withdrawal tube assemblies with removable caps or rubber stoppers.



AT&T Generic Installation Requirements

R17-120 Batteries shall be equipped with explosion proof vents with dust caps and shipping plugs/caps for the electrolyte draw off tubes. WHEN CHARGING CELLS OR MAKING CELL CONNECTIONS, THE EXPLOSION PROOF VENTS AND DRAW OFF TUBE SHIPPING PLUGS SHALL BE FIRMLY IN PLACE.

17.12.4 Preparation of Cell Posts, Straps, and Plates

The information addressed in **R17-123** and **R17-124** pertain to procedures for cleaning cell posts, straps, and plates prior to connection.

R17-121 The Installation Supplier shall refer to the job documentation and the 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 the AT&T representative for direction.

R17-122 Power tools shall not be used when cleaning lead plated surfaces.

R17-123 Cell posts, battery straps, lead plated lugs, and post terminal plate surfaces shall be cleaned and protected in these four basic stages:

- Removal of oil and grease.
- Removal of residual deposits.
- Removal of lead oxide.
- Application of a thin layer of corrosion reducing agent.

R17-124 The battery manufacturer's cleaning method/procedure shall be used.

17.12.5 Moving and Installing

R17-125 Cells in a string shall be matched and dated. If all cells in a string are not matched and same dated, the Installation Supplier shall refer the condition to the AT&T for resolution. When installing more than one string of cells, keep matched cells together in their strings. Cells shall be designated to indicate which string (when multiple strings are shipped to the job site) the cell belongs in.

R17-126 Explosion proof vents with dust caps and shipping plugs for electrolyte draw off tubes shall be firmly in place while moving and/or handling cells.

R17-127 A spreader shall be used at the top of the cell when lifting with belt straps. This is to prevent compressing at the top edge of the cell. Do not lift a cell by the post or by means of intercell connectors.



AT&T Generic Installation Requirements

R17-128 Cells shall be placed so that the cell plates are parallel to the stand shelves. The first and last cell shall not be positioned next to each other or side by side on a two-row stand (exception: Round Cells). A suggested arrangement on a two-tier stand is to place the number 1 cell on the bottom row and the last cell directly above it. Number the cells consecutively with number 1 at the ground end of the string.

R17-129 Before charging is started, the cell with the lowest specific gravity shall be designated as the Temperature Reference Cell (i.e., pilot cell). Place the Temperature Reference Cell on the lower shelf of the stand. Do not place the Temperature Reference Cell on the end of a stand, near a window, or near a heating/cooling vent.

R17-130 Strings of battery cells that utilize separators to inhibit motion shall have separators placed between the cells, end bracket and side rails of a stand. There shall be a nominal clearance of 1/8 inch between the sides of the cell and the stand end brackets, side rails and cell spacers. The Installation Supplier shall notify the AT&T representative if the above clearance cannot be obtained.

CAUTION: Cell separators shall meet AT&T flammability and ESD requirements.

17.12.6 Cell Charging

Sufficient ventilation is required during the charging process. Arrangements must be established prior to cell charging with AT&T for ventilation needs.

R17-131 The Installation Supplier shall post warning signs near the charging area.

R17-132 There are various methods of charging cells and cell strings. The method used shall be discussed, agreed upon and recorded in the MOP prior to job start.

R17-133 The Installation Supplier shall provide their own charging equipment with remote alarm capabilities.

**AT&T Generic Installation Requirements**

R17-134 The following information applies specifically to lead acid cells with lead calcium grids only. This information does not apply to lead antimony, gelled electrolyte cells, or valve-regulated cells. Instructions for these or other cells should come from the manufacturer.

- Cells that are less than six months old shall have 150 hours of charge at 2.50 to 2.55 volts per cell.
- For cells over six months old but less than a year, increase charge time to 225 hours.
- Under no circumstances shall cells be charged for more than 250 hours.
- Cells over one year old shall not be installed. Notify the AT&T representative if this condition is encountered.

R17-135 Explosion-proof vent caps and shipping plugs shall be firmly in place on each cell during cell charging activities.

R17-136 The following requirements shall be met prior to a battery string being turned over to AT&T. The Installation Supplier shall notify the AT&T representative if these requirements have not been met prior to job completion.

- The cell string has been connected to the plant and on float for three or more days.
- String float voltages shall average 2.17 volts per cell (cell voltage limits are 2.13 and 2.22).
- Battery charge record information shall have been measured and documented at proper intervals per the manufacturer's testing requirements.
- Job documentation (e.g., battery charge records, job specification, etc.) shall have been turned over to the AT&T representative.

R17-137 A micro-ohm or milli-volt test with appropriate load applied shall be performed per the manufacturer's requirements on battery inter-cell connections. The results shall be documented and provided to the AT&T representative prior to turnover.

R17-138 If acid is spilled on cells during the charging process, it shall be cleaned as specified by AT&T and OSHA requirements. The Installation Supplier shall contact the AT&T representative for information on the approved wipe down materials, solutions, and cleaning procedures. In an emergency, drinkable water alone may be used.



AT&T Generic Installation Requirements

R17-139 The Installation Supplier shall avoid handling cells during charge and for 72 hours after completion of charge.

17.12.7 Electrolyte

R17-140 The electrolyte level shall be at the midpoint between the upper and lower level lines. Notify the AT&T representative if the level is above the midpoint when the cells are received at the job site.

R17-141 Only distilled or deionized water shall be used when adding to the existing electrolyte. If there is a question as to which type of water is appropriate for a particular cell, the Installation Supplier shall contact the AT&T representative.

17.12.8 Charging Records

R17-142 The Installation Supplier shall utilize the battery charge record or equivalent for each battery string. Document at a minimum the voltage and specific gravity of each cell at the following intervals:

- Before charging has started.
- Once each hour until stable.
- At time of turnover.

R17-143 The Installation Supplier shall document (on the battery charge record) the time, charge current, voltage, and temperature of the pilot cell, at the following minimal intervals:

- At the start of charge.
- Once each hour until the current is stable.
- Once each day after current is stable.
- Just before charging is stopped or temporarily discontinued.
- When charging is restarted and the charge current is stable.

These are the minimum reading requirements. The Installation Supplier shall include the manufacturer's requirements.

R17-144 All Battery Charge Records shall be turned over to the AT&T representative at the completion of the job to be filed and maintained at the location of the cells.



AT&T Generic Installation Requirements

17.12.9 String Transitions

R17-145 The Installation Supplier when preparing for a string transition shall obtain from the AT&T Power Representative, the following information:

- The required battery reserve time to be maintained during string transitions.
- The Installation Supplier and the AT&T representative shall determine the sequence of events during transitioning and installation so that reserve time requirements are met.

R17-146 The Installation Supplier shall provide transition strings with enough battery capacity to meet the reserve time specified. Under no circumstances shall the battery reserve time be less than 3 hours.

R17-147 The Installation Supplier is responsible for conditioning and capacity of their transition string(s).

R17-148 The battery string shall be on a stable float charge, and not under discharge nor recharge at the time of opening the string.

R17-149 Only one string shall be taken off line at a time.

R17-150 New or transition strings shall not be connected to a battery plant when the voltage difference is more than 0.50 volts. It is preferable to raise the transition string voltage to meet the power plant voltage when it is necessary to adjust voltages to meet the requirement above. If, as an alternative, a decision is made to lower the plant voltage, it shall be done in the presence of an observer and the plant voltage shall never be lowered more than 4.0 volts on a -48 volt plant and 2.0 volts on a +24 volt plant. In all cases, the plant voltage shall be kept within the operating limits of the equipment served by the battery plant.

**AT&T Generic Installation Requirements****18. Grounding and Electrical Protection for AT&T Telecommunication Buildings and Equipment**

***** (Additional AT&T requirements for Telcordia GR1275 Section 18 are covered in the AT&T Grounding and Protection for AT&T Telecommunication Buildings and Equipment) *****

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 803-501-100 (MLID 12914).

If you have any questions on the content of this DC Power Practice, please contact Jesse F. Stearns Jr. (Frankie) on (770) 953-5522, or E-Mail fstearns@ems.att.com

18.1 Introduction

This section provides the Installation Supplier with installation generic requirements for central office bonding and grounding. Any problems that may arise in the area of central office

bonding and grounding shall be directed to the AT&T representative. The workmanship requirements in this section are general in nature and not all inclusive or an exhaustive treatment of the subject. AT&T has a stand-alone grounding document. The Installation Supplier shall verify the existence of such a document and it will supersede this section.

The reliability of a bonding and grounding system is as much dependent on careful and proper installation as it is on the proper choice of materials. Improper preparation of surfaces to be joined to make an electrical path, loose connections and corrosion can introduce impedances that can seriously impair the ability of the ground path to protect personnel and equipment.

18.2 General

R18-1 All connections to ground bars and flat metallic surfaces shall be made with listed two hole irreversible compression copper/tinned copper connectors.

R18-1A All grounding connections to bays or cabinets shall be made with a listed two hole compression copper/tinned copper connector secured by either a Phillips pan head or hex head screws equipped with external tooth star washers. The washers shall be located between the head of the screw and the upper surface of the lug. Both the screws and the washers should be made of zinc-plated steel for steel bays and bronze for aluminum bays. On nut and bolt connects the washer shall be installed between the nut and the mounting surface.

R18-1B Field mounted units/shelves equipped by the manufacturer with a grounding pigtail shall have the lead connected to the bay/cabinet framework. This connection shall be made using appropriate screw/screws and external tooth star washer/washers. Both the screws and the washers should be made of zinc-plated steel for steel bays and bronze for aluminum bays. On nut and bolt connects the washer shall be installed between the nut and the mounting surface.



AT&T Generic Installation Requirements

R18-2 Grounding conductors, by gauge, shall be electrically continuous from a larger gauge feeder to the last frame or component served by the grounding lead (e.g., 750 KCM to 500 KCM to 1/0, etc.).

R18-3 An aisle equalizer shall be limited to 50 feet. The aisle equalizer shall be installed as a single continuous length conductor for the ultimate length of the line-up.

R18-4 If installation of the aisle equalizer to the ultimate length is not possible because no support system has been installed, the extra length shall be run as far as the support structure is installed with the excess length coiled and secured to the end of the existing aisle ground support structure. If a partial line-up exists, the aisle equalizer may be extended by a crimp connection and the excess length stored as previously stated.

R18-5 Prior to connecting to an existing ground conductor (main aisle equalizer, aisle equalizer, etc.) the Installation Supplier shall verify the continuity of the existing grounding conductor back to the ground source, e.g., Central Office Ground (COG) bus. The BDFB should not be in this ground.

R18-6 Taps from an aisle equalizer to a frame can be the same gauge (e.g., 6 AWG to 6 AWG).

R18-7 Cable to cable taps shall be made with exothermic weld, or listed irreversible compression connectors.

R18-8 No aluminum conductors or connectors shall be used in any bonding and grounding system.

R18-9 Ground bars not supplied as part of a standard assembly shall be copper or tinned copper.

R18-10 Single grounding conductors shall not be run in a metallic conduit and shall not be completely encircled by metallic clamps. If it is unavoidable and a grounding conductor must be run in a metal conduit or raceway, the conduit or raceway shall be less than three feet long and be irreversibly bonded (H-Tap on conductor and exothermic weld on conduit) to the conductor at both ends with a #6 AWG stranded conductor.

**AT&T Generic Installation Requirements**

R18-11 A “DO NOT DISCONNECT” tag shall be affixed to ground conductors as near to the connection to the ground bus as possible (see Figure 18-8):

- All connections at the “Office Principal Ground Point”
- Vertical equalizer terminations
- All main aisle horizontal equalizers
- Power plant horizontal equalizers
- All isolated grounding conductors at the Central Office ground bar.

The size and type of tag shall be determined by the local AT&T representative.

R18-12 Both ends of grounding conductors shall be equipped with a destination tag recording the far end termination. The tag shall be applied within 12 inches of the termination and must be visible from the floor. When an entire ground conductor can be visually identified from end to end and not readily obscured by future installations, tags are not required.

R18-13 Single grounding conductors shall be routed in as straight a line as practicable. Changes of direction shall be taken over as wide a radius as possible with a minimum radius of 1 foot.

R18-14 All metallic items that interact electro-magnetically with CO equipment shall have their framework bonded and grounded to the CO grounding system with a minimum #6 AWG grounding conductor. Examples include switch frames, power plant frames, battery stands, storage cabinets and other metallic objects, etc. “Daisy chaining,” or frame to frame connecting of these conductors is not permitted.

R18-15 Conductors shall be routed along and secured to the side or bottom of cable racks or to the side of framing channels with supporting apparatus, etc. Grounding conductors shall never be run within a cable rack with any other types of cable or secured to AC conduit or raceways.

R18-16 Vertical and horizontal equalizer runs shall be exposed so they can be inspected visually.

R18-17 Vertical risers, when in plastic conduit, shall be supported at intervals of 5 feet or less. When the run is exposed, vertical risers shall be supported at a maximum of every 4 feet. The vertical riser, at the sleeve in the floor, shall be equipped with a fire-retardant floor chock.

R18-18 Horizontal CO ground cables shall be supported approximately every 12 inches with a maximum distance between supports not to exceed 18 inches.

R18-19 The central office ground bus shall be mounted to the wall or column at least 1 foot below the lowest level of cable rack, and shall be located within 20 feet of the vertical riser. The CO ground bus shall be stenciled “CO Ground” and indicate the column location of the vertical riser it is connected to.



AT&T Generic Installation Requirements

R18-20 All grounding conductors shall be a minimum #6 gauge stranded copper cable.

18.3 AC Distribution System Grounding

R18-21 The Installation Supplier shall conform to the most recent issue of the National Electric Code (NEC) when performing AC installations. Requirements in the NEC, state codes and local codes shall supersede the following generic requirements up to and including the use of a licensed electrician.

R18-22 If a transformer is an isolation type transformer, a grounding electrode conductor must be provided to bond the neutral conductor and metal enclosure back to the nearest CO ground bus, building steel, building service ground, and/or Office Principal Ground Point (OPGP).

R18-23 The overcurrent device for the secondary of the transformer must be located within 25 conductor feet of the transformer.

R18-24 AC neutral conductors shall be white or neutral gray or banded with tape. ACEG conductors shall be green or green with a yellow stripe painted or marked green.

R18-25 All added AC circuits, regardless of length or overcurrent device rating, shall be equipped with an equipment grounding conductor sized per the National Electrical Code (NEC Section 250).

R18-26 AC conduits and raceways shall be tightly assembled and free of insulated couplings and air gaps.

R18-27 All appliance receptacles shall be properly wired, grounded, and free of opens, shorts, and reversals (polarity).

**AT&T Generic Installation Requirements****19. Grounding and Electrical Protection for AT&T Telecommunication Buildings and Equipment**

**** *(Additional AT&T requirements for Telcordia GR1275 Section 19 are covered in the AT&T Grounding and Protection for AT&T Telecommunication Buildings and Equipment)* ****

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 803-501-100 (MLID 12914).

If you have any questions on the content of this DC Power Practice, please contact Jesse F. Stearns Jr. (Frankie) on (770) 953-5522, or E-Mail fstearns@ems.att.com

19.1 Introduction

This section provides generic requirements for installation of equipment in an isolated ground plane environment. The workmanship requirements in this section are general guidelines and are not all inclusive or an exhaustive treatment of the subject. Some AT&T has a stand-alone grounding document. The Installation Supplier shall verify if AT&T uses their own version of grounding and that will supersede this section. (For power workmanship requirements, refer to the "Power" section of this standard.)

It is recommended that the installation supplier obtain a copy of TR-NWT-000295, *Isolated Ground Planes: Definition and Application to Telephone Central Offices*, for more information.

Central office equipment, transport and switching, installed in an isolated ground plane shall conform to the requirements in this section, and to those specified by the equipment manufacturer. Any problems that may arise in the area of isolated grounding shall be directed to the AT&T representative. Care is required to preserve the integrity of the isolated ground plane at all times when installation efforts of any kind are performed on such equipment, whether working or not.

The reliability of the isolated grounding system is as much dependent on careful and proper installation as it is on the proper choice of materials. Improper preparation of surfaces to be joined to make an electrical path, as well as loose connections and corrosion, can introduce impedances that will seriously impair the ability of the ground path to protect personnel and equipment.

19.2 General

R19-1 This isolated grounding section shall be used in conjunction with requirements specified in the job documentation and the applicable AT&T requirements.

R19-2 Only two hole irreversible crimp compression connectors, (copper/plated copper), shall be used for all grounding connections.



AT&T Generic Installation Requirements

R19-3 To prevent violations between the integrated and the isolated ground plane, caution shall be exercised when installing or interfacing the following: conduit, light fixtures, cable racks, duct work, auxiliary framing, anchor bolts, and insulators.

19.3 Isolated Ground Plane Requirements

R19-4 All metallic elements and frames comprising a portion of the isolated ground plane shall be within one floor of the ground window.

R19-5 All elements of the integrated ground plane (auxiliary framing, cable rack, vent ducts, pipes, etc.) within a minimum of 6 feet of an isolated ground plane (analog or digital) shall be bonded to the Main Ground Bus (MGB) in the ground window with a minimum #6 AWG stranded copper conductor.

R19-6 Lock washers shall be used with self tapping or machine threaded nuts and bolts. Self tapping screws or bolts shall have split ring or external tooth type lock washers between the head and the connector. Nut and bolt connections shall have the washer installed between the nut and mounting surface.

R19-7 Protector frames on the same floor as the isolated ground plane shall be bonded both to the MGB in the ground window and the central office ground bar with a minimum 1/0 conductor.

R19-8 If a Main Ground Bus (MGB) bar is extended, the extension shall be bonded to the existing MGB with a 750 MCM connection. The maximum overall length of the MGB shall not exceed six feet in total length.

R19-9 The line-up framework ground conductor shall be referenced to the MGB via a #1/0 conductor.

R19-10 Isolated equipment frames shall have a minimum insulation resistance of 100,000 ohms to the integrated ground plane.

R19-11 Contact surfaces shall be cleaned so that direct metal to metal contact is made. A minimum of 1/16-inch perimeter larger than the contact surface shall be cleaned. Nonconductive coatings (such as paint, lacquer and enamel) on equipment to be grounded shall be removed to assure good electrical continuity.

R19-12 To the greatest extent practicable, contact surfaces shall be flat to ensure maximum cross-sectional area contact.

R19-13 All grounding material shall be made of copper/tinned copper.

**AT&T Generic Installation Requirements**

R19-14 Each frame, except the Power Distribution Cabinet (PDC) located within the isolated ground plane, shall be bonded to its line-up's framework grounding conductor with a #6 AWG stranded copper conductor.

R19-15 Prior to connecting to an existing ground conductor (main aisle equalizer, aisle equalizer, etc.) the Installation Supplier shall verify the continuity of the existing grounding conductor back to the ground source, e.g., Main Ground Bus (MGB) or collection bar.

R19-16 Each PDC shall be referenced to the MGB with a minimum #1/0 conductor.

R19-17 All required frame/cabinet base isolation bushings, studs, nuts, washers, lockwashers, etc., shall be installed properly to maintain the isolation integrity of the frame/cabinet from the building integrated ground plane.

R19-18 All conduits and/or raceways entering the isolated ground plane shall be routed through the ground window and bonded to the MGB with a minimum #6 AWG conductor, not to exceed three feet in length.

R19-19 The Alternating Current Equipment Grounding (ACEG) conductor, shall be bonded to MGB with a #6 AWG conductor used to bond the conduit to the MGB.

R19-20 All conduits entering the isolated ground plane shall be insulated from integrated ground plane components with two wraps of 1/64-inch sheet fiber, 1 inch before and after points of support after passing through the ground window.

R19-21 The ACEG wire entering any receptacle in an isolated ground plane equipment frame or cabinet shall be connected to a ground screw at the back of the receptacle box as well as the ground terminal on the receptacle.

NOTE: Only one wire per screw is permitted.

CAUTION: Isolated receptacles with an isolation symbol stamped on them shall not be installed!

R19-22 All equipment, such as printers, terminals, stand alone units, etc., that are metallically connected to the isolated ground plane equipment shall be:

- Insulated from contact with integrated ground plane members.
- Powered from sources within the isolated ground plane or AC power that has been routed through and bonded to the MGB.

R19-23 Metallic shields that enclose wires shall be grounded at the isolated ground plane equipment end only. Shielded cable used for composite clock/timing distribution shall be grounded at the timing source. The ungrounded end shall be taped to prevent accidental grounding.



AT&T Generic Installation Requirements

R19-24 The maximum distance from the Vertical Equalizer (Central Office Ground [COG]) to the further most point of the isolated ground plane shall not exceed 100-feet straight line distance. The Vertical Equalizer shall not be further than 200-conductor feet from the furthest frame in the isolated ground plane.

**AT&T Generic Installation Requirements****20. Workmanship Requirements - Equipment Removals****20.1 Introduction**

This section provides generic workmanship requirements for cable mining and equipment removal activities (removal activity), and are intended to be used in conjunction with the job documentation and the applicable sections of this standard. The workmanship requirements in this section are general guidelines and are not all inclusive or an exhaustive treatment of the subject.

20.2 General

The safety precautions and equipment protection information in this section are not intended to be all inclusive. Additional items, conditions, local issues, etc., may need to be discussed and agreed upon prior to the start of the removal activity.

R20-1 The appropriate section(s) of this standard shall be reviewed prior to the start of the removal activity. Special attention shall be given to the following sections:

Section	Title
2	Building Requirements
3	Regulations
4	Safety
5	Hazardous Materials/Waste
7	Prevention of Service Interruption or Degradation Method of Procedure (MOP)
8	Tools
9	Workmanship Requirements - General Information
12	Workmanship Requirements – Firestopping

R20-2 Prior to the start of any installation/removal activity the Installation Supplier must prepare a Method of Procedure (MOP). **THERE SHALL BE NO EXCEPTIONS.** This is to help insure the safety of AT&T and the Installation Supplier's employees, the security of the premises, and the integrity of services and equipment. The person preparing the MOP must be knowledgeable and experienced in the work activity addressed in the MOP.

R20-3 Unless otherwise specified, the Installation Supplier shall utilize the Job Information Memo (JIM) (or equivalent), as specified in this standard, for required written responses to the AT&T representative.

R20-4 All equipment remaining in the removal area, and associated with the removal activity, shall meet requirements as specified in the job documentation and this standard.



AT&T Generic Installation Requirements

R20-5 All designations associated with removed equipment, shall be removed from the equipment remaining in an office. This includes but is not limited to distributing frames, end guards, fuse and power-board assignments, and DSX panels. The designation shall be re-stenciled or new card designations replaced to bring the identification into compliance with the office configuration and the job specification.

R20-6 An inspection of the facilities and equipment shall be made by the Installation Supplier and the AT&T representative prior to the start of the removal activity. The purpose of the joint inspection is to disclose any potential hazards that may jeopardize personnel safety and/or equipment operation and maintenance. In addition, this inspection shall identify any unusual work conditions, additional work effort, and/or additional or unique material items that may need to be addressed due to existing office conditions.

R20-7 The pathway(s) used for bringing in or removing material or equipment and the removal of the scrap materials shall be established before the start of the work and be agreed to and detailed in the MOP.

R20-8 The Installation Supplier shall notify the AT&T representative immediately (within 24 hours), in writing, if additional material or work effort is required to complete any removal activity that was not anticipated in the requirements specified in the job documentation and/or this standard.

R20-9 Before job completion and/or turn over to AT&T, the Installation Supplier shall identify in writing, using the Job Information Memorandum or Job Completion Report, any work activities that were not completed and/or any material that was not installed, removed, or modified as specified in the job documentation and this standard. Refer to Section 6 of this standard for more information.

20.3 Job Coordination and Documentation

At the request of the AT&T representative, the Installation Supplier may be required to participate in several job related meetings, such as Contact Meetings, Installation/Removal Planning Meetings, Quality Review Meetings, etc. The purpose of these meetings may be, but is not limited to, such items as reviewing job documentation, reviewing the job schedule, identification of AT&T and Installation Supplier responsibilities, review and approval of MOPs, reporting of job progress, resolution of quality deficiencies, and the completion of required forms, etc. The Installation Supplier shall refer to Sections 6 and 7 of this standard for detailed information.

R20-10 At the completion of the removal activity the Installation Supplier shall provide, to the appropriate AT&T representative, all job documentation furnished for the removal activity.

**AT&T Generic Installation Requirements****20.4 Hazardous Material/Waste**

Prior to the equipment being removed from the site, AT&T is responsible for identifying all the known hazardous material from the equipment being scrapped. AT&T shall adhere to the guidelines and procedures as documented in their Hazardous Material/Waste Management Handbook. The AT&T representative shall obtain the names of hazardous material/waste contractors who have been pre-qualified to handle hazardous waste.

R20-11 The Installation Supplier must contact the AT&T representative if it becomes known to the supplier that hazardous material exists in the equipment being scrapped.

R20-12 For additional information on hazardous material/waste, the Installation Supplier shall refer to Section 5, "Hazardous Material/Waste," of this standard. Some examples of potentially hazardous materials and their central office sources are shown in Table 20-1.

Potentially Hazardous Material	Central Office Source
Lead	Batteries, Lead sheathed cable
Acids	Batteries
Mercury	Switches, Relays, Tubes
Radium Bromide	Tubes
Krypton	Tubes
Polychlorinated Biphenyls (PCBs)	Capacitors, Fluorescent Light Ballast, Transformers
Solvents and Cleaners	Storage Cabinets
Asbestos	Power Plants, Exhaust Stacks, Diesels, Heating and Plumbing Duct Work, Sprayed on Fireproofing, Line Cards resistors, Floor Tiles

20.5 Scrap Material Segregation and Disposition**20.5.1 General**

R20-13 The Installation Supplier shall contact the AT&T representative for direction or resolution of any questions pertaining to scrap material segregation, scrap material classification, scrap material packaging, weighing of scrap material, coordination of disposition, required receipts, etc.

R20-14 The Installation Supplier shall contact the appropriate AT&T representative for direction on the required signatures on receipts, certificates, seals, bills of lading, etc.



AT&T Generic Installation Requirements

R20-15 The Installation Supplier shall obtain and pay for all applicable permits, as required, for the installation of platforms, ramps, etc., and the blocking of parking spots to load scrap material into trucks and/or trailers.

20.5.2 Disposition

The AT&T representative will provide the Installation Supplier with the appropriate Disposal of Telephone Company Owned Material Form(s).

R20-16 The Installation Supplier is responsible for completing all entries appropriate for the Installation Supplier regarding the equipment, circuit packs, tools, and test equipment, etc., and returning the form to the responsible AT&T representative at the job finish.

R20-17 Required scrap segregation shall be maintained during packaging and disposition.

R20-18 Packaging requirements (if any) shall be specified in the MOP or the job documentation.

R20-19 Adequate steps shall be taken to avoid pilferage of high value scrap material.

R20-20 The Installation Supplier shall coordinate with the trucking, hauling, or scrap company specified in the job documentation for disposition of the scrap material.

R20-21 Scrap material shall be weighed on a public scale.

R20-22 Except under specific written authorization from the AT&T representative, scrap material disposed of locally on a weight basis shall not be weighed solely on the scrap dealer's scale.

R20-23 Unless otherwise specified by the AT&T representative, the Installation Supplier shall:

- Observe that truck loads of material arrive at public scales intact.
- Certify the unloaded weight of the truck and the weight of the scrap material.
- Assure that the weight certificates for material sold locally on a weight basis are signed by the scrap dealer or representative.
- Assure that the weight of the material shipped is shown on all copies of the shipping ticket, including the one that accompanies the material.



AT&T Generic Installation Requirements

20.6 Office Drawings and Records

Refer to Workmanship Requirements - General Information, Office Drawings and Records for detailed information on drawings and records. Refer to Section 9.5 for specifics on office drawings and records.

20.7 Prevention of Service Interruption or Degradation

Prevention of service interruption or degradation is the joint responsibility of the AT&T and the Installation Supplier. For additional information on prevention of service interruption or degradation and reporting of outages refer to the job documentation, the MOP, and Section 7 of this standard.

The following items will help reduce the possibility of service interruption during the removal activity. This list is not intended to be all inclusive; more items may be necessary to effectively reduce the possibility of service interruption.

- Full and continued cooperation, between the Installation Supplier and AT&T, prior to and during the removal activity.
- Complete discussion and understanding of the removal activities.
- Identification of AT&T and Installation Supplier's responsibilities.
- Utilization of a job plan and approved detailed MOP(s).
- Identification and approval (in the MOP) of the tools and processes to be used during the removal activity.
- Identification of live equipment, cables, or cable loops that may be within the removal area.
- Protection of working equipment in the vicinity of the removal activity.
- Identification or marking of equipment to be removed.
- Identification of when and how working equipment may be taken out of service.
- Identification of who will be taking working equipment out of service.
- Determination of whether a change in working hours is required for high-risk work operations.

R20-24 No cable shall be removed by pulling or dragging the cable, via mechanical or other means, along the cable rack. Cable shall be un-stitched, separated, and disentangled from the existing cable bundle and then draped over the cable rack stringer and cut, with ring cutters, while hanging below the cable rack.



AT&T Generic Installation Requirements

R20-25 Armored cable can cause serious damage to other cable and has been the cause of central office fires during cable mining jobs. Armored cable is a potential grounding path especially during the removal process. Exercise care when armored cable is being removed from the cable rack. Armored cable shall be un-stitched, lifted, separated, and disentangled from other cables carefully for no greater than 6-foot increments. The armored cable shall be carefully placed over the cable rack stringer and cut off the rack with ring cutters.

R20-26 Armored cable shall not be pulled from the cable rack.

R20-27 Caution shall be observed when removing metallic clamps or clips to prevent them from cutting live cable or falling into working equipment.

R20-28 Power or switchboard cable not removed shall have their free ends insulated per local AT&T requirements.

20.8 Equipment Protection

R20-29 The Installation Supplier shall provide adequate protection, as agreed to in the MOP, for working equipment and AT&T facilities in the vicinity of the removal activity.

R20-30 The following examples of equipment protection shall be viewed as examples only. These are not the only cases where protection is required. These examples are:

- Static resistant and fire-retardant materials shall be used to protect working equipment from dust and debris.
- Temporary walls or partitions may be required to protect sensitive working equipment.
- Use of pipe stanchions for temporary support of auxiliary framing.

R20-31 The Installation Supplier shall remove any debris and vacuum all cable racks affected by the removal/mining process prior to starting the removal job using a AT&T-approved HEPA vacuum and as documented in the MOP.

R20-32 The Installation Supplier shall not disable or block the operation of fire/smoke or other environmental controls or detectors.

R20-33 At the completion of the removal activity, all associated equipment protection shall be removed.

R20-34 All materials used for equipment protection shall be either noncombustible or treated with a AT&T-approved fire-retardant material.



AT&T Generic Installation Requirements

R20-35 AT&T-approved fiber board or plywood shall be placed at all building and equipment locations that are at risk of being damaged due to removal activities. The Installation Supplier shall contact the AT&T representative if there is a question as to the type or extent of protection required. See Section 2, "Building Requirements," for detailed information.

20.9 Safety

R20-36 For additional information on safety, the Installation Supplier shall refer to the job documentation and Section 4, "Safety," of this standard. Additional safety precautions associated with specific removal activities are listed in the appropriate paragraphs of this section.

R20-37 The Installation Supplier shall ensure its employees adhere to federal, state, and local Occupational Health and Safety Administration (OSHA), and AT&T regulations and requirements governing personnel safety while on AT&T premises.

R20-38 The Installation Supplier shall be responsible for providing the necessary safety precautionary supplies/tools to ensure a safe working environment for all personnel in the removal area. Supplies/tools may include but not be limited to safety cones, signs, caution tape, safety glasses, goggles, fall protection harnesses, gloves, etc.

20.10 Cable Hole/Opening Firestoppage

For detailed information on firestopping materials, firestopping procedures, and firestopping requirements, refer to the job documentation and Section 12, "Workmanship Requirements - General Firestopping Considerations," of this standard.

20.11 Tools and Supplies

20.11.1 General

R20-39 The Installation Supplier shall observe all federal, state, and local laws, regulations and codes associated with the use and maintenance of tools, equipment, and supplies used for the removal activity.

R20-40 The Installation Supplier shall review Section 8, "Commonly Used Tools," of this standard, for detailed information on tools.

R20-41 The Installation Supplier shall identify and detail the intended use of any heavy equipment or demolition devices in an approved MOP.

20.11.2 Cable Cutters, Portable Ladders, and Scaffolds

The Installation Supplier shall review Section 8, "Tools," for detailed information on cable cutters, portable ladders, and scaffolds.



AT&T Generic Installation Requirements

20.11.3 Hoisting Centers

R20-42 The location of hoisting centers and the hoisting procedures to be used for the removal activity shall be outlined in the MOP and be approved by the appropriate AT&T representative.

R20-43 Hoisting equipment and the associated rigging shall be in good working condition and of the proper size, capacity, and type for the equipment that is to be hoisted.

R20-44 Hoisting equipment shall not be left unattended while supporting a load.

20.11.4 Scrap Material Bins and Containers

R20-45 The conditions, environment, and type of scrap material bins and/or containers that may be used for the removal activity shall be outlined in the MOP and be approved by the appropriate AT&T representative.

R20-46 Scrap material bins and their use shall comply with all applicable federal, state, and local safety and fire regulations and codes.

R20-47 Scrap material bins and containers shall not be located near areas where they would be a potential hazard.

R20-48 Scrap material bins and containers shall be removed from the building at the end of each working day or placed in a suitable location, as authorized by the AT&T representative and outlined in an approved MOP.

CAUTION: The AT&T representative should verify the floor loading capacity will not be exceeded by the placement of the scrap material bins or piles of removed material.

R20-49 Corrugated fiberboard pallet boxes shall be covered with a AT&T-approved cover when not in use.

20.12 Equipment Alarms

R20-50 A detailed and approved MOP shall be required before any work is performed on equipment alarms or associated cabling.

R20-51 The Installation Supplier shall notify the appropriate AT&T representative before working on any equipment alarm circuits.

**AT&T Generic Installation Requirements**

R20-52 AT&T and Installation Supplier shall jointly test (before and after the removal activity), all alarms that may be affected by the removal activity. The alarms shall be tested for proper operation and those that do not function before the removal work is started shall be listed in the MOP.

20.13 Grounding

R20-53 Central office ground shall be extended to all equipment frames, bays, equipment bays, main distribution frames, protector distribution frames, etc., per the job documentation and the appropriate section(s) of this standard.

R20-54 For additional grounding information, the Installation Supplier shall refer to Sections 18 and 19 of this standard.

R20-55 No equipment frame or bay remaining in the removal area shall become un-grounded as a result of the removal or mining operation.

R20-56 All equipment frames and bays remaining in the removal area shall meet the requirements specified in the job documentation and this standard.

R20-57 The Installation Supplier shall remove only those grounding leads identified by the job documentation.

CAUTION: When power plants are removed, all ground leads, particularly the "CO Ground" lead shall be checked with a clamp-on ammeter to verify that there is no current flowing in the leads to be disconnected. This work operation should be a joint effort by the Installation Supplier and the AT&T power specialist. If current is detected, the leads shall not be disconnected until resolution is agreed.

R20-58 The job documentation shall also identify how far back the leads/cables will be mined.

R20-59 When there is equipment utilizing an isolated ground system in the vicinity of the removal activity, precautions shall be taken to avoid the possibility of accidentally violating the isolated ground plane.

20.14 Equipment Removed for Reuse**20.14.1 General**

R20-60 The Installation Supplier shall make a visual inspection of the equipment being removed for reuse to identify and document physical defects or missing parts (broken or bent terminals, broken or warped circuit pack shelves, missing hardware, etc.). The inspection shall be conducted prior to the equipment being tagged or shipped to the Reuse Equipment Disposition Group.

**AT&T Generic Installation Requirements**

R20-61 The Installation Supplier shall notify the AT&T representative verbally as soon as practical and in writing within 72 hours of the discovery, if the equipment appears to have physical damage, defects, or other conditions that may hinder its installation, maintenance, or working capabilities when it is to be placed back in service. The written documentation shall contain the Installation Supplier's company name, AT&T job number, inspection date, and a detailed description of the location and/or condition of the damaged or defective equipment.

R20-62 Unless otherwise specified by the AT&T representative, the Installation Supplier shall not ship, to the Reuse Equipment Disposition Group, equipment that appears to have physical damage or other conditions that may hinder its installation, maintenance, or working capabilities when it is to be placed back in service.

R20-63 The AT&T representative shall contact the Reuse Equipment Disposition Group Coordinator upon notification that a piece of equipment, which has been identified for reuse, is physically damaged or defective. The Reuse Equipment Disposition Group Coordinator may, based on the information received from the AT&T representative, request that the damaged or defective equipment be scrapped.

R20-64 The Installation Supplier shall utilize the correct tools, methods and procedures necessary, during all aspects of removing equipment identified for reuse, to ensure that the equipment is not damaged during the removal process. If the equipment is damaged during the removal activity, the Installation Supplier shall notify the AT&T representative per [R20-61](#).

R20-65 The Reuse Equipment Disposition Group will supply, on a one-time-only basis, equipment identification tags for the equipment that has been identified for reuse. The tags are to be placed on equipment frame or bay upright and on the outside of shipping cartons.

R20-66 The Installation Supplier shall safeguard against the loss of equipment identification tags supplied by the Reuse Equipment Disposition Group. If equipment identification tags are lost, the Installation Supplier shall make arrangements for their replacement. The tags shall have an adhesive back, be 1-3/4 x 7 inch in size, and contain the information specified in the Material Transfer Reports. These replacement tags shall not be handwritten.

R20-67 The Installation Supplier shall sign, date, and return to the Reuse Equipment Disposition Group photo copies of all Material Transfer Reports prior to shipment of the equipment.

R20-68 The AT&T representative shall make arrangements for the Installation Supplier to receive the shipping and packing materials necessary for shipment of unmounted units to the Reuse Equipment Disposition Group.

**AT&T Generic Installation Requirements**

R20-69 The Installation Supplier shall unitize the packaging manufacturer's carton assembly and packing instructions when preparing to ship equipment removed for reuse. All equipment must be packed and secured as specified by the packaging manufacturer's instructions to safeguard against possible equipment damage during shipment.

R20-70 Unmounted units shall be palletized using AT&T-approved pallets. Cartons shall be stacked on pallets so that all tags are visible.

R20-71 Unless otherwise specified in the job documentation, all frames being shipped for reuse shall be transported uncrated in an electronic air ride van with an internal hoist. The AT&T representative shall make the necessary transportation arrangements.

R20-72 During shipment, equipment frames shall be adequately spaced, carefully positioned and securely fastened so as to eliminate the possibility of damage to exposed wiring, apparatus, terminals, equipment shelves, etc. Under no circumstances shall equipment frames be stacked one on top of the other during shipment.

20.14.2 Workmanship Requirements

R20-73 When removing supplemental frames (normally associated with electro-mechanical and electronic switching systems), the Installation Supplier shall clean all wiring terminals associated with the removed interframe cables at the basic frame. Secure the interframe cable form to the supplemental frame.

R20-74 Cable forms and wire installed as part of the manufacturing process shall not be altered, cut or damaged, and shall be secured and protected for shipment.

R20-75 The Installation Supplier shall disconnect all cables and wire and clean all wiring terminals associated with "installer run cables and wire" on equipment to be removed for reuse.

R20-76 Do not disconnect or change any internally hardwired equipment options.

R20-77 Installer run and terminated connectorized cables shall be disconnected at the connector (not cut). Cable terminated to the equipment that is mated with a connector at a far end termination may require the connector capped or protected.

R20-78 Circuit packs and plug-in units shall be prepared for reuse and shipping by the AT&T method as outlined in the MOP.

R20-79 The Installation Supplier shall not remove any equipment designations indicating the equipment type, model, part number, etc., or its "Equipped With" information.

**AT&T Generic Installation Requirements**

R20-80 The Installation Supplier shall secure all removable or hinged covers by means agreed to in the MOP.

R20-81 The Installation Supplier shall secure all equipment designation strips on the equipment that is being removed for reuse.

R20-82 The Installation Supplier shall remove and secure to the equipment framework any base mouldings, base covers, frame junction material, fuses, nuts, bolts, etc., that the frame or equipment is equipped with in a shipping container approved by AT&T.

20.15 DC Power Circuit and Fuse Removal**20.15.1 General**

Personnel safety and equipment protection is critical when work is to be performed on live power equipment and circuits. For additional requirements associated with power equipment refer to the job documentation and Section 17, "Power," of this standard.

R20-83 A detailed MOP shall be prepared and approved before working on live power equipment.

R20-84 Some work activities performed on live power equipment may require that activities be accomplished during non-standard working hours (maintenance window). This decision shall be documented in the MOP.

R20-85 The Installation Supplier shall not remove any fuses on live Battery Distribution Fuse Bays (BDFBs), Main Power Boards (MPBs), Aisle Distribution Cabinets (ADCs), or fuse bays without an approved MOP outlining the activity and specifying who is responsible for the fuse removal (AT&T or the Installation Supplier). AT&T may elect to assign an observer to the removal activity. The observer's partial responsibility may be to remove fuses associated with the removal activity or to observe the Installation Supplier removing fuses.

R20-86 Before removing any fuse the Installation Supplier shall verify, with the appropriate AT&T representative, that there are no working circuits associated with the fuse being removed.

R20-87 Only fuses specified to be removed, in the job documentation, shall be removed.

R20-88 The Installation Supplier shall verify all fuses/breakers on the equipment bay have been de-energized and the feed is not live.



AT&T Generic Installation Requirements

R20-89 The Installation Supplier shall verify the absence of voltage on each power lead that has been identified as feeding the equipment before the leads are removed.

R20-90 Before a lead is cut/removed from the power source the Installation Supplier shall use a clamp-on ammeter to verify the absence of current on the lead.

R20-91 The Installation Supplier shall contact the AT&T representative as soon as possible if any additional fuses need to be removed, or current or voltage is present (see requirements **R20-89** and **R20-90** , or any discrepancies exist between the job documentation and the actual electrical configuration of the office.

20.15.2 Safety Precautions and Equipment Protection

R20-92 The Installation Supplier shall not begin any work operation on live BDFBs, MPBs, or ADCs unless a minimum of two people are present. The persons involved shall be aware of hazards, the measures required to avoid an accident, and the action required in case of an emergency. This is a safety precaution to ensure a timely response in the event of an accident. The names of the people involved in this work operation shall be specified in the detailed MOP.

R20-93 When a fuse is removed or a switch is opened on a live circuit, in order to work on the circuit, the fuse clips shall be insulated or the switch shall be secured in an open position to prevent the circuit from being accidentally closed while it is being worked on. The fuse shall be replaced, or the switch closed, only by the person responsible for the work operation and only after it is determined that it is safe to do so.

R20-94 The Installation Supplier shall place a warning tag on fuse clips or switches when electrical potential is removed in order to work on the circuit. Each circuit shall be identified "Warning - Person Working on Circuit," and have the Installation Supplier's company name and the job number that the contractor is working on.

R20-95 Adequate protection and insulation, as detailed in the MOP, shall be placed on tools, bus bars, framework, etc., when working in or on live MPBs, BDFBs, ADCs, etc., to prevent accidental short circuits.

20.15.3 Workmanship Requirements

R20-96 When a fuse and associated power circuit are removed from a MPB, BDFB or fuse bay, the associated feeders (cables or wires) shall be disconnected from the terminals and/or busses, cut back to the cable form (or as specified in the engineering specification), have the exposed ends insulated with a heat shrink cap or two layers of electrical tape, and be secured to the cable form.



AT&T Generic Installation Requirements

R20-97 When a fuse and associated power circuit is to be removed from a MPB, BDFB, or ADC, the associated alarm fuse shall be removed.

R20-98 Equipment designations and fuse capacity stamping shall be removed from associated fuse and power circuit.

R20-99 Dummy fuses shall be installed at all vacant fuse locations.

R20-100 Fuse Record Books associated with fuse bays shall be updated to reflect any circuits that were added or removed. Minor changes (ten lines or less) on fuse record sheets shall be made by covering the changed line of information with correction fluid and adding the correct fuse assignment information with a blue or black ball point pen. A new fuse record sheet shall be inserted into the Fuse Record Book if it is necessary to change more than ten lines of information on a fuse record sheet. In all cases, if new fuse record sheets are provided, they shall be inserted into the Fuse Record Book.

R20-101 Fuse capacity designation pins, associated with removed 70 type fuses, shall be removed.

20.16 AC Circuit and Conduit Removal

20.16.1 General

Personnel safety and equipment protection is critical when work is to be performed on live AC circuits.

For additional requirements associated with AC circuits and conduit, refer to the job documentation and Section 17, "Power," of this standard.

R20-102 A detailed MOP shall be prepared and approved before working on any live protected or essential AC circuits or cabinets.

R20-103 Any work performed on live protected or essential AC circuits may require that activities be accomplished during non-standard working hours (maintenance window). This shall be a joint decision between the AT&T representative, the Installation Supplier and the AC power SME.

R20-104 The Installation Supplier shall not turn off any circuit breakers or remove any fuses on protected or essential AC circuits without an approved MOP outlining the activity and specifying who is responsible for turning off the circuit breakers or removing the fuses (AT&T or Installation Supplier).

R20-105 AT&T may elect to assign an observer to the removal activity. The observer's partial responsibility shall be to turn off circuit breakers or remove fuses on protected or essential AC circuits or to observe the Installation Supplier turning off circuit breakers and/or removing fuses.

**AT&T Generic Installation Requirements**

R20-106 Before removing or turning off any fuses or circuit breakers the Installation Supplier shall verify, with the appropriate AT&T representative, that there are no working circuits, test equipment, etc., associated with the circuit being removed or turned off.

R20-107 Only circuits specified in the job documentation shall be removed or turned off. The Installation Supplier shall contact the appropriate AT&T Representative if any additional circuits need to be removed or turned off.

20.16.2 Safety Precautions and Equipment Protection

R20-108 When it is necessary to work on or adjacent to live exposed or unprotected AC circuits, two persons shall be present while the work is being performed. The persons involved must be aware of the hazards, the measures required to avoid an accident, and the action required in case of an emergency.

R20-109 When work is to be performed on live AC circuits or ringing supply circuits of 100 volts or higher, fuses shall be removed or switches opened wherever it is practical to do so without causing a service interruption.

R20-110 Frame and aisle lighting and appliance outlet circuits are not essential for maintaining equipment operation. If possible, these circuits shall never be worked on while live. This applies to other AC circuits that do not furnish power to working equipment.

20.16.3 Workmanship Requirements

R20-111 The leads associated with de-powered/defused AC circuits shall be removed from their assigned terminals at both ends and the wire mined or their wire ends insulated using wire nuts, electrical tape or an approved boot.

R20-112 Equipment designations and fuse capacity stamping, associated with removed AC circuits, shall be removed.

R20-113 Circuit identification cards inside of AC service cabinets shall be updated to reflect circuits removed or added.

R20-114 Conduit remaining in the removal area shall be run and supported as specified by the NEC and in the job documentation, be securely fastened, and all unterminated ends closed.

R20-115 Conduit and conduit supports associated with removed equipment shall be removed from its served point (far end) back to the distribution point, unless otherwise specified in the job documentation.

**AT&T Generic Installation Requirements**

R20-116 Open but unused knockouts, in AC service cabinets, conduit junction boxes, etc., remaining in the removal area shall be closed.

R20-117 Conduit junction boxes and fittings remaining in the removal area shall be equipped with covers.

R20-118 Any AC wire nut connections remaining in the removal area shall be reconnected in an enclosed location, such as a conduit junction box.

20.17 Cable Removal and Mining**20.17.1 General**

When loosening cable or wire for removal (cutting securing stitches or removing cable clips) the Installation Supplier shall exercise caution and utilize the appropriate tools to ensure that adjacent cables, which may be live, are not damaged or cut.

R20-119 A detailed MOP shall be prepared and approved as specified in Section 7, "Method of Procedure (MOP)," of this standard before starting a cable removing or mining operation.

R20-120 All applicable service interruption and/or degradation prevention and equipment protection precautions shall be adhered to during cable removal and mining operations as outlined in the MOP.

R20-121 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.

R20-122 When cable is being removed from the cable rack, either horizontal or vertical, the Installation Supplier shall verify the cable rack is fastened to the building surface or a supporting structure before the stitching is removed.

R20-123 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 un-anticipated movement, the Installation Supplier shall immediately stop the work activity and notify the AT&T representative.

R20-124 The Installation Supplier shall be prepared to provide assistance under the direction of AT&T, in the restoration of any service outage or unsafe condition caused by the removal work.

R20-125 The Installation Supplier shall be equipped with a cable splicing kit capable of splicing 25 pairs of 22-, 24-, or 26-gauge conductors at one time.



AT&T Generic Installation Requirements

R20-126 The Installation Supplier shall be qualified to repair lightguide equipment in the event of service interruption.

R20-127 The Installation Supplier shall have the splice kit and personnel experienced in cable splicing on the job site at all times during cable cutting operations.

R20-128 The conditions and environment where scrap material bins and containers may be used for cable removal or mining activities shall be discussed with and agreed upon by the AT&T representative.

CAUTION: If the Installation Supplier uncovers hazardous material during the cable mining job (e.g., lead cable, arsenic cable, PCBs 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.

20.17.2 Cable Cutting Tool

R20-129 Cable cutting tools shall be equipped with a protective ring during the cable removal or mining operations in the vicinity of working equipment.

20.17.3 Cable Cutting Procedures and Precautions

AT&T shall verify which cable(s) are to be removed from the equipment at the initial cable disconnect/cut.

R20-130 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.

R20-131 Under no circumstances, shall a loop of cable or wire be inserted through the protective ring of a cable cutting tool to be cut.

R20-132 Under no circumstances, shall cables or wire be cut in the cable rack.

R20-133 All cables to be cut, during a cable removal or mining operation, shall have their ends hanging off the cable rack and all cuts shall be made a minimum of 18 inches below or to the side of the cable rack.

R20-134 Cut sections of cable shall be carefully placed in scrap cable containers or bags.

R20-135 If there is a possibility of the cut portion of a cable striking working equipment when it is cut, the cable cutting activity shall be performed on the floor, or the appropriate equipment protection shall be installed to ensure that the cut cable ends do not strike working equipment.

**AT&T Generic Installation Requirements**

R20-136 Extreme caution and adequate equipment protection shall be used when cutting and removing armored or BX type cable. See **R20-25**.

R20-137 If there is a possibility of the exposed ends of cables coming in contact with working equipment during the cable cutting activity, the exposed cable ends shall be insulated to prevent the possibility of service degradation or interruption.

R20-138 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.

20.17.4 Workmanship Requirements

R20-139 All cables and wire remaining in the cable removal or mining area shall meet the requirements specified in Sections 13 and 15, "Workmanship Requirements -Cable and Wiring," and "Workmanship Requirements - Connecting," of this standard. If it is not possible to comply with the requirements of Sections 13 and 15, the Installation Supplier shall notify the AT&T representative.

R20-140 If the job documentation or engineering specification does not specify the extent to which cables are to be removed from equipment frames or bays that are being removed, the Installation Supplier shall detail in the MOP the point on the horizontal cable rack where the cable will be cut.

R20-141 If the job documentation does not specify the extent to which cables are to be removed or mined from vertical cable racks, the Installation Supplier shall detail in the MOP where the cable will be cut, the cable hole(s) and the floor(s) where the cable removal or mining activity is being performed.

R20-142 When removing cable on vertical runs of more than one floor the stitching securing the cable shall not be removed for more than one floor at a time.

R20-143 On vertical cable runs, cable(s) shall be cut from the floor above a cable hole allowing the free end to be identified before passing it through to the floor below.

R20-144 The exposed ends of dead cables or wire remaining on the cable rack shall be insulated with two layers of electrical tape or a heat shrink cap.

R20-145 Exposed ends or sections of dead power cable shall be protected with a heat shrink cap or electrical tape.



AT&T Generic Installation Requirements

R20-146 All unused lengths of cord and cable clips associated with removed cables and remaining in the removal or mining area shall be removed from the cable racks.

R20-147 The Installation Supplier shall re-secure all cable remaining on the Cable Distribution System.

R20-148 All cable penetrations opened during the removal/cable mining job shall be permanently closed using AT&T-approved firestop system and materials at the end of the shift or when the work completes for that day.

20.18 Units and Equipment Frame Removal

20.18.1 General

Service interruption or degradation prevention, equipment protection, and personnel safety is critical during frame and equipment removal.

R20-149 A detailed MOP shall be prepared and approved, as specified in Section 7, "Method of Procedure," of this standard, before starting any frame or equipment removal operations.

R20-150 Prior to the equipment frame or bay removal, the AT&T representative and the Installation Supplier shall jointly decide the methods, procedures, and tools to be used for hoisting and transporting of equipment frames within the office. The results of these decisions shall be specified in the MOP. Also, at this time, the route(s) to be used to transport equipment frames through the office to the staging area shall be identified.

20.18.2 Safety Precautions and Equipment Protection

R20-151 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.

R20-152 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.

R20-153 If working equipment is adjacent to the route that is to be used to transport equipment frames through the office, the working equipment shall be adequately protected as outlined in the MOP.

20.18.3 Workmanship Requirements



AT&T Generic Installation Requirements

R20-154 The Installation Supplier shall identify and designate or tag the equipment that is to be removed, prior to the start of the removal process. The designations or tags shall be plainly visible, placed on the front and rear of the equipment, contain the CON/TEO number, the Installation Supplier's name and the date they were designated or tagged. The method of identification and designation shall be specified in the MOP.

R20-155 The Installation Supplier shall remove, relocate, or add all end guards, end shields, frame work details, units/equipment, equipment frames, equipment bays, cable and wire terminations, terminal blocks, etc., as specified in the job documentation.

R20-156 Equipment associated with the removal activities, and remaining in the removal area, shall meet the requirements specified in the job documentation and the appropriate sections of this standard.

R20-157 Scrap material associated with units/equipment and equipment frames shall be kept segregated as specified in the job documentation.

R20-158 All far end connections and designations/stenciling, in the removal area and associated with removed units or equipment frames, shall be removed. All connections shall be disconnected (not cut).

R20-159 When units are removed from equipment frames or bays that are going to remain in the removal area, the Installation Supplier shall cut back the associated cable or wire as close as practical to the cable bracket or wire form to which they were last secured (or as specified in the job documentation). The exposed ends shall be insulated with rubber and electrical tape and re-secured to the cable bracket or wire form.

R20-160 Exposed ends or sections of live power cable, in equipment frames or bays, shall be insulated with a heat shrink cap or two layers of electrical tape.

R20-161 All wiring and connections remaining in the removal area, and associated with the equipment removal activities, shall be protected from hazardous conditions such as metal edges, excessive strain, etc., and meet the requirements specified in the job documentation and the appropriate section(s) of this standard.

R20-162 Central office ground shall be extended to maintain continuity of the equipment frame grounding system when equipment frames are removed from an equipment line-up.



AT&T Generic Installation Requirements

R20-163 Jack boxes, jack mountings, terminal blocks, etc., shall be removed from distributing frames when the associated equipment has been removed, unless otherwise specified in the job documentation.

R20-164 Designations and stamping associated with removed circuits or equipment shall be removed from terminal blocks, unless otherwise specified in the job documentation.

R20-165 There shall be no floor obstructions or protrusions resulting from the removal activities.

R20-166 Anchors shall not be removed during equipment removals unless specifically stated in the TEO. Anchors shall be removed if they become loose due to the removal effort. If they are removed due to either of the listed conditions the holes remaining in the concrete shall be filled with an appropriate material. Anchors remaining in the floor shall be made flush with the floor.”

Note: Anchor removal and floor condition assessment will be addressed during building space reclamation/construction by Building Engineering, and will be conducted consistent with and according to the following:

- Building Application Team (BEAT) Flash# 37 (attached) Condition Assessment of Structural Floors.
- AT&T Standard; 760-200-020 Design Loads for Telephone Buildings
- AT&T Standard; 760-200-021 Floor Design Load
- AT&T Standard; 760-200-040 Floor and Ceiling Anchors
- AT&T Standard 760-200-100 Structural Floors for Network Equipment Buildings

**AT&T Generic Installation Requirements**

FLASH # 37

Condition Assessment of Structural Floors**Background:**

Observations and testing of structural floors in Central Offices in California revealed that particular care should be exercised prior to the installation of new equipment. The following two conditions were observed:

- Topping slabs - Structural floors incorporating a relatively thin (2" to 3" thick) topping slabs placed over the reinforced concrete structural slabs may not provide adequate media for equipment anchorage. Topping slabs that were placed to achieve adequate surface finish are typically un-reinforced. Over time, due to past cycles of equipment installation and removal, the topping slabs may have been perforated with numerous holes. These holes tend to accelerate the concrete deterioration when the buildings undergo movements during small but frequent earthquakes.
- Lightweight concrete slabs - Structural floors constructed of lightweight concrete exhibit an increased tendency for cracking and deterioration. This can be particularly significant when these floors undergo movements during small but frequent earthquakes and the floors have been perforated by numerous holes due to equipment installation and removal.

In both of the above floor types typical equipment anchors may not be capable of developing their specified load capacities.

Recommendations:

Prior to implementation of new projects on the above floor types, it is recommended that a qualified engineer perform a condition survey. The condition survey should provided the following:

- Establish guidelines regarding the adequacy of the structural floors to safely support the equipment loads specified during the original designs.
- Determine the need to augment standard equipment anchorage details.

The above information should be communicated to all relevant stakeholders.
Reference is made to Seismic Zones Standard 760-200-026 Version 4.

R20-167 Endguards of equipment line-ups in the removal area shall have stenciling removed or blank designation strips added in relation to the frames or bays that have been removed.



AT&T Generic Installation Requirements

20.19 Mechanical and Crimp Type Power Connections

R20-168 All power connections shall meet the requirements specified in the job documentation and Section 17, "Power," of this standard.

R20-169 If mechanical connectors are encountered during the mining operation, the Installation Supplier shall notify the AT&T representative.

R20-170 When a mechanical power connector is removed from a power cable, thereby exposing a section of the conductor, the insulation from a similar size cable or multiple layers of rubber tape shall be placed around the conductor to a point where it is even with the outer layer of the existing cable sheath. The outer sheath shall be wrapped with a minimum of two half-lapped layers of approved electrical tape and extend 2 inches beyond the repair.

R20-171 When a cable is cut off from one side of a parallel connector, thereby exposing a portion of the end of the cable or parallel connector, sheet fiber and/or two layers of electrical tape shall be installed on the inside of the connector cover so as to effectively insulate the exposed portion.

20.20 Terminal Block and Circuit Removal

R20-172 The Installation Supplier shall identify and designate or tag the terminal blocks that are to be removed prior to the start of the removal process. The designations or tags shall be plainly visible, contain the CON/TEO number, the Installation Supplier's name, and the date they were designated or tagged. The method of identification and designation shall be specified in the MOP.

R20-173 Unless otherwise specified in the job documentation, terminal strips/blocks vacated due to circuit or equipment removal shall be removed from all distributing frames.

R20-174 When applicable, dummy blocks shall be installed at all vacated terminal block locations per the job documentation.

R20-175 Circuit designations/stenciling and connections, associated with removed circuits or equipment, shall be removed from terminal blocks that are to remain in the removal area.

R20-176 Wire-wrapped connections, associated with circuits that have been removed from equipment that is going to remain in the removal area, shall be unwrapped, cut back to the existing wire form and have the wire ends insulated, unless circuit conditions or the job documentation specifies otherwise.



AT&T Generic Installation Requirements

R20-177 The Installation Supplier shall notify the AT&T representative, in writing, of all locations where wire-wrapped connections associated with the removal activity have not been unwrapped and removed.

20.21 Appliance Outlets, Lights, Switches, and Risers

R20-178 The Installation Supplier shall notify the AT&T representative, in writing, of any appliance outlets, lights, switches, or risers remaining in the removal area and associated with the removal activity, which do not meet requirements as specified in the National Electrical Code, job documentation, or the appropriate section(s) of this standard.

R20-179 All appliance outlets, lights, switches, and risers shall be removed or relocated per the job documentation and the appropriate section(s) of this standard.

R20-180 All appliance outlets, lights, switches, and risers remaining in the removal area, and associated with the removal activity, shall be properly wired per the job documentation.

R20-181 All working appliance outlets remaining in the removal area, and associated with the removal activity, shall be brought into compliance with present, state, local, and national codes.

R20-182 All switches and switch risers, remaining in the removal area and associated with the removal activity, which have had their associated end guards removed, shall be relocated to an appropriate switch location (e.g., a column, a wall, etc.) or be rewired.

R20-183 Lighting and electrical outlets shall be on separate circuits.

R20-184 All armored cable and conduit connections, remaining in the removal area and associated with the removal activity, shall be tight.

20.22 Rolling Ladders

R20-185 Rolling ladders and ladder track shall be removed or relocated as specified in the job documentation.

R20-186 The Installation Supplier shall notify the AT&T representative, in writing, of any rolling ladders or ladder track remaining in the removal area, and associated with the removal activity, which do not meet the requirements specified in the job documentation and Section 11, "Workmanship Requirements - General Assembly, Cabinets, Frameworks, Units, and Misc.," of this standard.



AT&T Generic Installation Requirements

R20-187 When applicable, the Installation Supplier shall contact the AT&T representative for direction on the disposition of rolling ladders.

R20-188 Rolling ladders shall not be used by other than AT&T personnel.

R20-189 Stop bolts and bushings shall be installed in ladder track supporting rolling ladders, at the end of the run to prevent the ladder from coming off the track or coming in contact with any obstruction.

20.23 Overhead Ironwork and Bracing

20.23.1 General

R20-190 The Installation Supplier shall remove overhead ironwork and bracing as specified in the job documentation and Section 10 "Workmanship Requirements - Auxiliary Framing, Bracing, and Cable Rack," and Section 11 "Workmanship Requirements - General Assembly, Cabinets, Frameworks, Units, and Misc.," of this standard.

R20-191 The Installation Supplier shall notify the AT&T representative, in writing, of any overhead ironwork and bracing, remaining in the removal area and associated with the removal activity, which does not meet the requirements specified in the job documentation and this standard.

20.23.2 Safety Precautions and Equipment Protection

R20-192 Prior to removing equipment frames that support auxiliary framing and cable racks, the Installation Supplier shall install adequate temporary support. Normally this requires installing additional threaded rods and/or stanchions.

R20-193 When applicable, auxiliary framing and cable rack shall be permanently re-supported prior to the removal of equipment frames.

R20-194 When the removal activity involves work operations that are to be performed above the top of the equipment frame, the Installation Supplier shall adequately identify and mark the area of activity with warning signs "HARD HAT AREA - HARD HATS REQUIRED".

R20-195 When the job documentation specifies the overhead ironwork is to be removed, the Installation Supplier shall remove the rolling ladders prior to dismantling or removing the overhead ironwork.



AT&T Generic Installation Requirements

R20-196 When overhead ironwork 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 below.

R20-197 Overhead ironwork shall be removed systematically and in sections or portions that can be easily and safely handled by the Installation Supplier's personnel. Under no circumstances shall the overhead ironwork removal process involve dropping material to the floor.

20.23.3 Workmanship Requirements

R20-198 Auxiliary framing and bracing arrangements, remaining in the removal area and associated with the removal activity, shall meet support and bracing requirements specified in the job documentation and Section 10, "Workmanship Requirements - Auxiliary Framing, Bracing, and Cable Rack," of this standard.

20.24 Battery Removal

20.24.1 General

R20-199 The Installation Supplier must contact the AT&T representative for direction before any activity relating to hazardous material/waste is started. AT&T shall adhere to guidelines and procedures as documented in their Hazardous Material/Waste Management Handbook. The AT&T representative shall obtain from the Environmental Management Group or Procurement Group the names of hazardous material/waste contractors who have been pre-qualified to handle hazardous waste.

R20-200 For additional information associated with batteries, refer to the job documentation and Section 17, "Workmanship Requirements - Power," of this standard.

R20-201 The Installation Supplier shall not begin any battery removal activity without an approved and posted (on job site) detailed MOP.



AT&T Generic Installation Requirements

R20-202 The following battery removal activities (if applicable) shall be detailed in the MOP. This list is not intended to be all inclusive. The AT&T representative may require that additional activities be detailed:

- Safety.
- Equipment and building protection.
- Transition work procedures.
- Electrolyte removal procedures.
- Battery hoisting, lifting, and transporting procedures (within the office).

20.24.2 Safety Precautions and Equipment Protection

R20-203 The Installation Supplier's personnel involved with battery removal activity shall be familiar with procedures for safety and first aid.

R20-204 Adequate first aid supplies shall be located in close proximity of the battery removal activity.

R20-205 The Installation Supplier shall provide portable eye washing facilities to supplement the existing facilities as required by federal, state, or local codes.

R20-206 The Installation Supplier shall have an acid spill containment kit on the job site for all removal activities in the power area.

Suggested safety materials include, but are not limited to:

AT&T Material as required	Absorbents (two 32 gal. Drums min.)
	Vermiculite
	Clay grease sweep
	Rice hull ash

R20-207 Protective gloves, apron, and face shield shall be worn when acid or batteries containing acid are handled.

R20-208 Smoking, open flames, and spark producing equipment is strictly prohibited in or near battery rooms.

R20-209 When possible, disconnect battery strings at a point as far as possible from the nearest battery to prevent the possibility of a spark igniting the battery gases.



AT&T Generic Installation Requirements

R20-210 In the event of an acid spill or breakage of a cell or battery during the removal activity, the Installation Supplier shall do the following:

1. Administer first aid to any injured personnel.
2. Contain the spill.
3. Absorb any liquid.
4. Place all debris and contaminated absorbent in approved containers.
5. Notify the AT&T representative.

NOTE: If conditions warrant, notify the AT&T representative as soon as possible following the administration of first aid to injured personnel.

6. Dispose of acid contaminated waste following consultation and instruction from the appropriate AT&T representative (i.e., Hazardous Waste Manager).

20.24.3 Workmanship Requirements

R20-211 If batteries are to be set on the floor prior to shipment the floors shall be protected with non-absorbing insulating protection.

R20-212 All vents and filling tubes shall be plugged with a shipping plug prior to shipment of batteries containing acid. Terminals shall be protected from short circuit with electrical tape, caps, or protective packaging.

20.25 Equipment Retired in Place

R20-213 Refer to Section 21, "Workmanship Requirements - Equipment Retired in Place," of this standard and the job documentation for requirements associated with specific work activities for retiring equipment in place (e.g., Power Circuit and Fuse Removal, Terminal Block and Circuit Removal, Office Drawings and Records, etc.).

**AT&T Generic Installation Requirements****21. Workmanship Requirements - Equipment Retired In Place****21.1 Introduction**

This section provides Installation Suppliers with generic requirements concerning equipment “Retired in Place” (RIP). Items addressed in this section may require joint AT&T and Installation Supplier’s review and coordination prior to, during, and after the activity.

21.2 General

The requirements for CO equipment to be RIP are satisfied if, at the time of retirement, there is no intention of reusing the equipment in its present location, and safeguards are provided to ensure that the equipment cannot be inadvertently returned to service. The installer will be instructed in the Telephone Equipment Order (TEO), Method of Procedure (MOP), or specified installation instructions as to the work involved. Items such as fuse records, AC circuit breakers, fuse and alarm charts, floor plans, wiring lists, and equipment drawings will require updating to indicate “Retired in Place.”

21.3 Equipment Retired

R21-1 The Installation Supplier shall verify by test methods or contact with the AT&T representative that service has been removed and all power disconnected.

R21-2 The retired equipment shall have its cables cut in such a manner that under no circumstances could this equipment be used for service.

R21-3 Frame ground leads shall remain in place.

R21-4 Retired equipment shall have tag markings showing “RIP”, or “No Longer In Service.” All office drawings must reflect the same information. Equipment shall be taken out of the index of working equipment.

R21-5 The Installation Supplier shall be required to tag or stencil associated relay racks, units, and terminal strips with the RIP designation. Information shall contain authority number, specification number, and the date of RIP.

R21-6 All designation information on far end terminations of disconnected equipment shall be removed.

21.4 Power Distribution Bay

R21-7 Fuse(s) shall be removed as indicated in the Method of Procedure (MOP).

R21-8 Dummy fuse(s) shall be substituted for the removed fuse(s).



AT&T Generic Installation Requirements

R21-9 Where circuit breakers are used, they shall be identified as feeding RIP equipment.

R21-10 Fuse Records/Book shall be changed to reflect equipment RIP.

R21-11 Central office records/drawings shall be updated to reflect the RIP items.

R21-12 Appropriate drain tables shall be updated, on fuse assignment drawings.

R21-13 Power feeders disconnected from fuse post shall be cut back and removed as far as practical or as per the MOP. They shall be laced down with their ends insulated, as per the MOP.

R21-14 Designation pins shall be removed from 70 type fuse panels for equipment RIP.

R21-15 Equipment powered via Gutter taps shall be disconnected at the tap. After removal, the cable ends shall be insulated per the MOP.

R21-16 Designations at power source(s) shall be removed.

21.5 Vacated Terminal Strips

R21-17 Terminal strips vacated due to retired equipment shall be removed.

21.6 Distributing Frames

R21-18 If the job specification calls for cables to be cut at the distributing frame, DSX and DCS bays, the cable shall be removed up to the cable rack above the frame. The cable shall be insulated per the MOP.

R21-19 Distribution frame cross connections shall be removed as specified in the MOP.

21.7 Office Alarms

R21-20 All central office alarm and night transfer databases shall be changed to delete the equipment retired in place.

R21-21 Alarm bridging or multiple leads shall be extended to working equipment to maintain office alarm integrity.



AT&T Generic Installation Requirements

21.8 Hazardous Material

R21-22 Any hazardous waste material in the RIP equipment shall be handled in accordance with the guidelines found in AT&T hazardous materials/waste management practices and as outlined in the MOP, AT&T contract and federal, state, and local laws.

21.9 Circuit Packs

R21-23 All circuit packs in bays of retired equipment shall be disposed of as outlined in the MOP.

21.10 Documentation

R21-24 The Installation Supplier shall contact the AT&T representative to obtain and complete any local forms or documentation required by AT&T. All office records shall indicate the equipment is RIP.



AT&T Generic Installation Requirements

22. Intra-Office Fiber Optic Standards Document (MLID 13788)

**** (Additional AT&T requirements are in the AT&T Intra-Office Fiber Optic Standards Document Practice) ****

Questions pertaining to the contents shall be referred to:

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22.1 Introduction

This section provides Installation Suppliers with generic requirements for installation of fiber optic cable, inter-bay breakout cable, and interconnect fiber. This section shall be used in conjunction with the job specific documentation and applicable sections of this standard. The information in this section is not intended to be all inclusive. Additional items, conditions, local issues, etc., may need to be discussed and agreed upon prior to the start of job activities. AT&T installation requirements may differ from and supersede these requirements. All procedures and work items shall be outlined in an approved Method of Procedure (MOP). The wording "interconnect fiber" in this document is to be synonymous with what might have been known as "Fiber Optic Jumpers" (single or double fibers) in older fiber optic installations or technology. In this document, "Jumpers" refers to fiber cross-connecting Fiber Distributing Frame (FDF) terminations.

22.2 General

The appropriate sections of this standard should be reviewed prior to the start of any job activities.

R22-1 Fiber optic jumpers and cable shall not be pulled, twisted, or kinked.

R22-2 The Installation Supplier shall promptly notify the appropriate AT&T representative if a fiber optic jumper or cable is kinked, or otherwise damaged during installation.

R22-3 Fiber optic jumpers and cable shall not employ bending radii that are less than those recommended by the manufacturer.

R22-4 Unless otherwise specified, fiber optic jumpers and cables shall be run segregated from all other types of cable and placed on or in dedicated rack, compartment, or duct. No other types of cables shall be run on or in dedicated fiber optic cable racks, compartments, or ducts.



AT&T Generic Installation Requirements

R22-5 If fiber optic jumpers and cable are to share a cable rack, compartment, or duct, with another type of cable, they shall have a physical barrier to prevent other types of cable from being run in, over, and/or around the fiber optic jumpers or cable. No other types of cable shall be run on, over, or around fiber optic jumpers or cable. Snap-on “L” shaped brackets (or approved equivalent) may be used when cable separation is required on ladder type cable racks. Snap-on brackets shall be located on alternate cable rack cross straps of secured cable runs. The snap-on cable brackets shall not be used on unsecured cable runs.

R22-6 Fiber optic cable shall be run on dedicated cable rack. No one shall step or sit on fiber optic cable or jumpers.

R22-7 The Installation Supplier shall not deviate from the job documentation or requirements stated in this standard, unless the change is communicated to and approved by the AT&T representative in writing.

R22-8 Riser cable shall be OFNR rated as specified in the National Electrical Code (NEC). Riser cable shall be spliced in the Cable Entrance Facility (CEF) or at the Optical Cable Rearrangement Frame (OCRF) and installed from this point through enclosed conduit to the fiber floor.

R22-9

22.3 Optical Fiber Pathways

Various types and sizes of pathways can be used to support fiber optic medium. The Installation Supplier shall adhere to the installation requirements specified in the “Workmanship Requirements - Auxiliary Framing, Bracing, and Cable Rack” section of this document for pathway installation generic requirements.

R22-10 The office cable rack/pathway and auxiliary framing drawings shall be used when it is necessary to install cable rack/pathways or other types of support for fiber optic cable, breakout cable, or interconnect fiber.

R22-11 Fiber pathway shall be installed at a minimum height of 7 feet 7-1/2 inches measured between the finished floor and the bottom of the fiber pathway.

R22-12 At all drop off points, a fiber protection system bend radius support shall be installed. Bend radius shall be a minimum 10 times the diameter of the fiber cable or jumper.

R22-13 Cable rack straps or stringers shall be covered with sheet fiber protection at the point where fiber cable or breakout cable leave the rack.

R22-14 When fiber cable exits a vertical supporting conduit, it shall be supported on dedicated fiber optic pathways.

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R22-15 Pathways shall be designated/identified for fiber optic cable only.

CAUTION: The installation of pathways should be avoided under Main Distributing Frames or by supporting with 5-inch cable rack mounted to building walls.

R22-16 Pathway identification shall be at maximum 10-foot intervals for overhead pathways. The designations shall be placed on both sides of the rack stringer and at the start and end of each run. All designations shall be staggered five feet on both sides of the pathway.

R22-17 Under-floor pathways shall be designated at a 5-foot interval on both sides of the pathway.

R22-18 Cable rack used to support fiber optic cable or breakout cables shall be flat bar type strap.

R22-19 Pathways shall be supported by threaded rod suspended from auxiliary framing, or directly mounted and supported on equipment bays or racks or supported by stanchions.

22.4 Securing Optical Fiber Cable

22.4.1 Fiber Optic Cable/Jumpers

R22-20 Fiber optic jumpers shall be secured to cable brackets, framework details, etc., by first wrapping the jumpers with two layers of 1/64-inch sheet fiber, then sewing with twine. Under no circumstances shall the sewing stitch be pulled so tightly as to deform the sheet fiber or jumpers.

R22-21 Where it is necessary to band fiber optic jumpers in order to hold them in place or in formation, they shall be taped to adjacent jumpers with two layers of grey PVC electrical tape or be banded by first wrapping with two layers of 1/64-inch sheet fiber, then banded with twine. Under no circumstances shall the banding stitch be pulled so tightly as to deform the sheet fiber or jumpers.

R22-22 Two layers of 1/64-inch or one layer of 1/32-inch sheet fiber shall be secured to the cable at each point of attachment to the cable rack on vertical runs and in an old installation where cable rack panning was not provided on horizontal runs.

R22-23 Riser cable shall be secured (sewn) to cable straps at every third strap.

R22-24 Nylon cable ties shall not be used for banding or to secure fiber cable, inter-bay, or breakout cable to the cable rack.

**AT&T Generic Installation Requirements****22.5 Segregation of Optical Fiber Cable, Breakout Cable, and Inter-Bay Cable**

R22-25 Separate pathways shall be used to carry fiber optic riser cable, breakout cable, or inter-bay fibers. As directed by the AT&T representative, fiber cable may be run through a shared cable penetration as outlined in the MOP.

R22-26 Fiber optic riser cable shall not be run in fiber pathways along with interconnect, breakout, or inter-bay cable.

22.6 Fiber Pathways-Enclosed

An enclosed fiber pathway system serves a three-fold purpose of identification, segregation, and protection. Manufacturers provide pathways in various colors that can be used to indicate the presence of fiber optic cables. A fiber pathway protects the fiber cables from crushing and cut hazards. Troughs made of polymeric materials must attain an Underwriters' Laboratories (UL) standard rating of 94V-0 and pass the IEEE 383 vertical flame spread test. Fiber pathways, open channel, hinged, or snap on top shall be fire-retardant material and meet the requirements applicable in GR-63-CORE for flammability.

R22-27 The Installation Supplier shall use only AT&T-approved fiber pathway.

R22-28 The fiber pathway system shall be provisioned and installed along the entire length of the Fiber Distribution Frame (FDF) and extend from the FDF to the fiber optical terminating equipment. A down spout, "tee connection," shall be located directly over each vertical trough on the FDF and each bay of fiber optic terminals to ensure proper cable handling.

R22-29 Fiber pathways shall be secured via mechanical hardware. There shall be no sharp edges or material (bolt heads, washers, or other hardware) protruding into the area that will contain the fiber.

22.7 Physical Protection of Fiber Cable and Inter-Bay/Breakout Cable

Fiber optic cable and breakout cable are more fragile than the traditional copper wire cable or jumpers. The manufacture of this cable incorporates the use of thin glass fiber and plastics that can be easily damaged by physical misuse that may cause both physical and optical impairment.

R22-30 Pulling or dragging of fiber optic cable shall be strictly prohibited.

R22-31 Fiber optic cable shall be placed onto the pathway.

R22-32 Split duct tubing provided to protect fibers shall not be removed after installation.



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R22-33 Fiber optic cross-connect jumpers and fan-outs equipped with connectors or single and dual-conductor interconnect fibers shall be continuously supported and maintain the minimum bend radius of 2 inches or larger.

R22-34 Cable runs from the CEF or OCRF to the fiber terminating equipment shall be the length specified by the fiber cable route through the central office. Slack shall not exceed the maximum allowed by AT&T and shall be stored in the CEF or OCRF.

R22-35 The Installation Supplier shall use AT&T's approved methodology for the storage of slack for other runs within the Central Office.

R22-36 Fiber optic cable or interconnect fiber connectors shall be covered and protected with the manufacturer's dust caps during installation. The protective covering shall be removed only after verification of the run and when it is ready for connection to the equipment. Until the connectors are ready for use, the dust caps shall be reinstalled after each test or pre-in service operation.

R22-37 Kellum Grips, or equivalent, shall be used to support fiber optic cable that is not secured for three floors or more. The cable shall be supported every third floor. The Kellum Grips shall be sized for the particular cable and shall be hung from a hook or support bar anchored to the building.

22.8 Bonding/Grounding

R22-38 Outside plant cable ordered today may be provided without metallic strength members or metallic sheathing. However, in those cases where a metallic strength member or metallic sheath is provided the metallic members must be bonded/grounded to the central office ground system at the CEF. When metallic cable is brought into the CEF bonding/grounding shall be accomplished as close as practicable to the entrance wall of the CEF per NEC.

R22-39 In Controlled Environmental Vaults (CEV), or on Customer Premises locations, the cable shall be bonded to the CEV common ground point per NEC.

22.9 Corrugated Plastic Innerduct

R22-40 Where inner duct is used to protect fiber cable non fire-rated inner duct shall not be used in the central office beyond the CEF entrance wall.

R22-41 The inner duct shall be plugged to prevent water, fire, gas, and steam penetration into the CEF.

R22-42 Innerduct shall be rated an oxygen index of 28% or greater.

**AT&T Generic Installation Requirements****22.10 Cable Splicing**

R22-43 Outside plant cable shall be spliced to riser cable within 50 feet of the entrance to the CEF or OCRF.

22.11 Fiber Optic Cable/Connector Testing

R22-44 The Installation Supplier shall test fiber optic cables, jumpers, or inter-bay fibers and their connectors to meet or exceed a combined power loss value and reflectance tests as required by the AT&T fiber SME. The test value requirement shall be documented in the MOP. The power loss shall be < 0.40 db and the objective shall be < 0.20 db. The reflectance shall be -40 db and the objective shall be -55 db. The Installation supplier shall refer to the requirements in GR-326-CORE, *Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies*.

R22-45 The test results shall be recorded on a test record form and turned over to AT&T at job completion.

22.12 Connector Cleaning

R22-46 The Installation Supplier shall clean each assembly, connector, and coupling before insertion per manufacturer's instructions.

22.13 Labeling

R22-47 Individual fibers (jumpers or breakout fibers) shall be marked at both ends with the source and destination termination point. Flag-type labels shall be used for labeling. The AT&T requirements for content shall be used.

R22-48 Caution signs shall be applied per AT&T requirements.



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23. Installer Skill Level Assessment

23.1 General

This section provides Installation Suppliers with minimum generic requirements associated with the skill levels of Installation Supplier personnel.

R23-1 The Installation Supplier shall demonstrate to the AT&T that they have a documented program for qualifying an installer on specific work activities and systems related to the skill level requirements indicated in this section.

R23-2 Installer Skill Levels 1 through 4-4A shall be recorded in the Method of Procedure (MOP) for each installer assigned to the job.

R23-3 The Installation Supplier shall use the installer's years of experience in a specific system(s)/environment(s) and their demonstrated ability to perform work operations/job functions associated with equipment installation or removal activities and formal education in a related accredited curriculum in assigning skill levels.

R23-4 In this section a "certificate of completion" from a training facility or "appropriate curriculum" are considered specific training for a piece of equipment or a procedure. The Installation Supplier shall have documented records for each installer identifying training successfully completed. As a minimum, the following training: AC/DC theory, equipment grounding, generic central office installation, power fundamentals, safety, required federal state and local standards and OSHA requirements are recommended subjects.

R23-5 While the years of experience listed for a skill 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 management representative must concur and assure that the installer has the appropriate skills and abilities to competently progress to the next higher skill level before the installer performs work operations/job activities associated with the higher skill level.

23.2 Competency Skill Levels

R23-6 All installation competency skill levels shall require a complete understanding of the equipment installation/removal requirements and procedures associated with the work operation/job activity being performed.



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R23-7 Installers at Skill Levels 3 and 4 shall require a complete and in-depth understanding of the equipment being installed or removed including requirements detailed in the related sections of this document, and the requirements stated in the installation requirements of AT&T where the work is to be performed.

R23-8 The installer shall be assessed and classified by skill level associated with each of the following systems/environments: Common Systems, Manufacturer Specific Switching, Transport or Power Equipment.

R23-9 Once classified at a specific skill level on a system/environment, the installer shall only perform work operations/job activities associated with that skill level unless properly supervised by an installer of the appropriate higher skill level per Table 23-1 or the installation supervisor.

R23-10 Skill Level 1 and 2 installers must be directly supervised and be directed by a Skill Level 3 or 4 installer or installation supervisor. The Skill Level 3 or 4 installer or installation supervisor shall be “on-site” to direct Skill Level 1 or 2 installers.

R23-11 A Skill Level 4 or 4A installer shall be the only level that may perform additions, removals, and modifications on working equipment and circuits.

R23-12 A Skill Level 4 or 4A installer shall be the only person who performs the work operations/job activities associated with the Critical Work Activities detailed in the MOP. However, a Skill Level 2 or 3 installer may assist as required.

23.2.1 Critical Network Elements

“Network Elements” that are considered critical to the network and sufficiently complex to require special installation will be installed, tested, and turned-up by the manufacturer of the equipment or by an installer who has been qualified to do so by a training facility approved by the manufacturer.

In order to install or test Category 4 network elements, the installer must obtain certificates of satisfactory completion of courses relating to the installation, testing, and turn-up of the network element.

R23-13 Critical work activities shall be defined by the Installation Supplier and AT&T representative for the specific job. Critical work activities may include, but not be limited to, Safety Issues, Power Additions/Transitions, activities associated with working equipment, or work activities that may jeopardize service.

R23-14 The Installation Supplier shall provide to AT&T, on demand, proof of the installer’s qualifications in the installer’s name and on the network element in question.

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R23-15 The Installation Supplier shall provide the installer with a skill level identification card to confirm on demand the installer's skill level.

R23-16 The installer shall also have a current copy of the documentation necessary to install, test and turn-up the equipment on-site.

R23-17 The following table lists the network element categories by their complexity and skill

level of the installer authorized to do installation, testing, and turn-up.

* These can assist (see [R23-9](#)).

Network Element Category	Type of Equipment		Installer Skill Level for Installation	Installer Skill Level for Testing and Turn-up
	Non-power or passive			
1	Cable	Relay Racks	1	3
	MDF Blocks, DSX	Battery Racks	2	4
	Panels	Power Panels	3	
	Ironwork	Equipment	4	
	Passive Bridges	Cabinets, Etc.		
	General purpose type equipment			
2	Rectifiers	Inverters	2	4
	Alarm Equipment	UPS	3	
	DS0 Level	Emergency Engines	4	
	DS1 Level	Batteries, etc.		
	Self-contained intelligent systems			
3	Fiber Optic	Radio Systems	2*	4
	Terminals	Video Systems, etc.	3	
	SONET		4	
	Terminals			
	Software driven intelligent systems			
4	Digital Cross-connect Systems	Signal Control Point (SCP)	Qualified installer at level:	Qualified installer at level:
	(DCS) Analog / Digital	ATM	2*	4
	Switching Systems	IP	3*	4A
	Signal Transfer Point (STP)	Routers	4	



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23.3 Installer Skill Levels

23.3.1 Skill Level 1

R23-18 Installers at Skill Level 1 shall:

1. Be directly supervised and instructed by a Skill Level 3 or 4 installer or the installation supervisor.
2. Be capable of performing the following work operations/job activities:
 - addition or removal of Common Systems equipment/hardware.
3. Not perform Skill Level 2 and above work operations/ job activities unless properly supervised.
4. Not progress to Skill Level 2 without a minimum of 1-1/2 years experience or equivalent as determined by the Installation Supplier's training process, and demonstrated to the AT&T Representative upon request, proficiency in the system/ environment (e.g., Common Systems) being worked on, or hold a certificate of completion from a training facility providing an appropriate curriculum.
5. Not perform work operations/job activities on working equipment or circuits.

23.3.2 Skill Level 2

R23-19 Installers at Skill Level 2 shall:

1. Have a minimum of 1-1/2 years experience, or equivalent as determined by the Installation Supplier's training process and demonstrated to the AT&T Representative upon request, proficiency in the system/environment (Network Elements 1, 2, or 3) being worked on, or hold a certificate of completion from a training facility providing an appropriate curriculum.
2. Be directly supervised and instructed by a Skill Level 3 or 4 installer or the installation supervisor.
3. Be capable of performing the following work operations/job activities:
 - addition or removal of Common Systems equipment hardware.
 - addition or removal of wiring and connections (on non-working equipment only and switchboard cable only).
 - lead verification/continuity testing.
4. Not perform Skill Level 3 or 4 work operations/job activities unless properly

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supervised.

5. Not progress to Skill Level 3 without a minimum of 3 years accumulated experience or equivalent as determined by the Installation Supplier training process.

6. Not perform work operations/job activities on working equipment or circuits unless directly supervised. Refer to Table 23-1.

23.3.3 Skill Level 3

R23-20 Installers at Skill Level 3 shall:

1. Have a minimum of 3 years accumulated experience, or equivalent as determined by the Installation Supplier's training process and demonstrated to the AT&T Representative upon request, proficiency in the system (Network Elements 1, 2, 3, or 4) being worked on, or hold a certificate of completion from a training facility providing an appropriate curriculum.

2. Be capable of performing the following work operations or job activities without supervision or direction:

- addition or removal of Common Systems equipment hardware.
- addition or removal of wiring and connections (on non-working equipment only).
- lead verification/continuity testing.
- analysis of job specifications and drawings.
- provide work assignments to skill level 1 and 2 installers.
- prepare a Method of Procedure (MOP).
- write Job Information Memos (JIM).
- resolve job specification and/or drawing problems.
- mark/correct office record drawings.
- in-process and final quality inspections.

3. Be capable of performing as the Installation Supplier's in-charge person on Common Systems jobs.



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4. Not perform Skill Level 4 work operations/job activities unless properly supervised.
5. Not progress to Skill Level 4 without a minimum of 6 years accumulated experience or equivalent as determined by the Installation Supplier's training process.
6. Not perform work operations/job activities on working equipment or circuits unless directly supervised. Refer to Table 23-1.

23.3.4 Skill Level (4)

R23-21 Installers at Skill Level 4 shall:

1. Have a minimum of 6 years accumulated experience or equivalent as determined by the Installation Supplier's training process and demonstrated to the AT&T Representative upon request, proficiency in the system (Network Elements 1, 2, 3, and 4) being worked on, or hold a certificate of completion from a training facility providing an appropriate curriculum.
2. Be capable of performing the same work operations/job activities as a Skill Level 3 installer without supervision or direction.
3. Be capable of performing as the Installation Supplier's in-charge person.
4. Be capable of performing additions, removals, and modifications on working equipment and circuits. Skill Level 4 work operations/job activities may include:
 - circuit modifications
 - software additions or upgrades
 - power transition work
 - addition or removal of batteries.
5. Addition or removal of circuits on working power distribution sources.
6. Equipment testing and turn-up.

23.3.5 Skill Level (4A)

R23-22 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.



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24. Workmanship Requirements - Raised Floor

24.1 Introduction

Raised floors are used to support various types of Central Office (CO) equipment including cabinets and frameworks/relay rack, etc. Generally, AT&T's building or real estate organization will provide the raised floor installation. The raised floor can be used to accommodate the cable distribution system for power, signal, and fiber facilities or can serve as an air plenum for cooling air. In some installations both cable distribution and cooling may be provided in the under floor area.

Three types of raised floor may be used in the CO: Stringer-less, stringer and structural platform type raised floors can be provided. The floor height may vary. Typically the pedestals are arranged in a 2 x 2-foot grid pattern to accept the floor panel.

Stringer-less type may be installed in seismic zones 0, 1, and 2 and consist of pedestals that support the corner of the raised floor tile. This type of raised floor may or may not have provision for mechanical attachment to the pedestal head. The stringer-less floor is significantly weaker than a stringered floor system and is not recommended for network or data center equipment installations.

Stringer type raised floors generally consist of vertical steel pedestals, comprised of steel floor plates, tubular uprights, an adjustable head for leveling, and rectangular stringers that span three pedestals and the floor tile. The pedestals are installed on 2-foot centers and should be mechanically fastened to the concrete floor. Steel channel stringers 4 feet long are fastened to each pedestal head to form a supporting grid for the floor panels. The stringers form an interlocking configuration. In some installations 2-foot stringers may be found. The stringers and pedestals support 2 x 2-foot panels.

Structural platforms consist of steel angle members that may be bolted or welded together and are supported by angle iron pedestals with leveling feet. Steel plate floor panels are bolted to the steel angle members and cabinets or frameworks can be bolted directly to the plate without need for uni-strut or threaded rod attachment into the concrete flooring.

24.2 General

R24-1 AT&T's standard is a twenty-four inch finish platform height although there are many existing raised floors that are three and four feet. Installation procedures are the same regardless of the height. Finished floor height is to be measured from concrete floor to top of removable panel.

R24-2 Cutting or drilling of floor tiles shall be done in an area designated by AT&T.

R24-3 The agreed upon cutting location shall be recorded in the MOP.



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R24-4 The Installation Supplier shall review Section 2, "Building Requirements," for additional information.

R24-5 When it becomes necessary to cut a tile that cannot be removed from the floor grid, the Installation Supplier shall protect the adjacent area from particles becoming air borne. An approved HEPA filter vacuum shall be used during the drilling or cutting operation to capture the particles.

R24-6 The Installation Supplier shall clean the under floor area in the vicinity of the installation prior to and after the work is complete.

R24-7 When the raised floor is used for air distribution the installation supplier shall provide adequate protection to prevent particles from becoming airborne above and below the raised floor.

R24-8 Holes or squares cutout in the floor tiles shall not exceed the manufacturer's recommendations, however, not to exceed 20% of the tile area.

R24-9 Cuts near the edges of the tiles shall be in accordance with the floor tile manufacturer's recommendations.

R24-10 The tile manufacturer's recommended protection system/material or an equivalent material shall be installed for all cutouts in the tile surface where cables pass through the tile.

R24-11 Tape shall not be an acceptable method of protection.

R24-12 At circular cutouts for threaded rods, an insulating bushing shall be installed.

R24-13 When cutting floor tiles for equipment mounting holes or cable penetration, the tile shall be marked with a template for the type of equipment cabinet or framework footprint.

R24-14 Floor tiles may be pre-drilled for equipment mounting when it is known that a consecutive frame will be added to a line-up in the future on a tile that will not be removable at that time.

R24-15 Tiles pre-drilled for future frames shall be equipped with a cover over the hole as required by AT&T and recorded in the MOP.

R24-16 Floor tiles shall be marked to identify the place in the grid they were removed from and their orientation on the stringer grid.



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24-17 When working in the under floor area, the Installation Supplier shall be aware of existing building management controls such as fire-detection heads, water detectors, chiller piping, etc., and under floor cabling so as not to damage these facilities.

R24-18 The Installation Supplier shall not store or leave material in the under floor area at any time.

R24-19 The Installation Supplier shall clean the tile of obvious scuffing or markings caused by the installation activity at the completion of the installation.

24.3 Safety

The Installation Supplier shall review Section 4, "Safety," for additional information.

CAUTION: The installation supplier shall be aware of airborne contaminants, such as concrete dust, that may be found in the under floor area and proceed in accordance with OSHA requirements.

R24-20 Prior to starting the equipment installation, the Installation Supplier shall verify the floor tiles are sitting into the support stringers with no high spots that might cause a trip hazard. Tiles that do not sit flush shall be reported to the AT&T representative.

R24-21 If the raised floor is not installed up to existing walls, railings should have been installed to prevent accidental falls. The Installation Supplier shall report these omissions to the AT&T representative.

R24-22 The Installation Supplier shall use the correct tile removal tool per the floor manufacturer's recommendation to remove tiles. AT&T will provide these tools.

R24-23 If multiple tiles are to be removed to place long runs of cable, the floor tiles shall be stored in a designated area where they shall not pose a trip or safety hazard. The tiles shall be stored flat.

R24-24 The Installation Supplier shall protect the area in accordance with OSHA requirements to alert people to the potential hazards posed by the removed tiles.

R24-25 Floor tiles are heavy and can have sharp edges, therefore, the Installation Supplier shall exercise caution per OSHA and AT&T requirements when handling, removing, and cutting the floor tile.

R24-26 The Installation Supplier shall not walk on the raised floor stringers.



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24.4 Cabling Overview

Running cable under a raised floor must be done in a manner similar to running cable overhead on cable racks. When establishing new Raised Floor areas or extending an existing Raised Floor, a specific cable plan record shall be created. When adding cables to an existing raised floor area where a document does not exist, a plan shall be created and the pathing for the added cables shall be documented. It is not required to document existing conditions unless negotiated as part of the specific order. All future orders to this area shall update this document. This cable plan shall be based on the AT&T development plan, architectural plan and existing telephony records. The AT&T AORS document shall be used as a guide.

The cable plan record shall be documented as a record in the –600 series. All cable paths shall be identified by cable routing coordinates and based on cable type. Cable shall be routed to maintain segregation, allow even cable loading and minimize under floor bridging. The cable must be neat, protected, sewn when on racks, and must not be mixed with other types of cable. The only cable racks used under the floor are for primary power cables from the power room. Cable Rack bridges are required when crossing a **primary** power rack. Secondary power feeders and transmission cable are run directly on the concrete floor. AC conduits are run separately and attached at the high end of the pedestals that support the raised floor. For the Fiber Protection System (FPS) placement refer to sect 22, Fiber Diversity and Protection Guidelines. Golden Path & Non Golden Path cables shall be run according to the Golden Path guidelines. Fire Detection and Ground wires shall be run separate from transmission cables.

Transmission cables shall be run on the concrete following the cabling rules

24.4.1 Raised Floor Cabling Rules

R24-27 Cable paths shall be designated and recorded in a – 600 series job drawing. No deviations are allowed.

R24-28 All cable diversity rules such as “Golden Path” and power must be followed under the floor as well as above.

R24-29 Transmission cable to be run neatly directly on concrete floor in designated paths and protected from all sharp metal edges.

R24-30 Primary power cables shall be located on a cable rack and recorded on –600 series drawing and sewn as necessary.

R24-31 Secondary power cables and coaxial cables shall be run on the concrete slab and shown and recorded on the –600 plan drawing.

R24-32 Cable rack bridges should be used for cross aisles per the office cable plan to prevent mixing of primary power cable.

R24-33 Refer to sect 22 Fiber Diversity and Protection Guidelines document for method of placing FPS (Fiber Protection System) or riser cables.



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R24-34 Primary power runs from power room to PD/BDFB are to be secured on cable racks under the raised floor. Cable racks to be mounted on u-channel and must be grounded to central office ground (COG), not isolated ground.

R24-35 Primary Distribution that feeds equipment directly (not through a secondary distribution bay), is allowed to use the primary distribution racking system until it reaches the equipment area. While it is on the primary rack, such distribution shall meet all primary distribution requirements. Once it leaves the primary rack, it shall be treated as secondary distribution.

R24-36 Secondary power feeders from a PD / BDFB are to be run on concrete floor. If red and blue wire is used, they shall be diversified. They can be run under the same lineup, but should be banded on opposite sides of the lineup.

R24-37 Secondary power wire shall be bundled at least every six feet. This bundling may be accomplished by using either waxed twine or plastic wire ties.

R24-38 If red and blue wire is used, the red wire bundle shall be separated from the blue wire bundle by a minimum of four (4) inches except at the input to equipment bays or "cross-over" points.

R24-39 When secondary power distribution cables must cross, they should do so at as close to a 90-degree angle as possible. and with as little contact as possible. The wire bundle that is on top shall be fiber wrapped at the cross point. The fiber wrap shall be secured with either twine or a plastic tie wrap.

R24-40 At power wire crossover points there shall only be two bundles. Additional wire must be placed in existing bundles and NOT in additional bundles on top of the existing two bundles. No installation shall cause an interweaving or mixing of cable types (secondary power, signal). Secondary power cables shall always be on the lowest level of the crossing.

R24-41 Under normal conditions, floor stringers "Shall Not" be removed to install cables. If office and/or job conditions require the stringers to be removed, the procedure must be listed in the MOP and approved by the appropriate AT&T representative.

R24-42 The area under the Raised Floor shall not be used for storage.



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24.4.2 Bringing cable up from under raised floor

When bringing cable into racks/cabinets, the removable raised floor tile is cut to the rack/cabinet template, with the edges of the cut hole properly lined to protect the cable. There are several trim products that can be used to line/trim the tile edges of the cut out or hole to protect the cables from the sharp edges of the cut tile (**tape of any kind is not allowed**). Additional details may be found in ATTP760-200-110.

These trim products or equivalent are recommended:

R24-43 “F” Trim Cut-Out Molding/Trim and “Cut Out Sponge Seal”. The “F” shaped trim is used for square shaped cut outs, it is attached to the top/bottom of the tiles with pop rivets or screws. The Sponge Seal is inserted in the F groove and slits are cut thru it to pass cables thru. This product has to be cut to fit and can be obtained from Maxcess Floors or other manufacturers.

R24-44 “L” shaped Cut Out Molding/Trim is used the same as the “F” trim but has no groove for the Sponge Seal. This trim is attached to the tile the same as the “F” trim. This product has to be cut to fit and can be obtained from Maxcess Floors, Grom Tek or other manufacturers.

R24-45 Some manufactures provide pre-cut square, rectangular and three sided trims cutout to certain sizes.

R24-46 For simple round cut cutouts, the industry has available various diameter round grommets i.e. 2”, 3”, 4” & 5”. They can be purchased from Maxcess Floors or other manufacturers. If an “F” or “L” type Molding/Trim is used on a round cutout it must be secured to the tile with pop rivets or screws. The intent is to ensure the Molding/Trim does not dislodge of time resulting in damage to the cables.

24.4.3 Cable racks

The only cable racks used under the raised floor are for the primary power cable from the power room & vertical racks to cable enclosures.

These cable racks must meet these requirements:

R24-47 Horizontal cable rack must be mounted on u-channel anchored to the concrete floor.

R24-48 Cable rack must be grounded to integrated ground.

R24-49 Cables in vertical rack to cable enclosure must be secured on every strap and rack must be grounded to integrated ground.



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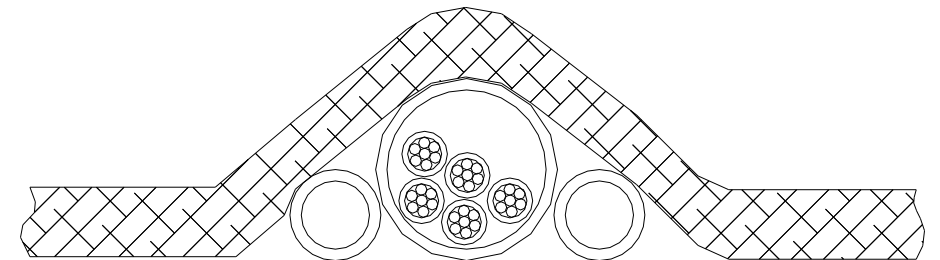
24.4.4 Raised Floor AC Distribution

R24-50 The vendor shall provide AC wiring and appropriate conduit to feed power from the customer's AC system. AC wiring shall conform to National Electric Code.

R24-51 AC wiring shall be run in an appropriate conduit per code. The conduit shall be supported from the floor pedestals (located near the top). **AT&T does not want the conduit or raceway run on the concrete slab.**

AT&T Generic Installation Requirements**24B.4.4 Conduit Crossing**

R24-52 Conduits run under raised floors shall be mounted on the pedestals and not flat on the slab floor. Unfortunately we do have sites with conduits mounted directly on the floor. When you need to cross these installations with cables that will lie directly on floor surface you must create a ramp structure over the conduit. This is not a “bridge” structure as used to cross over primary power cables under the floor. AT&T is not looking to eliminate direct contact with the conduit. The intent is to eliminate sharp approach and departure angles that could exceed bend radius limits and damage cables. The ramping structure can be created with little effort and expense. A preferred method is to obtain sections of conduit that are one half the diameter of the existing floor mounted conduit. The sections shall be sized to provide enough space for current and future crossing cables. This is usually equal to the spacing of the floor pedestals (2'-0"). The cut ends of the conduit shall be deburred prior to placement. Grommets should be applied to the open ends of the ramping conduits. The ramping conduits shall be placed on both sides of the existing conduit and secured in place. The conduit sections may be secured in any manner approved for securing cables within that type of office. The simplest method of securing is to tie the conduits together with waxed cord (nine cord). IDC locations may use permanent plastic ties. If plastic ties are used, place the locking heads of the ties where they will not interfere with the cable runs. Metal brackets should be avoided to prevent the introduction of surfaces that may harm the cables. No ramping shall occur at a location where the conduit contains a box. Ramping may occur at locations of slicing in the original conduit run. If this is done the splice fitting shall be fiber wrapped prior to the application of the ramping assembly.





AT&T Generic Installation Requirements

24.5 Raised Floors where equipment does not attach directly to the tile, (Tate Floors or equivalent).

24.5.1 Overview

For all new telecommunication equipment space, AT&T is requiring that the equipment be mounted on a raised, seismic Equipment Mounting Platform System (EMPS) **ATTP 760-200-110**, similar to that used in computer facilities. This platform was originally developed to be compatible with all equipment designs & seismic zones. However floor manufacturer must be consulted when placing this EMPS in seismic zones 2B-4.

If you have any questions on the above EMPS practice, please contact Russell McNeice on (910) 793-4834, or E-Mail mcneice@att.com

24.5.2 Equipment Installation

Leveling of equipment

R24-53 The raised floor is laser leveled at time of the floor installation so no leveling blocks or shims should be necessary to level the frames. This is especially important in seismic zones 2B and higher as leveling blocks would cause a rocking motion of the frames during an earthquake. If a vendor finds the floor is not level they should contact the AT&T Equipment Engineer.

24.5.3 Cutting and drilling of removable floor tile

R24-54 Mark removable floor tile for the cable access from below into the cabinet using template supplied by frame vendor, floor plan drawing, or place frame in proper footprint and mark the tile from the base of the frame or cabinet. Mark the tile for the frame anchoring holes in the same manner. Remove the tile, cut cable access holes, and drill anchoring holes through the tile in an area away **from the equipment** to make sure the equipment area is not contaminated with metal shavings. If the floor plan identifies a future frame on the same tile as the one you are adding a frame, it is necessary to drill and cut the tile for the future frame as you cannot remove the tile later.

**AT&T Generic Installation Requirements****24.5.4 Framework Anchoring Details**

(These standards are listed here on a temporary basis. An anchoring practice is being developed by Infrastructure Standards. The new standard will replace this section when completed)

(Some additional anchoring information may be found in ATTP 760-200-110)

R24-55 To anchor framework to a raised floor, the vendor must first know what earthquake zone the equipment is being installed in. **In zones 0 -2A, the frames shall be secured to the raised floor with four short ½ in threaded rods through two u-channel sections mounted perpendicular to the aisle and across the bottom of the floor tile and stringers. In zones 2B – 4, the frames shall be secured by using four ½ inch threaded rods extending through the raised floor and connected to the concrete below with seismic anchors using coupling nuts.** Standard hold down parts are used on top of the floor for all zones with the only difference being the length of the threaded rod. Anchors and hold down material has to be engineered for proper seismic zone. It will be necessary to use alternate anchoring holes in the event the primary holes are obstructed by the stringers supporting the removable tile.

24.5.5 Seismic Zones 0 - 2A

R24-56 To fasten cabinets or bay frameworks to a raised floor, place two 1-5/8 x 1-5/8 u-channel sections under the stringers. The sections shall be placed perpendicular to the equipment aisle with the continuous slot down. “C” clips shall be used to cover the bottom slotted ends of the u-channel where the threaded rod goes through, to prevent it from spreading when compressed. Use hold down plate engineered for that frame, use two ½ inch threaded rods per U channel, nut, washer, **insulating bushing** and hold down washer on the base of frame. Use “C” clip, washer, lock washer, and nut on bottom of u-channel. The u-channel should not extend more than four inches past the edge of the stringers or it will block access under the floor. End caps must be used on the u-channel to prevent injury. Torque the nut to 30 foot pounds. Do not over tighten as the tile will become deformed and will be uneven with surrounding tiles

24.5.6 Seismic Zones 2B - 4

R24-57 In seismic zones 2B and higher, U-channel is not used. Frames shall be anchored in all four corners. Four ½ inch threaded rods are run down to seismic anchors with coupling nuts from the concrete floor. Use hold down plate engineered for that frame, four ½ inch threaded rods, nut, washer, **insulating bushing** and hold down washer on the base of frame. Torque the nut to 30 foot pounds. Do not over tighten threaded rods as floor tile will deform and make floor uneven.



AT&T Generic Installation Requirements

24.6 Raised Floors where equipment attaches directly to the tile, (Maxcess Floors or equivalent).

24.6.1 Overview

For all new telecommunication equipment space, AT&T is requiring that the equipment be mounted on a raised floor. Requirements for this floor are detailed in **ATTP 760-200-110**. Variations of this Raised Floor have been specially developed to be compatible with all equipment designs and to meet all seismic requirements.

If you have any questions on the above EMPS practice, please contact Russell McNeice on (910) 793-4834, or E-Mail mcneice@att.com

24.6.2 Equipment Installation

Leveling of equipment

R24-58 The raised floor is laser leveled at time of the floor installation so no leveling blocks or shims should be necessary to level the frames. This is especially important in high seismic zones as leveling blocks would cause a rocking motion of the frames during an earthquake. If a vendor finds the floor is not level they should contact the AT&T representative and they will make sure the floor is level before starting the installation.

For additional information refer to **ATTP 760-200-110**.

24.6.3 Cutting and drilling of removable floor tile

R24-59 Mark removable floor tile for the cable access from below into the cabinet using template supplied by frame vendor, floor plan drawing, or place frame in proper footprint and mark the tile from the base of the frame or cabinet. Mark the tile for the frame anchoring holes in the same manner. Remove the tile, cut cable access holes, and drill anchoring holes through the tile in an area away **from the equipment** to make sure the equipment area is not contaminated with metal shavings. If the floor plan identifies a future frame on the same tile as the one you are adding a frame, it is necessary to drill and cut the tile for the future frame as you cannot remove the tile later.

For additional information refer to **ATTP 760-200-110**.

24.6.4 Framework Anchoring Details

R24-60 To anchor framework to a raised floor, the vendor must first know what earthquake zone is the floor designed for and the seismic zone where the floor is being added, he shall then refer to **ATTP 760-200-110** for anchoring information and details.

It will be necessary to use alternate anchoring holes in the event the primary holes are obstructed by the stringers supporting the removable tile.



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24.7 Floor and Equipment Grounding

The raised floor system will be provided by AT&T at the time of installation with grounding to the Central Office Ground (COG) system. A minimum # 1/0 AWG main bonding conductor should be provided and run as near as practical through the center of the raised floor. This conductor will be grounded at the COG bus. A # 6 AWG conductor should be placed in a ring configuration around the perimeter of the raised floor area. The perimeter ring ground conductor should be connected to the # 1/0 AWG main bonding conductor in two places at opposite sides of the raised floor. The # 6 AWG perimeter ring conductor should be bonded to pedestals in each corner of the raised floor. Additionally, # 6 AWG bonding leads should be connected to the perimeter ring ground and to pedestals at no greater than 20 conductor feet intervals. This system shall not be used for two-way radio transmission sites.

R24-61 The Installation Supplier shall review Sections 18 and 19 and AT&T's requirements for Bonding and Grounding before grounding the equipment supported by a raised floor.

R24-62 AT&T and the Installation Supplier shall locate the physical connection of the COG connection at the raised floor ring ground.

R24-63 The Installation Supplier shall verify that the raised floor main bonding conductor is connected to the COG bus.

R24-64 The Installation Supplier shall verify that the main bonding conductor is connected to the raised floor ground conductors (ring ground).

R24-65 If the verification finds the raised floor ground system is not complete, the Installation Supplier shall notify the AT&T representative to get the defect corrected before the installation starts.

R24-66 When the raised floor is supporting equipment that is single point grounded (an isolated ground plane), a # 6 AWG conductor shall be bonded to the raised floor ground system and connected to the Main Ground Bus (MGB) in the Ground Window (GW) on the integrated ground side.

R24-67 The Installation Supplier shall ensure the isolated ground plane equipment is not violated when installing and grounding the equipment.

R24-68 When the raised floor is supporting equipment that is part of the integrated ground plane, the Installation Supplier shall not ground the equipment to the raised floor grounding system. Equipment shall be grounded to the CO ground system. Equipment line-up horizontal equalizers shall be less than 50 feet.

R24-69 Equipment ground conductors shall be visible when the floor tiles are removed.



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R24-70 Ground conductors shall be segregated from other cabling/wiring.

R24-71 Equipment ground conductors shall be a minimum # 6 AWG, insulated and secured to the raised floor pedestals. The ground conductors shall be insulated from the raised floor metallic parts.

24.8 Firestopping

R24-72 The Installation Supplier shall review the firestop requirements found in Section 12, "Workmanship Requirements - General Firestopping Considerations."

R24-73 The Installation Supplier shall verify and use only the type of fire stop material approved for use in AT&T.

R24-74 Openings through fire-rated walls or floors below the raised floor system shall be firestopped.

24.9 Designations

R24-75 The Installation Supplier shall designate the location of under floor bus bars when these bus bars are mounted to the building columns. The designation shall be located on the column at a position agreed upon with the AT&T representative.

R24-76 The designation shall be made on the building column using the stencil or label method approved by AT&T.

R24-77 The identification shall be at a height and location and letter size agreed upon with the AT&T representative.

R24-78 The Installation Supplier shall designate the location of under floor power chandeliers on the Power Distribution Cabinet (PDC) or Battery Distribution Fuse Board (BDFB) supplied by the chandelier(s). The identification shall also be permanently placed on the floor tile above the ground bar or power chandelier.

R24-79 The stencil shall be with AT&T-approved stencil or label maker agreed to by the AT&T representative.

24.10 Equipment Frame and Aisle AC Power/Lighting

R24-80 AC conduit shall be mechanically secured to the building and floor pedestals per the NEC requirements.

R24-81 AC conduit shall be secured toward the top of the floor pedestals.

R24-82 AC conduit shall be secured to every third pedestal.



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R24-83 All junction boxes or pull boxes installed in a run of conduit shall be securely fastened in place.

R24-84 When installing conduit or AC power to equipment installed in an isolated ground plane, the Installation Supplier shall follow all the Bonding and Grounding precautions so as not to violate the isolated ground plane requirements.

R24-85 The Installation Supplier shall review Section 19, "Workmanship Requirements - Isolated Ground Plane," for further information on isolated ground planes bonding and grounding and AT&T requirements.

R24-86 Under floor outlets or power to equipment on the raised floor shall be on a separate circuit from those providing lighting.

24.11 Equipment Removals

R24-87 The Installation Supplier shall review the requirements in Section 20, "Workmanship Requirements - Equipment Removals," prior to starting any equipment removal.

R24-88 All cabling previously connected to the removed equipment shall be removed from the under floor area as detailed in the job specification.

R24-89 The Installation Supplier shall verify the reuse or replacement of floor tiles with the AT&T representative prior to the job start.



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51. Alarm Standards Manual

These instructions are controlled by the NPQ organization and are covered under AT&T Practice ATTP 154-103-101.

If you have any questions on the content of this Alarm Practice, please contact Robert P. Butler on (770) 483-2766, or E-Mail rpbutler@ems.att.com



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53. Earthquake & Disaster Bracing

AT&T standards for Earthquake and Disaster Bracing are incorporated in Practice Numbered 800-610-155.

If you have any questions on the above EMPS practice, please contact Russell McNeice on (910) 793-4834, or E-Mail mcneice@att.com



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Appendix A: Glossary

A

ABAM Cable — Multiple pair cable with a foil type (non-braided) shield.

AC — Alternating Current

ALTERNATING CURRENT EQUIPMENT GROUND (ACEG) — Alternating Current Equipment Ground used to provide fault current return path for faults to ground in A.C. power systems.

aisle distribution cabinet (ADC) — A power distribution cabinet at the end of an aisle used to fuse a line-up of frames.

ANALOG — Technology that deals with constantly varying signals.

ANCHOR BOLTS — Fasteners that hold central office equipment to the floor.

ANTISTATIC PROTECTIVE CASING — Specially treated casing designed to store electronic components in a static free environment.

APPLIANCE OUTLETS — Alternating current outlets (usually 117 volts AC, 60 hertz)

ARMORED CABLE — Cable with outer metallic flexible protective casing (example: BX cable).

AS BUILT — The final product as installed. This may be the result of an emergency installation with no drawings available at the time or because office conditions were different from the drawings provided.

AT&T REPRESENTATIVE — This would normally be the person responsible for the installation activity (typically the equipment engineer) but this function can be assigned to other personnel or organizations within AT&T.

AT&T PREMISES — Central offices or other AT&T owned or leased facilities where telecommunications equipment is presently installed, will be installed, or removed.

AT&T ENGINEER — The AT&T Engineer (i.e., Equipment Engineer, Facilities Engineer, Power Engineer, Switching Engineer, Real Estate Building Engineer, Outside Plant Engineer, etc.) who initiated and is responsible for the job.

AT&T REQUIREMENTS — Requirements that are defined by AT&T.

AUXILIARY FRAMING — Framing channels, in a 20-foot by 20-foot grid arrangement, consisting of high and low level structures. These structures are used to support cable racks, equipment frames, ladder tracks, ground pipes, etc. Auxiliary framing is defined as high and low level and primary and secondary framing. High level framing is located closest to the ceiling while low level is the framing closest to the equipment frames. Primary framing is defined as the framing that is run perpendicular to the equipment frame line-up while secondary framing is run parallel to the equipment frame line-up.

AWG — American Wire Gauge. A standard for measuring the size of wire.

B

BACK PLANE — A printed circuit assembly on the rear of circuit pack shelves where connectors or wiring is terminated. Circuit boards usually plug into the backplane.

BANDING CABLE — The putting together of multiple cables into one bundle.

BATTERY — A group of cells connected together to furnish current by conversion of chemical action into electrical energy.

BATTERY DISTRIBUTION FUSE BAY (BDFB) — Secondary distribution point for DC power. Associated fuses are located at this point.

BATTERY RETURN CONDUCTOR — The return conductor (usually the positive side of the supply) of a -48 volt or -24 volt plant.



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BAY — A unit, also known as a relay rack, into which central office equipment is mounted.

BENDING RADIUS — A measure of the bend of a cable. The radius of a circle of which the arc of a bend follows.

BONDED — The permanent joining of metallic parts or conductors to form an electrical conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

BONDING — The permanent joining of metallic parts to form an electrical conductive path.

BRAIDED CABLE — Cable made in the form of a braid that is generally used for grounding.

BRACES/BRACING — That which is used to add rigidity to the auxiliary framing, cable racks, etc. Typically a diagonal member which is used to prevent swaying or whipping.

BUILDING MANAGER — A manager for a telecommunications carrier facility or site. This person might be responsible for the entire building or a specific entity within a building.

BUTTING — The stripping away of the cable sheathing exposing the inner conductors of the cable.

BX CABLE — A form of armored cable, used for AC service, where the armor is flexible.

C

CABINETS — Framework enclosed with a top, sides, front and rear doors. Cabinets can contain equipment mounted on pre-drilled and tapped side rails.

CABLE — A number of insulated conductors assembled in a compact form and covered by a flexible, waterproof protective sheath.

CABLE BINDER — A sector division within a cable, dividing that cable into groups of conductors.

CABLE BUTT — The place where the cable sheath is cut, secured and stripped, exposing the individual wire which will be fanned out and connected.

CABLE DESIGNATION TAG — Cable Designation Tags used to identify the opposite terminating ends of switchboard, power and grounding conductors.

CABLE DISTRIBUTION SYSTEM — The system of cable rack and iron work that defines the cable routes for interconnecting network equipment. The cable distribution system can be found overhead or under a raised floor environment.

CABLE ENTRANCE FACILITY — Also may be known as the Cable Vault and is the entrance of subscriber, trunk and fiber optic cables to the facility. The CEF is usually located in the basement of the building; however, it may be located on the first floor near the Main Distributing Frame.

CABLE FANNING — The process of bringing the wires from the butt end of a cable into position to be placed through a fanning strip to a terminal strip or apparatus, or where no fanning strip is provided, the loose wire shall be stitched with break-out points for individual leads to be connected to terminals or apparatus.

CABLE FORMING — The process of forming cable wiring horizontally or vertically to conform to the arrangement of the associated apparatus. Break-out points will be where skinners are needed to connect to apparatus or terminals.

CABLE HOLE — An opening through which cables are run. This opening can be in a floor, ceiling, or wall.

CABLE LABEL — A tag used to identify a cable.



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CABLE MINING — The bulk removal of cable from the cable distribution system.

CABLE OPENING — A form of a cable hole or cable slot through which cables are to be run.

CABLE RACK — Metallic structure, in a ladder configuration, on which cables are run.

CABLE ROUTING — The method of running cable from one piece of equipment to another and generally supported by cable racks.

CABLE SECURING — The method of keeping cables or wires fastened to mounting brackets or cable racks in a neat organized fashion.

CABLE SLOT — An elongated opening through which cables are run. These openings can be in the floor, ceiling, or walls, and are usually applied to main distributing frames and secondary power distributing points.

CABLE SPLICING KIT — A kit consisting of splicing and tracing equipment.

CEILING INSERT — The point of attachment at the ceiling of a room or building for rods, braces, or other attachments.

CELL — A single containment of electrolyte and lead plates. Individual cells connected in series make up the central office battery supply.

CELL POST PLATES — A flat plate bolted to the first and last cell in a battery string and is used to connect battery and battery return cables to bus bars.

CENTRAL OFFICE (CO) — A location where Switching, Transmission and Power equipment that provide telephone service is centralized.

CENTRAL OFFICE GROUND (CO GRD) — This is a system of conductors designed to provide a low impedance reference to the building's principal ground point. The system consists primarily of a vertical equalizer, CO GRD buses, and horizontal conductors. The system provides ground reference for frames and power supplies.

CENTRAL OFFICE GROUND BUS (CO GRD BUS) — A Central Office Bus that references the principal ground point through the vertical equalizer. Usually, one of these buses is provided on each floor to permit the grounding of frames and power supplies as required. Larger buildings may have more than one of these buses.

CENTRAL OFFICE ENGINEER (COE) — The individual who is responsible for equipment in a centralized equipment location.

CENTRAL OFFICE RECORDS — The drawings specific to a particular Central Office often referred to as "T" base drawings.

CIRCUIT — A group of electronic components and their interconnections.

CIRCUIT BREAKER — A mechanically resettable unit that disconnects a circuit at a specifically defined current.

CLAMP-ON AMMETER — A meter equipped with a sensor that can be opened and placed around a conductor to read current without having to interrupt the circuit.

CLEI™ — COMMON LANGUAGE ® Equipment Identification: code used to identify equipment.

CLLI™ — COMMON LANGUAGE ® Location Identifier: code used to identify a building or site.

COAXIAL CABLE — A type of cable used for high frequency transmission. It consists of a central conductor surrounded by insulation. This in turn is surrounded by a circular outer conductor.

COMMON SYSTEMS — The equipment that is common to other specific equipment in a telecommunication carrier's facility. Examples of common



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equipment are alarm systems, rectifiers or power sources.

CON NUMBER — Control Order Number that identifies a specific job.

CONDUCTOR — A constrained medium for the transfer of electrical charges.

Examples of grounding conductors are the Vertical Equalizer, Grounding wires used to interconnect frames in a Stored Program Control Switching System, and the Alternating Current Equipment Ground Conductor.

CONDUCTOR FEET — Distance measured along the conductor between points A and B.

CONDUIT — A circular channel which encircles metallic electric conductors.

CONTROLLED ENVIRONMENTAL VAULTS — A concrete or fiberglass container that may be buried in the ground and provides permanent housing for telecommunication equipment. The CEV also provides an environmentally controlled environment for the equipment.

CORROSION REDUCING AGENT — A specific type of compound that is used in electrical installations to prevent metal corrosion.

NOTE - Corrosion reducing compounds that can flow or migrate to a cell top shall not be used on cell post connections. Connections to cell posts shall be treated by application of an anti-corrosive compound to be approved by the AT&T representative or battery manufacturer.

CRIMP — A mechanical method of compressing a conductor into the barrel of a connector.

CRIMP CONNECTOR — A connector that is terminated by mechanical means. Can be a threaded, pressure, or irreversible crimp type connector.

CRIMPING SLEEVE — An inner and outer circular ring which is crimped to bond the outer sheath of a shielded cable to a ground.

CROSS-AISLE RACK — Cable rack located at a right angle to equipment frame line-ups.

CUSTOMER PREMISES — An area, room, or building that contains the telecommunications equipment for a customer of a AT&T.

D

DAISY CHAINING — A series connection that may start at one end of an equipment line-up and connect through each of the subsequent frames to the last equipment. If a frame is removed or the connection opened, the remaining frames would also be disconnected from the source.

DC — Direct Current.

DETAIL ENGINEERING — That portion of the engineering job that identifies all the materials required for an installation, layout of equipment, development of specifications and drawings etc., and the provision of the instructions for the installation.

DIGITAL — A technology that deals with discrete signal levels rather than constantly varying levels.

DIGITAL SWITCH — A central office switch whose internal workings are based on digital technology.

DISTRIBUTING FRAME — A physical piece of hardware where cross connections are made.

DRESSED CABLE — Cable that is organized by sewing or tie wrapping to support equipment terminations.

DUCT WORK — An enclosed pathway in which cable, wire, air etc., is run.

DUMMY BLOCK — Spacers that are used for rigidity in specific types of distributing frames.



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E

EARTHQUAKE BRACING — Various methods of supporting central office equipment, whose inherent design is based on surviving earthquakes.

ECC — Emergency Control Center which handles emergencies on a 24-hour basis.

ELECTROMECHANICAL SWITCH — A central office switch whose internal workings are based on analog switching technology such as relays, selectors, and switches.

ELECTROLYTE — A mixture of distilled water and acid that is used in storage batteries.

ELECTRONIC SWITCH — A central office switch whose internal workings are based on electronic switching circuits.

ELECTROSTATIC DISCHARGE (ESD) — The discharge of high voltage, caused by static charging.

EQUIPMENT FRAMES — Structures of various heights used to mount central office equipment (example: relay racks, bays).

ESAC — Electronic Systems Assistance Center used for support of stored program control switches.

ESS — Electronic Switching System

ESSENTIAL SERVICE — Essential service is a service offering whereby the service provider guarantees priority protection. This service may be related to safety, security or priority communications.

EXOTHERMIC WELD — The use of graphite molds and metallic powder to produce molten copper.

F

FASCIA ANGLE — Angle type iron secured to the ceiling around the perimeter of a cable penetration and used to secure ceiling cover plates or partitions to a cable hole or slot.

FIBER OPTIC CABLE — A transmission cable that is made up of multiple fibers typically used to connect network elements or to the outside plant facilities.

FIBER OPTIC JUMPER — A single or multiple fiber which is used to cross-connect from one equipment frame to another, or from one unit of equipment to another within an equipment frame.

FIELD ENGINEERING SPECIFICATION — Generally, the engineering of a job while performing a site survey identifying changes and recording office conditions.

FIREBLOCK — A ready-to-use, intumescent flexible block used to firestop - seal cable penetrations.

FIRESTOPPING — Various methods that block openings from passing fire from one side of the opening to the other.

FORMED FIBER — A protection material to be placed on sharp objects to prevent cable abrasion, e.g., threaded rod, cable rack, etc.

FRAMEWORK GROUND — A protection ground consisting of a conducting path to ground non-current carrying frames, cabinets, and other metallic objects in the communication system.

FRAMEWORK/FRAME — Framework and frame shall be considered to be synonymous, and are defined as the metal structure or enclosure which supports equipment and apparatus.

FUSE — An apparatus that detects excessive current flow and opens a circuit at a preset current flow. Fuses are used for the protection of a circuit.

FUSE CLIPS — Projections that physically hold fuses in place.



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FUSE RECORD SHEETS — Record of equipment assignments to specific fuse positions in a fuse bay.

G

GROUND — A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

GROUND BARS — A metal bar on which ground cables are terminated.

GROUND BUS — Metal conductor, of various forms, onto which equipment grounds are terminated.

GROUND WINDOW — The ground window is a sphere with a three-foot maximum radius centered on the Main Ground Bus (MGB). The ground window is the interface between the building's integrated ground plane and the isolated ground plane. Any bond to the ground window shall be within three conductor feet of the center point of the sphere.

GROUNDING ELECTRODE CONDUCTOR — The conductor used to connect the grounding electrode to the equipment grounding conductor and/or to the grounded conductor of the circuit at the service equipment, or at the source of a separately derived system.

Example: In the AC service entrance switch gear of a building, the conductor that interconnects the insulated neutral bus with the office principal ground point bus bar.

H

HAZARDOUS MATERIAL — Those chemicals or substances that have been identified by a governmental agency as being physically hazardous or health hazards to persons or the environment.

HAZARDOUS WASTE — Those hazardous materials or substances as described above that will be disposed of and not reused.

HEAT SHRINK — A tubular sleeve or boot placed around conductors, then heated with a heat gun. This heating causes the tubing to shrink around the conductors.

HIGH LEVEL FRAMING — See definition for auxiliary framing.

HORIZONTAL EQUALIZERS — The term "Horizontal Equalizers" has two separate definitions:

- Conductors of relatively low impedance that interconnect the battery return voltage terminals in separated distribution cabinets. These equalizers keep the return voltage difference between loads in separated frames at an acceptable value during periods of high loads.
- Conductors that extend from the CO GRD bus on each equipment floor to the ground systems of D.C. power plants and power distribution systems, and to equipment frames, racks, cabinets, and other metallic components on that floor.

I

INCIDENTAL GROUND — An unplanned grounding connection. These ground paths exist within a building through such items as structural steel, water piping, air ducts, superstructure, conduits, raceways, reinforcement rods, cable racks, and other conductive objects that are installed for purposes other than to provide ground paths.

INSPECTOR — The AT&T person(s) which have been assigned to observe or inspect the job during the job interval.

INSTALLATION ACTIVITY — Any activity including, but not limited to, additions, modification, and/or removal of telecommunications equipment, or any services associated with telecommunications equipment.



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INSTALLATION SUPPLIER — Any person or organization contracted by AT&T to install, modify, remove or otherwise provide a service involving telecommunications equipment.

INSTALLATION SUPERVISOR — The installation supervisor may be a skill level 3 or 4 installer assigned the responsibility or a management person from the installation supplier's company who is responsible for this installation work.

INSULATORS — A non-conductive material used to isolate conductors (example: outer covering on wiring, fiber washers mounted on equipment anchors).

INTEGRATED GROUND PLANE — A set of interconnected frames that are grounded by making more than one connection to a ground reference. A multitude of connections to ground reference is made from these objects to reduce voltage drops to acceptable levels.

INTUMESCENT MATERIAL — A chemical composition that expands to a greater volume than its original volume when exposed to heat. Used as a fire barrier typically for cable holes in central offices. Material is available as moldable putty pads, strips or sticks.

IRONWORK — This is a general term used to describe high or low type auxiliary framing and its associated support and/or bracing material.

ISOLATED BUSHING — Insulating washers that are installed between equipment frames and equipment frame floor mounting anchors.

ISOLATED GROUND PLANE — A set of interconnected equipment frames that is intentionally grounded by making only one connection to a given ground reference.

J

JACK BOXES — Electrical boxes containing jacks, on distributing frames, used for testing and communications.

JAR — The bottom and side containment of a cell, made of tough, fire resistant, polycarbonate material.

JOB DOCUMENTATION — All documented information that is used (or provided for use) when installing, removing, and/or modifying equipment.

The following examples of job documents should be viewed as examples only and are not intended to be all-inclusive:

- Detailed engineered job specifications (prepared by AT&T or an outside supplier)
- AT&T equipment orders
- Field engineered job specifications (prepared by AT&T or an outside supplier)
- Central office record drawings (Office Base Drawings)
- AT&T requirements documents
- Product manufacturers' standards, assembly, and/or maintenance documents/drawings
- Method of Procedures (MOP)
- Job Information Memo (JIM).

JOB CONTROL NUMBER — The Job Control number (Con Number) is an identification that engineering assigns to a unique job. It may also be the Telephone Equipment Order (TEO).

JOB SUPERVISOR — The AT&T Supervisor responsible for the equipment after the installation is complete.

K



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KILOVOLT-AMPERE (KVA) — A measure of power related to central office power equipment.

L

LABEL MAKER — A commercially manufactured tool used for producing labels. This tool should produce permanent and legible markings in different letter size and color with adhesive backing.

LABELING — Labeling is the process of placing a designation on a piece of equipment.

LADDER TROLLEY — That portion of the rolling ladder assembly between the ladder and the rolling ladder track. The trolley assembly rides within the ladder track.

LID — The top of a cell or battery.

LISTED — The process of listing a piece of equipment that has been tested to and complies with the equipment manufacturer's specification. The testing is accomplished by an independent national testing laboratory and carries the testing laboratories listing as compliant.

LIVE CABLE — Cable that has power or electronic signals going through it.

LIVE CIRCUIT — A circuit that has power connected to it and is working.

LINE-UP RACK — Cable rack located parallel to equipment frame line-ups. A line-up rack may be located over the equipment frames, or over the aisle at the front or rear of the equipment frames.

LOW LEVEL FRAMING — See definition for auxiliary framing.

M

MAIN-AISLE RACK — Cable rack that is located above the main cross-aisle of an equipment area.

MAIN AISLE GROUND EQUALIZER — A ground cable usually connected to the central office ground bus and serving line-ups of equipment.

MAIN GROUND BUS (MGB) — A bus bar(s) located within the ground window that provides the electrical interface for connections between the building's integrated ground plane and isolated ground plane.

MAIN POWER BOARD (MPB) — Primary distribution point usually containing 60 amp or greater fuse protection.

MASONITE™ HARDBOARD — A sheet of material that is made of fibrous material.

MASTER AGREEMENT — A Master Agreement is a contract consisting of terms and conditions plus multiple Work Statements. Once a Master Agreement is negotiated and executed, multiple Work Statements may be executed against the terms and conditions without renegotiation. A Master Agreement is a corporate-level document that commits the company to the same terms and conditions for similar work. Master Agreements can be evergreen or for a specified period of time.

MATCHED CELLS — Individual batteries or cells, square or round, manufactured by a specific supplier and matched to other cells of the same run or series having the same terminal voltage or specific gravity prior to delivery. Matched cells reduce the probability of scattered float voltages in a string. Cells are matched by putting them through a constant current float at the factory and then grouping them by voltage. Markings, which identify matched cells, shall be located on the cell. CARE SHALL BE EXERCISED TO AVOID PLACING UNMATCHED CELLS IN BATTERY STRINGS.

MCM (THOUSANDS OF CIRCULAR MILS) — A measure of the diameter of a



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conductor. This term is generally used to define power cables, example: 350 MCM, 750 MCM cable.

METALLIC SHIELDS — A metallic circular conductor around a central conductor or conductors.

METHOD OF PROCEDURE (MOP) — A document prepared by the Installation Supplier describing the work to be done.

MPB — Main Power Bay

MSDS — Material Safety Data Sheets. Forms required by OSHA containing information on hazardous chemical products.

MUST — The word “must” indicates a requirement that is mandatory.

N

NATIONAL ELECTRIC CODE (NEC) — A code that spells out the requirements for electrical equipment and is applied to central office installations.

NATIONALLY RECOGNIZED TESTING LABORATORY — An independent testing facility, recognized nationally, that could test and evaluate properties of products to standards, features or functions as defined by the product manufacturer. The laboratory is independent of the product manufacturer.

NCC — Network Control Center: maintains tandem switches.

NETWORK ELEMENT — Telecommunication equipment such as multiplexes, digital switching systems, digital cross connection and digital loop carrier systems are examples of network elements.

NEUTRALIZING — A process that mixes bases with acids to result in a neutral solution.

NON-CONDUCTIVE MATERIAL — An insulator such as fiber sheeting, rubber, etc.

NON-CREEP BOLT — A special bolt used at specific locations of the ladder track to keep ladders from creeping

NON-OXIDIZING COMPOUND — A compound that is used to prevent oxidation.

NYLON TIES — An apparatus that is used to bind together wires, cables, etc.

O

OBSERVER — The AT&T person(s) that have been assigned to observe or inspect the job during the job interval.

OFFICE DRAWINGS/RECORDS — Documentation that supports a job specification related to a specific central office.

OFFICE PRINCIPLE GROUND POINT (OPGP) — A bus bar normally located near the entrance switch gear. It functions as:

- The central connection point for all main grounding conductors and earthing electrodes.

OHM — A unit of electrical resistance.

OPTICAL CABLE REARRANGEMENT FACILITY (OCRF) — Typically a cabinet used to connect an optical fiber cable from the outside plant facility to the inside house riser cable.

OSHA — Occupational Safety and Health Act. A federal and state program that addresses health and safety in the work place.

P

PASTE MATERIAL — Paste material is pressed into the plate grids to provide electrochemical power. The paste material is a mixture of lead compounds that gives the paste a porous structure. This porous paste structure will create greater effective surface area and increase the capacity of the cell.

PATHWAY — A distribution system for routing and transporting telecommunication cable and wire including fiber optic cable. Pathways may be



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cable rack or fiber containment.

PDC — Power Distribution Cabinet

PERT CHART — Program Evaluation and Review Technique chart that defines a sequence and time in which things must be completed in order to finish a task by a specified completion date.

PHASE LEADS — Electrical conductors that have a specific AC phase.

PIA — Plug-in Administrator

PLATE GRIDS — The plates of a lead acid cell are composed of the plate grid and plate paste material. The plate grid is lead with alloys of calcium or other metals to keep the plate from stretching under its own weight.

POLARITY — Positive or negative in a DC circuit.

POWER AREA — Also may be known as the power room. It is the area in a telecommunication facility where the D.C. potential that powers the telecommunication equipment is assembled. Typically this area includes batteries, rectifiers and power distribution panels.

POWER CABLE RACK — Cable rack restricted to the routing and support of office power plant distribution cables only.

PRIMARY FRAMING — See definition for auxiliary framing.

PROTECTED AC OUTLETS — AC outlets used only for priority equipment (i.e., data set).

PROTECTIVE RING — A physical ring on a cable cutting tool that prevents loops of cable from being cut.

PROTECTOR — A module that plugs into a protector block, on a distribution frame, that shorts to ground any high voltages that may harm personnel or equipment in a central office.

PROTECTOR FRAME — A type of distributing frame dedicated totally to protector blocks.

P.R.B.S — Pseudo, Random, Bit, Sequence. A sequence of bits containing all possible sequences of “N” bits.

R

RACEWAYS — An enclosed channel designed expressly for holding wires, cables, or bus bars with additional functions as permitted in the National Electrical Code.

RELAY RACK — An open frame assembly made up of vertical uprights, a top, and base. Used to mount individual plates or assemblies. It may accommodate 19- or 21-inch wide panels.

RETIRED IN PLACE — Equipment that is still physically in place. This equipment has had its power removed and all cables have been cut and disconnected from both ends of the terminations. The equipment is designated “Retired in Place” (RIP).

S

SCC — Switching Control Center: Controls maintenance of a group of stored program controlled switches.

SCAFFOLDS — Portable platforms.

SCHEMATIC DRAWING — A drawing that depicts an electrical circuit.

SHEATHING — Sheathing consists of a framework of channels, formed to fit around the cable hole or slot, and is fastened to the floor. Sheathing is sealed with a waterproof material or gasket to the floor so as to prevent water from one floor penetrating to a floor below.

SECONDARY FRAMING — See definition for auxiliary framing.



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SEPARATELY DERIVED SOURCE — A power supply that has electrical isolation between its input and output current-carrying members.

NOTE - This definition is similar to the NEC definition of “Separately Derived System”. Section 250 of the NEC.

Example: A standby AC reserve arranged so that the neutral is switched.

SEWN CABLE — Cable that is secured to a cable rack or support, by sewing with twine.

SHALL — The word “shall” indicates a requirement that is mandatory.

SHEET FIBER — An insulating material that comes in sheet form.

SHIELDED CABLE — A cable whose outer conductor is made of circular mesh or foil. This outer conductor acts as an electromagnetic shield that minimizes interference to and from external sources.

SHINER — A wire-wrap that has a distended unprotected metallic conductor between the last wire-wrap and the wire insulation.

SHOULD — The word “should” indicates an action that is advisory.

SINGLE POINT GROUND — A method used to ground a set of frames for a given entity that can have only one grounding connection to the planned ground reference.

SITE MANAGER — The AT&T manager responsible for the building or location where the work is being performed.

SKINNER — Section of a cable form where individual wires are fanned out and stripped of their insulation.

SME — Subject Matter Expert. An individual that has gained expertise in a particular subject or subjects.

SPARE LEADS — Wires that are not connected to anything and are left un-terminated for future use.

SPC FRAMES — Stored Program Control Frames

STAMPING, STENCILING — Stamping, stenciling or labeling are all associated with designating equipment. Stamping and stenciling is generally accomplished by using a rubber stamp, alphanumeric tool, daubed in paint to designate equipment.

STANCHIONS — Floor support for overhead framing used when no equipment frames are installed.

STRAPPING — Method of tying terminals together electrically.

STRING — A group of cells or batteries connected together in series.

STRIPPING — Removing the outer insulation from wire conductors or removing the outer sheath on a cable.

SWITCHBOARD CABLE — Multi-conductor cable used to interconnect various equipment.

SWITCHBOARD CABLE RACK — Cable rack used for the routing and support of office switching and transmission cables. Switchboard cable racks may contain certain switching or transmission “system” power distribution cables.

T

TELEPHONE EQUIPMENT ORDER (TEO) An order generated by the Central Office Engineer that defines in general terms what equipment will be added, modified or removed.

TERMINAL BLOCK — A physical unit containing wire-wrap pins, solder points, or punch down terminals that is used to terminate wires.

TERMINAL STRIPS — Same as “Terminal Blocks.”

TINNED WIRE — Copper wire whose outer layer is plated.



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TRCC — T-Carrier Restoration Control Center: Control center for the maintenance of T-Carrier Systems.

TRUNK STRAP — A woven cloth strap used for temporary support.

TWINE — A wax linen or polyester cord used to lace together cables on a cable rack or equipment. Typically 9-ply polyester twine is used for this application.

U

UNINTERRUPTED POWER SUPPLY (UPS) — A power source that is arranged such that power to the equipment it supplies should not experience power loss.

UNISTRUT — A form of iron work that supports equipment cable racks, etc.

UNTINNED WIRE — Bare copper wire.

V

VERTICAL EQUALIZERS — The main vertical grounding conductor used to obtain ground reference between the OPGP and the CO GRD bus bar on each floor in a building (usually called vertical riser).

VOM — Volt-Ohm-Meter: An electronic measuring tool.

W

WIRING CODES — Color codes used to identify specific wiring sequence. Note that there are several color codes used in the communications industry.

WRIST STRAPS — An electrical conductive band that is worn around an individual's wrist whose other end is terminated through a fixed resistance to ground. This is used to protect equipment from electrostatic discharge.