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[END OF SECTION]

CHECKLIST OF CURRENT SECTIONS

Updates to ATT-TP-76400 may be issued on a section-by-section basis when deemed necessary. Shown below are current sections of ATT-TP-76400 as of March 31, 2007.

Section	Issue Date	Section	Issue Date
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Checklist Of Sections	03-31-2007	Section 9	03-31-2007
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SECTION 1--INTRODUCTION

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1. GENERAL

1.1. Introduction

- 1.1.1 ATT-TP-76400, Detail Engineering Requirements, delineates the requirements for providing detail engineering services to the AT&T Local Exchange Carriers (AT&T LECs).
- 1.1.2 Changes in this issue of Section 1 are summarized in Table 1-1.
- 1.1.3 AT&T assumes no responsibility for any costs incurred by a given manufacturer or supplier in conforming to the requirements of ATT-TP-76400. Further, conformance to all requirements in this document does not constitute a guarantee of acceptance of a given supplier's product/service for use in the AT&T LEC.
- 1.1.4 AT&T reserves the right, without prior notice, to revise ATT-TP-76400 for any reason.

1.2. Purpose

- 1.2.1 The purpose of ATT-TP-76400 is to:
 - a) Establish engineering requirements for Detail Engineering Service Providers (DESP) engaged in detail engineering;
 - b) Provide the information the DESP can expect to receive from the AT&T LEC Equipment Engineer;
 - c) Provide guidelines for the expected output of the DESP;
 - d) Provide guidance on the required methodology used in constructing or correcting central office records;
 - e) Promote engineering compatibility with ATT-TP-76300, AT&T Local Exchange Carriers Installation Requirements.

1.3. Application

- 1.3.1 ATT-TP-76400 applies to all detail engineering services provided to all AT&T LECs and supersedes all detail engineering requirements documents previously issued by the AT&T LECs.
- 1.3.2 ATT-TP-76400 is applicable to all types of new and reused telecommunications equipment.
- 1.3.3 ATT-TP-76400 is applicable to central offices, towers, controlled equipment vaults (CEV), and huts, as well as some customer premises locations per applicable contracts and tariffs. For the purpose of this document, all these locations are hereinafter referred to as “central offices”. For detail engineering at Public Safety Answering Point (PSAP) locations, refer to ATT-TP-76911.
- 1.3.4 ATT-TP-76400 applies to Engineering, Furnish and Install (EF&I) orders, Engineering and Install (E&I) orders, or Engineering Only (EO) orders. The focus is on the “Engineering” activity, regardless of the “Furnish” or “Install” status.
- 1.3.5 In addition to contracted equipment DESPs, ATT-TP-76400 also applies to AT&T LEC personnel who perform equipment detail engineering, as well as to AT&T LEC personnel and contracted firms who provide building engineering services. In this document, these personnel and firms also are called DESPs.

1.4. Definitions

- 1.4.1 Definitions of certain terms used in ATT-TP-76400 are as follows:
 - a) **Assignment Request Form (ARF)** – The document the AT&T LEC Equipment Engineer or non-Cluster Vendor DESP will use to request office assignments from the Cluster Vendor.
 - b) **Detail Engineering Service Provider (DESP)** - The provider of detail engineering services, including telecommunications equipment and building engineering service providers, as well as AT&T LEC personnel who perform detail engineering.
 - c) **AT&T Local Exchange Carrier (LEC)** - Incumbent local exchange carriers affiliated with AT&T Communications.
 - d) **AT&T LEC Equipment Engineer** - The AT&T LEC engineering representative or the AT&T LEC real estate management representative who is directly responsible for the engineering and installation of the job and who has overall responsibility for job completion and acceptance.
 - e) **AT&T LEC Representative** - The AT&T LEC person(s), designated by the AT&T LEC Equipment Engineer, who has responsibility for the daily coordination between the Installation Supplier’s on-site personnel and the AT&T LEC.
 - f) **Shall** - Verb used to indicate mandatory requirements subject to audit.
 - g) **Should** - Verb used to indicate recommendations that should be met if existing conditions allow.

- h) **Telephone Equipment Order (TEO)** – The AT&T LEC's document to the DESP to authorize engineering services. The TEO may be conveyed in various forms, such as Growth Equipment List (GEL), Partners in Procurement (PIP) order, etc.
- i) **Vendor Response Form (VRF)** – The document the DESP uses to confirm the acceptance of the job from the AT&T LEC.

1.5. General Requirements

- 1.5.1 The current issue of each section of ATT-TP-76400 as of receipt of the Telephone Equipment Order is the issue in effect and shall be used. Revisions may be issued on a section-by-section basis. The Checklist of Current Sections at the front of ATT-TP-76400 indicates the date of issue. Along with the revised section(s), an updated Checklist of Current Sections will be issued to indicate the current date of issue for each section.
- 1.5.2 In addition to ATT-TP-76400, building codes, national (e.g., NEC) and local electrical codes or other ordinances, statutes, rules, or governmental regulations may be applicable to the job and shall require compliance. Where more than one requirement applies to any matter related to personnel safety or property protection, the strictest requirement applies.
- 1.5.3 ATT-TP-76400 is intended to be used in conjunction with the equipment manufacturer's product specific engineering information, product specific equipment drawings, and other documents listed herein or specified in any applicable contract between the DESP and the AT&T LEC. The DESP shall notify the AT&T LEC Equipment Engineer for resolution of any discrepancy between the manufacturer's engineering information and ATT-TP-76400.
- 1.5.4 The DESP shall utilize only AT&T LEC approved products.
- 1.5.5 Some requirements in ATT-TP-76400 are delineated by reference to other AT&T LEC standards such as ATT-TP-76300 and industry standards. These standards are summarized in Table 1-2 and shall be considered part of ATT-TP-76400.
- 1.5.6 The DESP is responsible for:
 - a) Providing a completed VRF to the AT&T LEC Equipment Engineer within 5 business days of official receipt of job information.
 - b) Obtaining all required documentation to engineer the order;
 - c) Ensuring detail engineering services are done in accordance with AT&T LEC requirements and federal, state, and local laws and regulations;
 - d) Ensuring the equipment supplier's installation and interconnection requirements are met. This understanding is especially important when the DESP is not the equipment supplier. This document is not intended to provide specific equipment or interconnection engineering standards;
 - e) Ensuring licenses, copyrights, or permits are available if an equipment supplier requires them in the course of engineering;
 - f) Providing information and direction to the equipment supplier in accordance with the requirements established by the AT&T LEC's practices or requirements;

- g) Developing and providing the detail specification(s) per ATT-TP-76400;
- h) Request or provide office assignments via the ARF;
- i) Creating and updating central office records as required by Section 4, ATT-TP-76400;
- j) Ensuring that the job, as detail engineered, can be installed in accordance with ATT-TP-76300;
- k) Providing interpretation and direction to the installation supplier on questions related to the detailed engineering of the job.

1.5.7 The DESP shall contact the AT&T LEC Equipment Engineer to request a variance from any ATT-TP-76400 requirement and any approval of a variance shall be in writing. The DESP shall not request from the AT&T LEC Equipment Engineer any variances from the requirements outlined in this document related to firestopping and safety issues.

1.5.8 The AT&T LEC reserves the right to audit any job for compliance to ATT-TP-76400. The DESP shall correct non-compliance items within 30 days of receipt of the audit.

1.5.9 All required forms and documents shall be filled out completely and accurately.

1.6. Proprietary Information

1.6.1 Proprietary documents referenced in ATT-TP-76400 are available to contracted Suppliers through signed nondisclosure agreements or as detailed in current contracts between the AT&T LEC and the Supplier.

1.7. Ordering Information

1.7.1 Extranet access is available to approved suppliers for downloading electronic copies of ATT-TP-76400 and other non-proprietary AT&T LEC standards. Information concerning extranet access can be obtained from:

Vickie Jefferson
111 S 3rd AVE, 1st Floor
Madill, OK 73446
Email: vj6542@att.com

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

1.7.3 AT&T LEC personnel may access the ATT-TP-76400 from the Common Systems web site at:
http://ebiz.att.com/commonsystems/com_sys5.htm

1.8. Comments On ATT-TP-76400

1.8.1 Comments on ATT-TP-76400 should be submitted by e-mail or in writing to:

Laurie Gustin
Area Manager
102 Cross St., Room 201
San Luis Obispo, CA 93406
E-mail: lg1376@att.com

TABLE 1-1 – SUMMARY OF CHANGES IN SECTION 1

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1.5.1 1.5.5 1.7.1 1.8.1 Table 1-2	1.5.1 1.5.5 1.7.1 1.8.1 Table 1-2
Deleted	1.7.2	
Added		

TABLE 1-2 – REFERENCES IN ATT-TP-76400

Reference	Title
ATT-TP-76200	Network Equipment Power, Grounding, Environmental, and Physical Design Requirements
ATT-TP-76300	AT&T LEC Installation Requirements
ATT-TP-76900	AT&T LEC Installation Testing Requirements
ATT-TP-76911	AT&T LEC E911 Requirements
ATT-812-000-016	Network Equipment Environments and Space Planning Considerations
ATT-790-100-656	DC Power Distribution
BSP 790-100-658MP	Standard Specification and Performance Requirements for Engine Alternator Sets
ATT-790-100-659	Standby AC Plants
ATT-812-000-010	Hardware Products and Materials Specifications
BSP 800-000-101MP	Network Equipment Anchoring Requirements
BSP 800-000-102MP	Central Office Equipment Framework Design Requirements
BSP 800-000-104MP	Bracing Requirements For Network and Data Equipment On Raised Floor System
ATT-812-000-032	Reference of Approved Firestopping Products and General List of Product Suppliers
BSP 800-006-152MP	Floor Stanchion Supported Cable Rack System Requirement
BSP 800-068-150MP	Central Office Equipment Framework

**DETAIL ENGINEERING REQUIREMENTS
AT&T Local Exchange Carriers**

**Section 1, ATT-TP-76400
March 31, 2007**

Reference	Title
	Support Requirements
ATT 801-601-900	AT&T Alarm Standards Practice
Infrastructure Deployment Guidelines (AT&T)	Main Distributing Frame (MDF) & Modular Frames
BR 751-410-101 (Telcordia Technologies)	Common Language Standard Abbreviation List
BR 781-822-005 (Telcordia Technologies)	
BR 781-826-001 (Telcordia Technologies)	List of DSX Bellcore Practices
BR 781-826-004 (Telcordia Technologies)	DSX-1 and DSX-1C Engineering Guidelines
TM-ARH 001287	Research and Engineering Opportunities in the DSX-1 Environment
TM-NPL 008523	DSX-3 and DSX-4 Engineering Guidelines
TR-NPL 000320	Fundamental Generic Requirements for Metallic Digital Signal Cross-Connect Systems DSX-1,-1C, -2, -3
TR-NPL 000321	Generic Requirements Digital Signal Cross-Connect Frames DSX-1,-1C, -2
BSP 201-200-060 (Telcordia Technologies)	Distributing Frames-General
BSP 201-219-101 (Telcordia Technologies)	Protector Frames-General
BSP 201-220-101 (Telcordia Technologies)	Conventional Frames-General
BSP 201-222-050 (Telcordia Technologies)	COSMIC DSS System-General
ADC Fiber Management System Application & Installation Manual	Network Equipment Fiber Distribution Systems
American National Standards Institute (ANSI) information	
Building Codes, National and Local Electric Codes, Ordinances, Statutes, Rules and Government Regulations	

Reference	Title
Federal Communications Commission Rules	
National Fire Protection Association standards	
Nationally Recognized Testing Laboratory (NRTL) information	
Under Writers Laboratories standards	

[END OF SECTION]

SECTION 2-- TELEPHONE EQUIPMENT ORDERS (TEOs)

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1. GENERAL

1.1. Introduction

- 1.1.1 This section describes the information that shall be provided to the Detail Engineering Service Provider (DESP) by means of the Telephone Equipment Order (TEO).
- 1.1.2 Changes in this issue of Section 2 of ATT-TP-76400 are summarized in Table 2-1.
- 1.1.3 It is assumed the DESP has access to the AT&T LEC office records and other information not included in the TEO, which may be necessary to perform the detail engineering function.

2. INFORMATION PROVIDED BY THE AT&T LEC EQUIPMENT ENGINEER

2.1. General

- 2.1.1 The AT&T LEC Equipment Engineer shall provide a TEO for every job issued (electronic if available) to the DESP to identify relative billing information, work effort and job schedules. The DESP shall receive a TEO before issuing the detail specification.
- 2.1.2 The AT&T LEC Equipment Engineer shall provide an appendix TEO when the job scope changes (i.e. additional services, assignment updates, date changes).

2.2. TEO Facesheet

- 2.2.1 The TEO Facesheet (JAM or SSOP) shall contain, at a minimum:

- a) **Job address (Install at)**
- b) **Telco 11i Project Number**
- c) **Telephone Equipment Order (TEO) Number.** AT&T LEC Order Number
- d) **CLLI Code.** Common Language Location Identifier code

Note: AT&T LEC Equipment Engineer will provide the eight or eleven character CLLI code

- e) **TASK/FRC.** Task Number, Field Reporting Code or Account Code
- f) **LOC or GEO/PAR.** AT&T LEC Accounting Location Code / GEO and Parcel Code
- g) **Appendix No.** Appendix number of the TEO. The original TEO will carry Appendix No. 0 or 00. Subsequent appendices follow the pattern: 1, 2, 3, etc. or 01, 02, 03, etc
- h) **BASE.** Office Base Number. Unique identification code for drawings of a specific Central Office, where utilized to access floor plans in ORION
- i) **Detail Spec Due Date.** Date the total detail specification package is to be received by the AT&T LEC Equipment Engineer
- j) **Material Ship Date.** Date major material is to be shipped from the material supplier
- k) **Vendor Start Date.** Date installation is scheduled to start
- l) **Vendor Complete Date.** Date vendor is scheduled to complete installation
- m) **Complete Date.** Date equipment is in office and can be provisioned to provide service.
- n) **Installation Package To.** The "Ship To" for Installer's Papers. Required for jobs when DESP is not the installation supplier

Note: The AT&T LEC Equipment Engineer will provide the address and zip code. If the installer is not identified, the AT&T LEC Equipment Engineer will type TBD in the address field. If the DESP does not receive the address from the AT&T LEC Equipment Engineer by job completion, the DESP shall send the detail specification to the AT&T LEC Equipment Engineer.

- o) **Material Ship To.** "Ship To" location for material required for the job
Note: The AT&T LEC Equipment Engineer shall include address and zip code.
- p) **Description.** A summary of the scope of work including; Activity, Equipment Type(s) and Quantity, Bay/Shelf Location(s), and Circuit quantity
- q) **AT&T LEC Equipment Engineer.** Name of the AT&T LEC Equipment Engineer responsible for the job
- r) **Engineering Issue Date.** Date AT&T LEC Equipment Engineer issues the TEO
- s) **Phone Number & EMAIL.** Telephone number and e-mail address of AT&T LEC Equipment Engineer
- t) **Cost Center Code.** Cost Center Code (i.e., RCO) of the AT&T LEC Equipment Engineer.

2.3. Other TEO Information (TEO as defined in definitions Section 1)

- 2.3.1 The following information shall be included in the TEO as applicable per the scope of the job:
 - a) A listing of AT&T LEC provided equipment (a.k.a. "Telco Provided Equipment")
 - b) A description of any authorized variances from ATT-TP-76400

- c) Instructions on where to send engineering marked central office drawings
- d) Equipment model number
- e) Required assignments or instructions for obtaining them (e.g., Alarms, FDF, DSX etc.)
- f) Required connections to remote management systems (e.g., ,NetDCN) or instructions for obtaining them (i.e. Maintenance Requirement)
- g) In offices with Modular (COSMIC, etc.)-type distributing frames, FRAMEMATE assignments or instructions for obtaining them
- h) Conventional distributing frame termination locations or instructions for obtaining this information
- i) Disposition of any removed equipment; i.e. junk, send to reuse, redeploy to another location, Retired in Place (RIP)
- j) Specify whether cable mining is to be performed and to what extent cable mining is to be performed (a to z location)
- k) Name and telephone number of the AT&T LEC Representative
- l) For bays and/or MDF Frame Blocks being added or removed, provide the relay rack and/or frame location via Space Assignment Form (SAF)
- m) For equipment (e.g., shelves) to be installed in existing bays, the equipment locations if the addition deviates from sequential growth patterns
- n) Applicable specific installer notes to be included in the detail specification
- o) Fuse panel assignments and other specific power source requirements, or instructions for obtaining this information
- p) Instructions on where to send the Material Disposition Record (MDR) that reports any installer corrected drawing activity
- q) Unique, supplier specific numbering schemes for bays, shelves and circuits or instructions for obtaining this information
- r) Any other office-specific information necessary to engineer the job
- s) The SCID (Sonet Carrier Identifier) code
- t) The Power Engineer's name and telephone number for BDFB Load Demand Worksheet requirements
- u) For jobs adding, changing, or removing critical power equipment (primary power equipment, etc.) as defined in ATT-TP-76300 D 4.1, the name and telephone number of the respective AT&T Power Maintenance Engineer
- v) The cluster vendor company name, SPOC and telephone number shall be provided to the DESP for any job not engineered by the cluster vendor.(i.e. New BDFB Worksheet, switch job assignments, etc.).

TABLE 2-1 – SUMMARY OF CHANGES IN SECTION 2

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	2.3.1 s) 2.3.2 l)	2.3.1 s) 2.3.2 l)
Deleted		
Added		

[END OF SECTION]

SECTION 3--DETAIL ENGINEERING SPECIFICATION REQUIREMENTS

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1. GENERAL

1.1. Introduction

1.1.1 This section describes the requirements for the Detail Engineering Specification.

1.1.2 Changes in this issue of Section 3 are summarized in Table 3-1.

1.2. General Detail Engineering Requirements

1.2.1 The DESP shall submit a completed VRF (Vendor Response Form) upon request of transport work from the AT&T LEC Equipment Engineer.

- 1.2.2 Upon receipt of the TEO the DESP shall provide a detailed specification for all items requested in the TEO, the DESP shall not request a variance of this requirement from the AT&T LEC.
- 1.2.3 Along with the detail specification, the DESP shall provide a copy of the TEO (including all attachments) to the installer, the DESP shall not request a variance of this requirement from the AT&T LEC.
- 1.2.4 The DESP shall obtain from the AT&T LEC written approvals for variations from ATT-TP-76400. As an alternative, the DESP may send a confirming correspondence to the AT&T LEC and include this correspondence with the detail specification.
- 1.2.5 Established patterns within the central office should be considered by the DESP (i.e. distributing frame blocks wiring patterns).
- 1.2.6 The DESP shall insure that the correct TEO number is identified on the Spec for marking the material being shipped to the job site.
- 1.2.7 Any discrepancies in the information provided by the TEO shall be resolved with the AT&T LEC Equipment Engineer prior to issuing the Detailed Specification.

1.3. Contents of Detail Specification

- 1.3.1 The completed output constitutes the detail specification. The detail specification shall include the following sections as applicable:
 - a) SPECIFICATION COVER SHEET - A facesheet or title page containing specific key information about the equipment order
 - b) SPECIFICATION -The information to be included in the detail specification, in the sequence listed below:
 - 1. General Job Summary
 - 2. General Installation Supplier Notes
 - 3. Work To Be Done By The Installation Supplier (Work Items)
 - 4. Specific Installation Supplier Notes
 - 5. Material Listing Notes
 - 6. Material Listings
 - 7. Office Drawing Records List
 - 8. AT&T Equipment and Interconnect Drawing List
 - 9. Reference Drawings List
 - 10. Cable Running List
 - 11. Equipment Inventory Update (EIU)
 - c) APPENDICES OF SPECIFICATIONS - A listing of additions, modifications, and removals of information or material after a specification has been issued.

- 1.3.2 The format and arrangement specified herein for the detail specification shall be followed for all jobs except voice switch. The contents of the detail specification, as delineated herein, shall apply to all jobs. Appendix 3-A of this section provides a template for the detail specification. The DESP may utilize this template for the detail specification. Appendix 3-B provides an illustration of completed detail specification forms.
- 1.3.3 The DESP shall provide the completed specification forms (worksheets) in a single package.
- 1.3.4 By the Detail Specification Due Date, the DESP shall provide an electronic file of the detail specification to the AT&T LEC Equipment Engineer.
- 1.3.5 This electronic file shall be compatible with the Microsoft Excel® release designated by the AT&T LEC Equipment Engineer.
- 1.3.6 The DESP shall ensure that distributed paper copies of the detail specification are consistent in content and format with this electronic file.
- 1.3.7 The DESP shall place the following statement in the footer of each completed detail specification form:

RESTRICTED-PROPRIETARY

**Not for use or disclosure outside the AT&T Local Exchange Carriers except under
written agreement**

The proprietary statement on the completed forms of Appendix 3-B of ATT-TP-76400 is for illustration only and does not render this appendix proprietary.

2. SPECIFICATION COVER SHEET

2.1. Contents of Cover Sheet

- 2.1.1 The Cover Sheet is the first page of a specification. It contains information from the TEO Facesheet, as well as information to be provided by the DESP.
- 2.1.2 On the Cover Sheet, the DESP shall transfer all information from the fields of the TEO Facesheet and add the following information:
 - a) Supplier Order Number
 - b) SPEC Appendix No. The original detail specification shall carry Appendix Number 0, or 00. Subsequent appendices shall follow the pattern: i.e. 1, 2, 3 or 01, 02, 03, etc.
 - c) For voice switch specifications formatted in sub-specifications as described in Section 3 below, the appendix numbers apply to the index sub-specification only
 - d) Date DESP received TEO
 - e) List of AT&T LEC TEOs and appendices if included in this specification
 - f) Table of Contents
 - g) DESP's Full Name (primary DESP – not subcontractor)
 - h) DESP's Contact and Telephone Number

- i) DESP's actual Engineering Completion Date.
- j) Instruction to mark packages with TEO Job Number

3. SPECIFICATION FORMS

3.1. General

- 3.1.1 Voice switch specifications may be grouped in sub-specifications. If the detail specification is divided into sub-specifications, the sub-specification that contains the Cover Sheet shall also contain an index.
- 3.1.2 The following header information shall appear at the top of each specification page:
 - a) City, State
 - b) TEO Number
 - c) Page X of Y (consecutively)
 - d) CLLI
 - e) Supplier Order Number
 - f) Appendix Number of detail specification.

3.2. General Job Summary

- 3.2.1 The General Job Summary provides the scope of the entire job and shall contain the following information:
 - a) Major items of equipment added, removed, etc. and description of work to be done
 - b) Listing of associated jobs/orders
 - c) Job sequencing/coordination requirements
 - d) List of AT&T LEC approved variances from ATT-TP-76400

3.3. General Installation Supplier Notes

- 3.3.1 General Installation Supplier Notes provide instructions to the equipment installer that are general in nature. General Notes shall be numbered consecutively, starting with "1." If appendices are issued, the General Notes should continue in sequence.
 - a) General Notes shall always contain the following:
 - 1. All information in this specification shall be considered proprietary and may not be disclosed to subcontractors or third parties without written agreement from the AT&T LEC.
 - 2. The entire installation shall be in compliance with ATT-TP-76300.
 - 3. The installer shall make equipment acceptance tests in accordance with ATT-TP-76900 and all applicable practices. A copy of ATT-TP-76900 shall be retained on the job site for reference during testing.

4. The installer shall send an MDR, per ATT-TP-76300, indicating any installer corrected drawing activity and route corrected drawings to [The DESP shall provide the address].
5. The installer shall refer engineering questions pertaining to this specification to the detail engineer listed on the Cover Sheet.
6. The Installation Supplier shall record BDFB load readings on the BDFB Load Demand Worksheet, and forward the worksheet to the AT&T LEC Equipment Engineer (Implementation Engineer) and Power Engineer on all jobs that add a power load to a BDFB. This includes jobs that add load to the BDFB via an existing bay fuse panel and/or circuit additions to the BDFB. The Power Engineer's approval is required, prior to adding new circuit fuse positions at the BDFB. Instructions and worksheets are available on Woodduck and the extranet.
7. Certain types of asbestos containing materials may be found in the building and equipment. Such materials include resilient flooring, BDFB Power Boards, and cable hole firestop covers. BDFB Power Boards and cable hole firestop covers are to be removed intact. Activities which impact (e.g. removal, drilling) resilient flooring, such as asbestos containing sheet or rolled goods (e.g. linoleum), are prohibited unless performed by a Zurich approved abatement contractor in accordance with applicable regulatory requirements for work controls and training. Procedures for drilling into floor covering material containing Asbestos or Presumed to contain Asbestos are defined in ATT-TP-76300, Section G.

Additional notes shall be included after the above notes, as required by the job.

3.4. Work To Be Done By The Installation Supplier

- 3.4.1 The DESP's specific instructions (work items) to the installer shall be included on the Work to Be Done by the Installation Supplier form. These instructions may also direct work operations to be performed on existing central office equipment associated with the operation.
- 3.4.2 Detailed instructions to the installer shall be listed under the following headings:
 - a) ITEM - The consecutive number of the individual operation instruction. Always start with "1"
 - b) OPERATION - The type of work operation (work item) required to be performed, e.g., add, extend, modify, remove, etc.
 - c) QUANTITY - The number of items to be added, extended, modified, removed, etc.(by specific unit of measure i.e. feet, number, weight, volume) if other than each.
 - d) DESCRIPTION - A narrative description of the work operation required to be performed. The Description shall include references to current relevant drawings

- e) NOTES - Notes applying only to the installer, referenced by a letter which relate to a specific work operation, to be shown under the heading "Specific Installation Supplier Notes."

3.4.3 Operations such as the following shall be covered in Work To Be Done By The Installation Supplier:

- a) Adding, extending, or removing circuits or multiples
- b) Adding, relocating, or removing the wiring and apparatus in existing positions, sections, bays, frames, etc.
- c) Renumbering circuits, when no other wiring or apparatus changes are required
- d) Modifying equipment, or the installer cutting or disconnecting wiring furnished by the supplier to meet job requirements, except when covered by notes and standard drawings
- e) Adding, relocating, removing, or modifying apparatus or equipment, e.g., cable racks, frames, etc.
- f) Adding, relocating, removing, or modifying cable racks, auxiliary framing lighting, etc.

3.5. Operation Types

3.5.1 Installer work items shall include a specific Operation Type to be listed under the "OPERATION" heading. The various operations required are determined by selecting the appropriate term(s) "add," "extend," "modify," "remove," etc., identified below.

3.5.2 Only the following terms, under the heading "Work to be Done by the Installer," shall be used to specify "work operations" or "work items" in the OPERATION column.

ADD - Required when new or additional circuits, cabling, material or apparatus, are to be furnished. Any special instructions concerning cabling being added, or already in place, or instructions concerning modifications of existing equipment, shall be included in an installer's note.

ASSIGN - Required when spare or fully equipped idle miscellaneous circuits or terminals on equipment (i.e. DSX, DCS, fiber, BITS etc.) are associated with added equipment. Any special instructions concerning assignments made by existing cable shall be indicated in an installer's note. If an assignment is made from an Installer's Cable Running List, the term ASSIGN need not be expanded by an installer's note.

EXTEND - Required when existing circuits are to be extended into locations in which they did not previously appear. Give the location for all appearances in terms of sections, positions, panels, frames, racks, terminals, circuits, etc.

MODIFY - Required when apparatus and/or wiring of existing circuits are to be changed. . Show only the figures and/or options directly associated with the modification.

MULT - Required when like leads are multiplied (mult) within the bay and mult wire/cable is ordered in the Summary of Material. The drawing number, figure and location shall be indicated under the wire/cable ordered in the Summary of Material.

Note: Mult information may appear in any of the Work To Be Done By The Installation Supplier, Specific Installation Supplier Notes or Material Listings pages.

REASSIGN - Required when a working circuit is to be disassociated from one circuit and reassociated with another circuit or if the assignments associated with equipment has changed. Use this term only when the reassignment can be made without recabling or no new cable needs to be reordered. List the wiring diagram number and figure numbers involved and show both present assignment or termination and the new assignment and termination.

RECABLE - Required when only the cabling, wiring or power cabling of a circuit is to be reterminated. Cover the exact changes required, give the present terminations as well as the new, and state what portion of the circuit is to be recabled if more than one cable termination is shown on the circuit.

RELOCATE - Required when apparatus and/or wiring of one or more circuits or when noncircuit apparatus is to be changed from one location to another. When recabling is required, list the wiring diagram and figure covering the cabling.

REMOVE - Required when the apparatus, wiring, or both of one or more circuits is to be removed, or when non-circuit apparatus or equipment is to be removed. When disposition of removed equipment information is given in the TEO, include this information in an installer's note.

RENUMBER - Required when office numbering of present positions, relay racks, bays, frames, units, circuits, etc., is to be changed. This term should be used only when no other "work item" changes are involved. This term is to be used even though the actual work involved may be restamping, restenciling, relabeling, etc. Give the old numbering and new numbering of the affected circuits or equipment.

REOPEN & CLOSE - Required when cable holes or sleeves have to be opened and closed when routing cables or wire through an existing cable hole, slot, or sleeve. To reopen and close existing cable holes and sleeves, list the cable hole number, floor and location.

RETIRE IN PLACE - Required when the AT&T LEC Equipment Engineer has indicated that equipment will be retired and left in place. All records shall be corrected to indicate the equipment is Retired In Place (RIP) or removed.

VERIFY – Required when directed to double check bay locations, assignments, routes, footages, etc.

3.6. Specific Installation Supplier Notes

- 3.6.1 Specific Installation Supplier Notes, which apply only to the installer and pertain to a specific item in the specification, shall be shown under the heading "Specific Installation Supplier Notes".
- 3.6.2 Each installer's note shall be cross-referenced to a specific entry in the Work to be done by Installation Supplier, Material Listing and/or Cable Running List sections.

- 3.6.3 Installer's notes shall be lettered beginning with "A". The letters "I" and "O" shall not be used since they could be misconstrued as numerals. Notes AA, AB, AC, etc. follow Note Z.
- 3.6.4 When these notes are referenced in the Material Listings page, the note reference shall appear in the Description Field.
- 3.6.5 Any information concerning an item involved in a change that will aid the installer in understanding the reason for the change, especially any modification item, should be given in an installer's note associated with the item.
- 3.6.6 If applicable to the job, specific instructions shall be included concerning the disposition of removed material and equipment.
- 3.6.7 If there is not an equipment standard drawing figure available depicting the lead termination pattern on distributing frame terminal strips, an installer's note shall be included, containing a sketch if necessary, to convey the terminal strip lead arrangement.

3.7. Material Listing Notes

- 3.7.1 Material Listing Notes are lettered notes containing instructions and information about the material being provided. These shall be used to indicate the supplier or source, and any special handling requirements of material ordered in the Material Listings page, including instructions to the supplier and installer, as appropriate. This information may be provided by the AT&T LEC Equipment Engineer in the TEO.
- 3.7.2 Notes shall be alphanumeric.
- 3.7.3 The note "symbol", e.g. A, B, C, etc., is to be placed in the "note" column of the Material Listing Notes page. The variable, worded portion of notes is to be placed in the "Description" column of the form.
- 3.7.4 When two or more notes with a particular alphabetical symbol are used, the note shall be given a numerical suffix: for example, three additional "T" notes would be numbered T1, T2 T3, etc.
- 3.7.5 When Material listing Notes are used, the following shall be used as standard designations. Other notes may be used, when there is a need.
 - AA - The length shown in the narrative is the minimum allowable length required for installation. The supplier can provide one length as specified in the quantity field or variable lengths as specified in the narrative.
 - H - Denotes HECL designation for plug-in units.
 - HL - Denotes Header Line information. This one shall be shown against every line of Header Line information.
 - MXX - Denotes material manufacturer or supplier. The "XX" designates a specific manufacturer or supplier.
 - SPR – Denotes material designated as spare and can be a subset of the main material item.

STC - Denotes information which the installer is required to designate on panel, unit or bay (CLEI CODE). Refer to ATT-TP-76300.

T - Material designated "T" will be furnished by the telephone company to the installer in accordance with -----(indicate letter, (date), or telephone company order number).

NOTE: Use this note for material which is to be furnished by the telephone company to the installer, from its own stock, from another exchange, from the holding account, from surplus, or from any other order. Show materials exactly as furnished by the AT&T LEC Equipment Engineer in the case of sections, relay racks, and other units. Show the exact lists furnished, even though some lists may be removed and others added by the installer. Where "T" items in the same specifications, and associated appendices have different variables, the items shall be designated "T", "T1", "T2", etc.

TA - Materials designated "TA" have been advanced ordered, under the same order number, by the AT&T LEC purchasing organization or AT&T LEC Equipment Engineer in accordance with TEO_____.

NOTE: Use this note for material that has been ordered in advance (Pre-ordered) of the release of the complete detail engineered specification. The advance ordered material has been previously processed by the AT&T LEC purchasing organization and should not be reordered when the complete specification is processed. Where "TA" items in the same specification and associated appendices have different variables, the items shall be designated "TA1", "TA2", "TA3", etc.

TIV - Material designated "TIV" is minor material to be provided by the Installation Supplier. The generic list of installation supplier provided minor material will be provided by the AT&T LEC purchasing organization upon request. The material listed against this note shall meet AT&T LEC standards.

3.8. Material Listings

3.8.1 The Material Listings shall provide a complete list of materials and equipment necessary for the job. Minor materials may be listed in detail or combined as one or more line items.

3.8.2 The DESP shall list material in the body of the Material Listings page under the following headings:

- a) OP - Include the appropriate appendix operation type
- b) Main Item Number - Required for each item listed, numbered consecutively.
- c) Note - Enter the specified note as required per the Material Listing Notes
- d) Quantity - Enter the correct quantity of material ordered by the number of units, feet, etc.
- e) Material Identifier - Enter the manufacturer's part number including any sub-groups required to identify the unit to the installer.

- f) Material Description - Enter a description of the item, including relay rack, shelf or panel location, circuit number and unit of measure (if other than "Each").
- g) TASK (FRC)/ECN - This field should be completed if the information is known.

3.9. Central Office Records

- 3.9.1 The DESP shall list on the Central Office Records page the central office records updated as a result of the job.

3.10. AT&T Equipment and Interconnect Drawings

- 3.10.1 The DESP shall list on the AT&T Equipment and Interconnect Drawings page the following drawing(s), with issue numbers, used in engineering the job:
 - a) Manufacturer's (equipment) drawings
 - b) Circuit, interconnect and schematic (wiring) drawings

3.11. Reference Drawings

- 3.11.1 The DESP shall list on the Reference Drawings page any other central office records or equipment drawings that may assist the installation effort.

Note: Reference Drawings listed here are not sent to the installation supplier

3.12. Cable Running List

- 3.12.1 All interbay cable or wire (power, switch, transport, miscellaneous) to be run by the installer shall be listed under the subsection, "Cable Running List." Near-end and far-end termination locations shall always be specified.
- 3.12.2 The heading for a Cable Running List entry shall show the interconnect drawings, figures and options related to cabling of each end of the circuit.
- 3.12.3 The DESP shall provide the following information on a cable running list:
 - a) Cable run number of each cable
 - b) A reference note, if required, shall be cross-referenced to the applicable Specific Installation Supplier note
 - c) The length of each cable run in feet
 - d) The number of cables to be run
 - e) The code/type of the cable being run
 - f) When cable route diversity is required the DESP shall indicate "Diversity" in the cable route column.
 - g) The from and to locations of the cable run. When diverse cables are required, the side of the bay or relay rack on which to run the cables shall be shown in the "TO DROP" and "FROM DROP" columns. Cable drop in feet may be included if desired. For example, L

indicates drop on the left side of the bay, as referenced from the front of the bay, or 10L indicates a ten foot drop if the cable drop in feet is included

h) The cable termination point on the equipment or applicable drawing figure.

3.12.4 The DESP shall not show combined lengths of multiple cables within a single run.

3.13. Equipment Inventory Update

3.13.1 The DESP shall provide a completed EIU where TIRKS and/or Granite inventory is required by the scope of the job and distribute as part of the detail specification.

a) General Information

1. Include the Project Number, TEO Number, CLLI Code, Telco Engineer Name and Phone, DESP Name and Phone, IE (In-Effect) Date, Order Type (add, remove, etc.)
2. Also include, as required, DESP Name and Phone, Primary Gateway, HECI/CLEI Code, Model Number, SCID Code, and any other appropriate information.

b) Cabling Information

1. Equipment Information

- i) Equipment Description (FLM 150, TELLABS 532L, etc.)
- ii) HECI/CLEI code (if required)
- iii) Floor location where equipment is installed
- iv) Relay Rack (Aisle / Bay) location where equipment is installed
- v) Shelf / Unit or Group number
- vi) Cable length (if required)

2. Termination Information

- i) DSX-1 and/or DSX-3 Floor, Relay Rack location, Panel, and Jack circuits
- ii) DCS/EDSX Relay Rack location, Electronic Address (eleven-character CLLI), Shelf and Slot number and how used (STS, 3 to 3, 3 to 1)
- iii) Distributing Frames
(MDF, CDF, TDF) Horizontal / Vertical location
Fiber Distributing Frame (FDF) Relay Rack location, Shelf number, Connector
COSMIC and SMDF frame module, shelf, block.

c) Plug Slots Pre-equipped -- All Plug-in Units provided in the detail specification shall be specified if spare or pre-equipped.

d) Notes

1. EIU Builder - Note Section provides:

- i) Auto-populated Equipment Description and Configuration

- ii) Auto-populated change information
 - iii) Free form text input
2. EIU Form – Notes Section provides: Free form text field
- e) When D4 Channel Bank equipment is provided, indicate the mode, timing and whether it is equipped with Unitized SMAS. If MFT is provided, indicate single or double slot and whether it has Unitized SMAS. Where SMAS is provided, provide the following information:
 - 1. SMAS system number
 - 2. Maintenance Connector number
 - 3. From and to relay rack locations
 - f) When hardwiring to DCS equipment, the electronic addresses (SDF, Port, CLLI, HECI/CLEI, RR, and Unit) are required.
- 3.13.2 If any changes to the EIU information occur, the DESP shall notify the AT&T LEC Equipment Engineer to revise the EIU information prior to vendor complete date.

4. APPENDICES TO SPECIFICATIONS

4.1. Purpose

4.1.1 The DESP shall provide an appendix detail specification when the job scope changes (i.e. additional services, assignment updates, equipment changes).

4.2. Appendix Preparation

4.2.1 A statement shall be made in the General Job Summary, describing the reason for the Appendix, and in general, the changes made. Include an Appendix Summary, identifying the portion of the original specification replaced, or the portion of the specification being added by the appendix.

4.2.2 Appendices shall always refer to the original specifications. The Appendix shall reflect the most recent changes in quantity, etc., noted in previous appendices.

4.2.3 When adding material on an appendix, continue numbering the items in sequence with the original specification or appendix.

4.2.4 The headings used to list material in the Appendix shall be the same as those used in the original specification, except for the following:

- a) Populate the “OP” column.
- b) The only valid designations for operations are shown below with their single letter abbreviations, to be used in the operation column throughout the appendix.

<u>DESIGNATION</u>	<u>ABBREVIATION</u>
ADD	A
DELETE/CANCEL	D

CHANGE	C
TO	T

- c) The term "ADD" is used to add an item or an additional line to a previous item. If you add more than one line to an existing item, the term "ADD" should be applied to each added line, with the item and line number shown for each line.
- d) The term "CHANGE" and "TO" are used in combination when changing an item, or a line within an item. If you change more than one line of an item, but not the entire item, the term "CHANGE" - "TO" is to be applied to each line changed. The "CHANGE" - "TO" operation should not be used to increase the quantity of equipment being ordered, as this may cause the original quantity ordered to be double shipped.
- e) The term "DELETE" is used for removing an item, or a line within an item. If you delete more than one line of an item, but not the entire item, the term "DELETE" is to be applied to each line deleted. Deleting the first line of an item only will delete the entire item.

5. SPECIFICATION DISTRIBUTION

5.1. General

- 5.1.1 The DESP shall complete and distribute detail specifications and appendices to meet the detail specification due date. A copy of the final detail specification and appendices shall be sent to the AT&T LEC Equipment Engineer no later than 30 calendar days following completion of installation.
- 5.1.2 For E&I or E, F, & I jobs, the detailed specification shall be forwarded to the DESP's installer. For E only jobs, the detailed specification shall be forwarded to the AT&T LEC Equipment Engineer.

TABLE 3-1 – SUMMARY OF CHANGES IN SECTION 3

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	3.13.1 3.13.1 a. 2	3.13.1 3.13.1 a.2
Deleted		
Added		

APPENDIX 3-A – SPECIFICATION TEMPLATE

APPENDIX 3-B – SPECIFICATION EXAMPLE

Appendices 3-A and 3-B are available separately as Microsoft Excel® files on the Extranet for approved suppliers.

[END OF SECTION]

SECTION 4--CENTRAL OFFICE EQUIPMENT RECORDS

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1. INTRODUCTION

1.1. General

- 1.1.1 This section describes the Central Office (CO) equipment records that are created, maintained, and used by the AT&T LEC to establish a permanent record of CO equipment.
- 1.1.2 Changes in this issue of Section 4 are summarized in Table 4-1.
- 1.1.3 The term CO record refers to office specific records in a graphical/mechanical CO base drawing, tabular (database) format, or electronic document storage system. The term CO base records refer to records numbered in the central office base record numbering scheme described in this section.
- 1.1.4 The DESP shall correctly update and/or mark-up for update CO records as identified in Table 4-3. These records are the official AT&T LEC documentation of CO equipment.
- 1.1.5 The Office records listed on Table 4-3 shall be maintained only in those regions where they are currently updated.
- 1.1.6 All CO records are the property of the AT&T LEC. Use of these documents is restricted for use by the Detail Engineering Service Provider (DESP), installation crews, or other subcontractors. The information contained in these records is proprietary and should be protected against unauthorized disclosure. Access to proprietary information should be limited to those having a "need to know."
- 1.1.7 Office records (as shown in this section) are not required at Enclosed Network Extensions (ENE). ENEs are defined as CEVs, CUEs, Huts, Premis, Radio Sites, etc.

2. CENTRAL OFFICE RECORDS DESCRIPTION

2.1. General

- 2.1.1 CO records reflect the engineering and installation plan for description and location of equipment installed for each AT&T LEC. These records are continuously updated to reflect changes in building layout, equipment configuration, capacity, equipment standard drawing information and physical location of each piece of equipment.
- 2.1.2 The DESP shall ensure the appropriate base or bases are reviewed and updated because some COs may have more than one base number.
- 2.1.3 The existing drawing numbering scheme shall be followed when creating or updating drawings specified in Table 4-3.
- 2.1.4 The CO Base Numbering System is not applicable in the TAB/db environment.

2.2. CO Record Document Types

- 2.2.1 The following records shall be updated in the regions they are presently maintained.

Table 4-3-CO Record Document Types

Document Type Code	Description	Marked for Update	Updated By	Data Base
FP	Floor Plan	DESP	CSSP	Electronic
DF	Distributing Frame	DESP	Cluster Vendor/DESP/MDRC/AT&T LEC	Graphical/Mechanized/Electronic
BF	Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU)	DESP	Cluster Vendor	Electronic – TAB/db
PB	Power Boards	DESP	AT&T Power Engineer	Electronic - PowerPro
FE	Front Equipment	DESP	Cluster Vendor	Electronic – TAB/db
AR	Assignment Record	DESP	Cluster Vendor	Electronic
AL	Remote Alarm Records	DESP	MDRC/AT&T LEC	Graphical/Mechanized/Electronic
FB	Fuse Bay (Where Records Exist)	Installation Supplier/DESP	DESP/Cluster Vendor	Electronic/Manual TAB/db or Bay Book (Fuse Bays shall no longer be used)
AC	PDSC AC Service records	DESP	AT&T Power Engineer	Electronic - PowerPro

*Note - Mechanical/Graphical – Archived Drawings are obtained from the electronic document storage system.

Electronic records are obtained from TAB/db, PowerPro and updated on line.

2.3. Floor Plan Records

- 2.3.1 The AT&T LEC creates Floor Plan Records from architect drawings and plans. The AT&T LEC maintains floor plan records using Space Assignment Forms (SAF), as well as engineering and installation marked prints.
- 2.3.2 Floor Plan Records are building details necessary to engineer, locate, and install CO equipment.
- 2.3.3 Aisle spacing requirements for equipment lineups are contained in Section 9 of the ATT-812-000-003 document.

2.4. Distributing Frame Records

- 2.4.1 Distributing Frame Records reflect circuits and cables terminated on a specified Distributing Frame (DF). There are many types of DFs, varying in both method of construction and the type of equipment that terminates on them. Commonly used frame designations include:

MDF	Main Distributing Frame
LDF	Line Distributing Frame
CDF	Combined Distributing Frame
TDF	Trunk Distributing Frame
IDF	Intermediate Distributing Frame
SDDF	Subscriber Digital Distributing Frame
HFDF	High Frequency Distributing Frame
TPDF	Tie-Pair Distributing Frame
FDF	Fiber Distribution Frame
LPCDF	Low Profile Combined Distributing Frame
Modular (Cosmic)	Common Systems Main Interconnecting Distributing Frame

- 2.4.2 Distributing Frames can be either single-sided or double-sided. On a double-sided frame, the sides are referred to as the horizontal side and the vertical side. Some single-sided DFs are arranged with the horizontal elements located on the lower portion of the framework and the vertical elements on the upper part.
- 2.4.3 On the horizontal portion, each level within a bay is identified with a letter designation beginning with "A" on the lowest level, "B" on the next to the lowest level and continuing to the top of the framework, excluding alphas I and O. First is the level letter, followed by the bay number. For example, HMDF L15 refers to a frame block on the horizontal side of the MDF located on level "L" at bay 15.
- 2.4.4 On the vertical portion of the DF, the frame blocks are mounted in vertical rows. Each vertical is assigned a number, beginning with the numeric one at the first vertical, and continuing in consecutive order to the end of the framework. Frame blocks are assigned a level letter beginning with A at the bottom and continuing up in consecutive order to the top of the framework, excluding letters I and O. On the vertical side, specify the vertical number first, followed by the level designation. For example, VIDF 2E is a frame block on vertical 2, at level E of the IDF.
- 2.4.5 Although the numbering of vertical and horizontal positions on a frame is usually in one direction, a frame can grow in two directions. The Floor Plan Record shall be reviewed to

determine frame growth patterns and numbering. If a frame grows in two directions, the horizontal and vertical positions are numbered 1, 2, 3, etc., in one direction and 901, 902, 903 etc. in the opposite direction.

2.4.6 On the conventional DF CO base record, each frame block mounting position is shown as the space between the short cross marks on the horizontal or vertical.

2.4.7 COSMIC and modular ESS Distributing Frame Records are tabular and the records shall be maintained in Frame Mate. There is no graphical/mechanical CO base record.

2.5. Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU) Records

2.5.1 The BDFB/SPDU Record is a tabular assignment record of secondary distribution circuits from the BDFB/SPDU to various frames and equipment served by the BDFB/SPDU which shall be maintained in TAB/db.

2.5.2 The BDFB/SPDU TAB/db Record provides a relational tabular data base of information associated with the BDFB/SPDU and shall include Company, office location, floor, lineup, manufacturer, fuse panels, fuse blocks, fuse positions, fuse assignments, and cable run list. Notes: shall include voltage drop information, fuse type, and other general information about the BDFB/SPDU and associated circuit distribution. (In addition, BDFB/SPDU information such as supply cable size, cable length, voltage, voltage drop, fuse type and installation information may be populated in PowerPro.)

2.6. Power Board Records

2.6.1 Power Board Records are maintained by the AT&T LEC Power Engineer in PowerPro. The PowerPro DC Distribution Record contains the Power Board Manufacturer, Model Number, Power Plant Association, Bay Designation; Panel Description and Position(s); protection device size(s); and load assignments; etc.

2.6.2 The DESP shall submit DC Distribution (Power Board) assignments to the AT&T Power Engineer via PowerPro DC Distribution Worksheets (available on the Mechanization Team Web Site under the PowerPro Tab).

2.6.3 The archived Power Board Front Equipment Record (520 Series) shows the physical arrangement of the power board, i.e. fuses, breaker, bay mounted rectifiers and control equipment. These drawings are available on the electronic document storage system.

2.7. Front Equipment View Records

2.7.1 Front Equipment View Records are records of the physical location of equipment on various frameworks throughout the central office. They contain equipment information in pictorial or tabular form. This information is related to the location, position, and specific mounting details of CO equipment as derived from supplier's standard equipment drawings. Other CO records, such as assignment records support the Front Equipment View Record.

2.8. Assignment Records

- 2.8.1 Assignment Records contain specific information for the interconnection and monitoring of the capacity of network elements. Assignment records may include DSX, Fiber Distributing Frame, and timing, fuse panels and alarm records (Remote Alarm Records are maintained manually).
- 2.8.2 The DESP shall maintain the assignment information in the appropriate Tabular Database system.
- 2.8.3 Remote Alarm Assignments reflects TBOS serial and discrete status/command terminations for Network Elements (NE) on a Central Office (CO) Telemetry Alarm Unit (Dantel or Westronic).

2.9. Equipment Numbering Plans for Central Office Equipment

- 2.9.1 The numbering of bays and frames on all CO records shall be consistent with the Floor Plan Record.
- 2.9.2 Switching equipment shall conform to the manufacturer's lineup and frame numbering scheme.
- 2.9.3 New equipment frames or lineups shall be designated numerically. These numbers shall be unique and assigned only by the CSSP, per the AT&T Space Planning Guidelines.

2.10. Cable Hole Numbering Plans for Central Offices

- 2.10.1 The DESP responsible for E&I jobs, shall submit the floor plan sketch to the Equipment Engineer where new cable hole(s) will be opened, before the start of the job.
- 2.10.2 The sketch shall accurately reflect new cable hole(s) size and relative distances from the column. The Equipment Engineers responsible for the job will forward the sketch to Common Systems Space Planner (CSSP) and obtain an approval of the location of new cable hole(s) before actual hole(s) being opened. CSSP is responsible for cable hole numbering.
- 2.10.3 Cable hole designations should be tracked on office floor plans by the CSSP as he/she is best equipped to know if a new hole will conflict with space allocation plans and, the CSSP will know if space allocation plans need to be adjusted for cable management reasons.
- 2.10.4 Central office cable hole numbering may be encountered in AT&T LEC buildings in one of two methods as follows:
 - A) Floor, Nearest column, Sequential letter designations radiating outward from the column. For example: 02G3B is second floor, near column G3, B representing the second cable hole designated near column G3.
 - B) Floor, Nearest column, Compass direction from the column, Sequential whole numbers in that compass direction. For example: 02G3W2 is second floor, near column G3, West side of column, second hole to West of column.
- 2.10.5 For existing central office buildings, new cable holes shall be numbered in keeping with the established scheme in use in the building. For new central office buildings, the second method above (utilizing compass direction) shall be used.

2.11. Grounding Records

2.11.1 The archived Grounding Schematic (650 Series) Drawings are available on the electronic document storage system. Office Principle Ground Point (OPGP) location changes, and the changes/additions of CO GRD, MGBs, COGs will be shown on revisions to the floor plan and shall be the responsibility of the Common Systems Space Planner (CSSP). Both the floor plan and archived Grounding Schematic (650 Series) Drawings will be used for overall CO Ground System reference.

2.11.2 The archived Grounding Schematic Drawing shows the following information. Subsequent location changes or additions only to the OPGP, CO GRD bus bars, or MGBs will be shown on the floor plan going forward as noted in Section 3, ATT-TP- 76400.

- a) Office Principle Ground Point (OPGP) location and terminations;
- b) Vertical riser (if required);
- c) Horizontal equalizers;
- d) Location of the CO GRD bus bar;
- e) Main Ground Bus (MGB) of the Ground window (when required);
- f) Equipment ground bars;
- g) Size of grounding conductors;
- h) Grounding electrodes;
- i) Driven ground rod system;
- j) Cable Entrance Facility (CEF) ground bar

2.12. Power Equipment Records

2.12.1 Power Equipment Records are those CO records that include details of the equipment used to produce, control and distribute power to CO equipment. Power Equipment DC and AC Distribution Records shall be updated, as applicable in PowerPro, any time equipment is added, changed, or removed from a CO.

The following CO power drawing series records are archived and available in the electronic document storage system for reference:

<u>Dash Number</u>	<u>Power Equipment Drawings Description</u>
- 500-509	Power Battery Distribution; AC Service
- 520-529	Power Board - Front Equipment; Controllers
- 550-559	AC Service and BDFBs
- 650-659	Grounding Schematic; Power Equipment Emergency Engine;

2.13. Fuse Bay Equipment Records

2.13.1 New assignments shall no longer be made on Fuse Bays.

2.13.2 Fuse Bays were originally engineered to provide secondary distribution for many different, small amperage equipment types spread over a large area of the Central Office. Dedicated power

distribution units (PDU's) (feeding equipment in same rack) and non-dedicated (PDU's) (feeding equipment in an adjacent rack) are not considered Fuse Bays.

- 2.13.3 Some of the active Fuse Bays have been converted to TAB/db and the DESP shall maintain the Assignment Record when removing circuits. If the fuse bay record has not been created in TAB/db, the DESP shall include a specific installer note in the detailed specification to update the fuse record book associated with the bay for circuits is being removed.

2.14. AC Service - PDSC Records

- 2.14.1 The AC Service Records show the physical arrangement of the cabinet or panels, the source and capacity wire sizes, terminal lugs, and AC circuit assignments. The requirement for AC Power Drawing Record updates has been replaced by AC Distribution Record updates in PowerPro. The DESP shall submit AC Distribution (Power Distribution Service Cabinet (PDSC) Panel) assignments to the AT&T LEC Power Engineer via PowerPro AC Distribution Worksheets (available on the PowerPro Web Site). The archived AC Service Drawing Records (550 series) Drawings are archived in the electronic document storage system for reference.

2.15. Wiring List and Block Schematic – Power Equipment Records (Discontinued)

- 2.15.1 Wiring List and Block Schematic Drawings are discontinued, and no longer available.

2.16. Ring, Tone And Cadence Records (Discontinued)

- 2.16.1 Ring, Tone and Cadence Record drawings are no longer available. Database records of Ring Plants and Components are populated in the PowerPro system by the AT&T LEC Power Engineer.)

2.17. Miscellaneous Power Records

- 2.17.1 Miscellaneous Power Records are specialized records that include information on power equipment layouts, bus bar, bus bar details, sectional views, standby power equipment, emergency AC equipment, and miscellaneous details of power ducts.
- 2.17.2 Miscellaneous Power Record Drawings are no longer available. Generic versions of CO power detail information in a AT&T Power Drawing format are available in the electronic document storage system for reference.

3. MANUFACTURER AND AT&T EQUIPMENT DRAWINGS

3.1. General

- 3.1.1 The appropriate CO records shall be updated or created to indicate the proper equipment drawings, as well as their associated lists, groups, figures, etc.
- 3.1.2 There are two types of equipment drawings:
- a) Manufacturer's equipment and interconnect drawings. These drawings should only be used if there is no existing AT&T drawing for the associated equipment.
 - b) AT&T drawings. These drawings always supersede information shown on the associated manufacturer's drawings/documentation.

4. AT&T LEC TABULAR AND GRAPHICAL/MECHANICAL CENTRAL OFFICE RECORDS

4.1. General

- 4.1.1 Upon receipt of the AT&T LEC Telephone Equipment Order (TEO), the DESP shall determine which CO records are required to complete the engineering process.
- 4.1.2 To determine which CO records are required, the DESP shall cross-reference Table 4-3. The following details the process for creating or updating CO records.

5. CENTRAL OFFICE RECORDS CREATION AND UPDATING

5.1. General

- 5.1.1 This section details the procedures employed when creating or updating CO records listed on Table 4-3. Specific topics addressed include but are not limited to:
 - a) Creating records;
 - b) Marking and updating existing records;
 - c) Renumbering records;
 - d) Voiding records.
- 5.1.2 CO records shall be created or updated when:
 - a) Equipment is added to an office;
 - b) Equipment is removed from an office;
 - c) Equipment is relocated in an office;
 - d) Assignment record updates are identified;
 - e) Other changes take place, including renumbering records, record only changes and equipment modifications, which may change a list or option designation.
- 5.1.3 The DESP shall resolve any TEO assignment discrepancy with the AT&T LEC Equipment Engineer.
- 5.1.4 The DESP shall make all required "as built" changes to tabular central office records no later than 30 calendar days following completion of installation.
- 5.1.5 The DESP shall mark the required "as built" changes on graphical/mechanical central office records (refer to Table 4-3) and forward marked hardcopy to the MDRC no later than 30 calendar days following completion of installation to:

MDRC Marked Print Desk
2600 Camino Ramon 2S500EE
San Ramon, California 94583

: Exceptions:

CSSP

If in doubt, questions regarding transmittal of marked prints may be directed to the AT&T LEC Equipment Engineer.

5.2. Central Office Drawing Title Block

5.2.1 The drawing title block shall appear on the first sheet and supplementary sheets of CO base records and shall contain the following basic information.

- a) Type of Record: Indicate the type of record such as "Floor Plan," etc. in the first line of the title, beginning at the top center of the title block
- b) Name of Equipment: Top center below Type of Record
- c) Equipment Designation and Numbering: Show the equipment designation (relay rack bays, frames, sections etc.) below the Name of Equipment in the title space as applicable. The numbering shall include the ultimate equipment when known both present and future, for which the record is designed. The range of bay numbers shall be updated to reflect added or removed bays
- d) Floor Number: Show below the Equipment Designation and Numbering
- e) Telephone Company Name: Show below the Floor Number
- f) Office Name: The office name is shown in the lower left hand corner
- g) Office Location: The Town and State is shown in the lower right hand corner
- h) Street Address: The street address may be included in the title block
- i) Common Language Identification (CLLI): The CLLI Code for an office must be shown in the upper left hand corner of the Title Box
- j) Sheet numbers shall be shown in the sheet box as follows
 1. Sheet 1 of 3* on first sheet
 2. Sheet 2 of 3* on second sheet
 3. Sheet 3 of 3* on third sheet, etc.*Last sheet number of the record
- k) Record Titles for Multi-sheet Records
 - l) The first sheet of a multi-sheet records requires a title as described above
 - m) The second and subsequent sheets of a multi-sheet record require a more abbreviated title as follows:
 1. Type of record
 2. Name and designation of equipment on record
 3. Office Name
 4. Town and State

5.3. Central Office Record Marking Standards

5.3.1 The following colors shall be used when manually updating CO records which will be returned to the AT&T LEC by the DESP:

- a) Red - Mark in red all equipment additions, relocations, assignment changes, and record title box changes representing equipment being added, reconfigured, modified, or reassigned. When the number of frames, units, etc. have been changed, also show the new quantities in red
- b) Yellow - Show in yellow all equipment being removed from a CO. Whenever frame numbers, quantities, assignments, etc. change, the old numbers, locations, or assignments are to be highlighted in yellow
- c) Green - Mark in green all record only changes. CO records which do not reflect equipment being added or removed, but which represent new information concerning existing COE configurations are record only changes and are marked in green
- d) Black - X-3 notes, which are instructions to the draftsman, shall be marked in black, encircled with the same color (red, green or yellow) as the associated change marking and with an arrow in the same color pointing from the X3 note to the marked change(s)

5.3.2 The following requirements shall be maintained whenever CO records are changed:

- a) All CO records submitted for update or shipped to a job site shall be clearly labeled with the DESP Name, Detail Engineer's Name or Initials, Detail Engineer's Phone Number and the AT&T LEC TEO order number
- b) Only approved abbreviations shall be used. Refer to Telcordia Technologies document BR 751-410-101, Common Language Standard Abbreviation Master List for standard abbreviations
- c) The AT&T LEC EDMS drafting symbols library shall be used for creating or updating CO base records
- d) Any new symbols added to the body of the record shall be defined in the General Notes
- e) All notes shall be referenced somewhere on the body of the record
- f) All applicable records shall be updated
- g) Whenever measurements are required, such as on floor plans they shall be shown and the appropriate records updated
- h) Entire records shall be provided in a legible format. Partial prints may be submitted, if attached and referenced to an entire record
- i) X3 notes shall be used on engineered marked records only to convey instructions to the draftsman. When X3 notes are used, they shall be color-coded as described above and formatted as follows.

X3: appropriate note to draftsman

5.3.3 The DESP shall bring any updated record to current standards as outlined in this section.

- a) Major record updates to correct record inaccuracies shall be authorized by the AT&T LEC Engineer.

5.3.4 The DESP shall submit all updated CO records to the AT&T LEC per instructions on the TEO.

5.3.5 The DESP shall review any installer marked records and insure drawing standards violations are corrected prior to submitting to the AT&T LEC.

5.4. Office Record Distribution

5.4.1 For E&I or E, F, & I jobs two (2) copies of all new and/or changed central office records, whether administered by the DESP or AT&T, shall be forwarded to the DESP's installer. For E only jobs, two (2) copies of central office records, as part of the installation package, shall be forwarded to the AT&T LEC Equipment Engineer or the Installation Supplier as noted in the AT&T Telephone Equipment Order.

5.5. Updating Floor Plans

5.5.1 The DESP shall request the AT&T LEC Equipment Engineer to resolve unexpected space requirements with the AT&T LEC Space Planner.

5.5.2 The DESP shall forward information on blocked cable holes to the AT&T LEC Space Planner.

5.6. Updating Distributing Frame (DF) Records

5.6.1 Modular Distributing frame records are maintained in the AT&T LEC FrameMate system instead of a conventional drawing.

5.6.2 Conventional frame records are electronically maintained in FrameMate. Marked prints shall be required for mechanical updates that are posted on electronic storage system as active (TBASE) records.

5.6.3 When a frame block is added, it shall be shown on the record by darkening the location at the chosen coordinates. The terminating circuit title, bay location, and circuit numbering shall be indicated.

- a) If insufficient space is available to show the information, an expanded sketch may be used. This sketch is identified by the location coordinates of the frame block. On the sketch, each tick mark is one row of connecting terminals on the frame block;
- b) When the expanded sketch is not used, and all of the rows of a frame block are not assigned, the abbreviation "SR" (Spare Rows) shall be used along with the quantity of spare rows remaining for example [10SR]. Only that portion representing rows of terminals utilized shall be darkened.

5.6.4 As Conventional DF equipment and circuits are added, removed, or relocated, the record shall be updated. The following information shall be shown on these records:

- a) Circuit title;
- b) Originating location;
- c) Spare rows;

- d) Circuit numbering;
 - e) Title box information;
 - f) Jack box and connecting block information - assignments and multiples;
 - g) Sketches showing individual circuit information, such as location, circuit title, spare rows, and circuit numbering.
- 5.6.5 The DESP shall update the "Location of Equipment" table on the drawing with information relating to wiring diagram numbers and figures, frame block code, and the horizontal or vertical location of the frame block.

5.7. Updating AC and DC Power Records

- 5.7.1 AC and PDSC Power Distribution Panel changes and Power Board DC Distribution Changes will be entered into the PowerPro Database. The DESP shall submit AC and DC Distribution (Power Board) assignments to the AT&T LEC Power Engineer via PowerPro AC and DC Distribution Worksheets (available on the Mechanization Team Web Site under the PowerPro Tab.)
- 5.7.2 Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU) RECORDS
- a) TAB/db:
 - 1. Fuse position number
 - 2. Fuse size
 - 3. Secondary distribution cable run length, size, and connector type
 - 4. Assigned network element relay rack number
 - 5. Assigned network element description and load designation
 - 6. L-2 type DC drain of the assigned network element(s)
 - 7. Total assigned drain per BDFB/SPDU load
 - 8. New BDFB/SPDU information as listed in the New BDFB/SPDU Worksheet.
- 5.7.3 The DESP shall forward the New BDFB/SPDU Worksheet to the Cluster Vendor and the AT&T LEC Power Engineer within 5 working days of completing the BDFB/SPDU installation.
- 5.7.4 The Cluster Vendor shall input the information from the New BDFB/SPDU Worksheet into TAB/db.
- a) Engineered BDFB/SPDU Voltage Drop information shall be entered for each BDFB/SPDU into TAB/db.

5.8. Updating Front Equipment View Records

- 5.8.1 The Front Equipment View Records depict how relay rack (RR) frameworks in a CO are equipped. They shall contain the following items:

- a) RR height
- b) Height of first mounting plate from the floor
- c) Mounting plate width and height
- d) Individually added units depicting the correct location and number of occupied mounting plate spaces
- e) Manufacturer, equipment description, part number and list/group structure
- f) Unit/Panel numbering
- g) Circuit numbering
- h) Adapter arrangements where applicable.
- i) Miscellaneous and overhead equipment not occupying mounting plates within the frame (TAB/db only).
- j) Removed units eliminated from drawing when units are removed

5.9. Updating Assignment Records

5.9.1 Assignment records shall be updated in the appropriate database systems. They shall contain the following items:

- a) Equipment description and part number of equipment
- b) Wiring diagram number, quantity of units, circuits, figures
- c) Relay rack location
- d) Shelf/unit/panel numbering
- e) Circuit numbering
- f) Notes.

5.9.2 When a Network Element is terminated on an alarm surveillance unit, the DESP shall mark for update the alarm assignment drawing and forward to the MDRC except when the AT&T LEC Equipment Engineer has updated the database previously.

5.9.3 The tabular assignment records for field assembled equipment bay fuse panels shall be updated to include the potential/polarity, maximum allowable and cumulative assigned current drain, fuse position and size, and the equipment type, interconnect figure and location. Assignment records are not required for fuse/circuit breaker panels when they are included as part of a preassembled bay.

5.10. Updating Switch Records

5.10.1 Switch internal assignment records, power distribution cabinet or frame records and other miscellaneous switch records shall be updated in accordance with the switch manufacturer's standards.

5.11. Voiding Records

- 5.11.1 CO base records may be voided for any of the following reasons:
- a) A record has been entirely substituted by a new record;
 - b) A new record has been established, and the order to which it applies has been entirely canceled;
 - c) The removal of equipment, circuits, framework, etc. that covers an entire record.
- 5.11.2 Records are placed on a void status, rather than destroyed, so that a record of equipment configurations is available in case the equipment is reused in another office. Voided records are retained in EDMS for three years. Voided records may be reinstated within the three-year period only by contacting the AT&T LEC. Records shall not be voided without the concurrence of the AT&T LEC Equipment Engineer.

TABLE 4-1 – SUMMARY OF CHANGES IN SECTION 4

Change	Item in 11/1/05 Issue	Item in This Issue
Revised	2.4.1 5.6.2	2.4.1 5.6.2
Deleted		
Added		5.9.3

[END OF SECTION]

SECTION 5--EQUIPMENT LAYOUT & EQUIPMENT ENVIRONMENTS

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1. GENERAL

1.1. Introduction

- 1.1.1 This section describes the general requirements for telecommunications equipment layout engineering.
- 1.1.2 Changes in this issue of Section 5 (if any) are summarized in Table 5-1.
- 1.1.3 Equipment engineered for installation in AT&T LEC locations shall be in compliance with ATT-TP-76200 Network Equipment Power, Grounding, Environmental, and Physical Design Requirements.

1.2. Equipment Layout Requirements

- 1.2.1 If the AT&T LEC Equipment Engineer has provided a marked floor plan or specific equipment locations, the DESP shall request the AT&T LEC Equipment Engineer to resolve any equipment layout changes with the AT&T LEC Space Planner.
- 1.2.2 The equipment installation design shall ensure that CO technicians have optimum access to installed equipment.
- 1.2.3 Equipment layouts shall be in accordance with the Company's standards for network equipment environments (refer to BSP 800-003-100, issue C, Standards for Network Equipment Environments), and in compliance with published equipment manufacturer's requirements/restrictions relative to actual placement of equipment.

2. EQUIPMENT FRAMES

2.1. Introduction

- 2.1.1 Equipment frames, as defined here, include relay racks, bays, and floor-supported cabinets comprised of a structural framework, and all equipment mounted thereon.

2.2. Equipment Frame Requirements

- 2.2.1 All equipment frames placed in AT&T LEC central offices shall be in compliance with BSP 800-000-102MP, "Central Office Equipment Framework Design Requirements."
- 2.2.2 Nineteen-inch wide relay racks are not standard and shall not to be used.
- 2.2.3 All frames in a system or a line-up shall be the same height, unless otherwise authorized by the AT&T LEC Equipment Engineer.
- 2.2.4 The DESP shall specify a 1 3/4 or 2 inch drill hole pattern on miscellaneous equipment frame uprights.
- 2.2.5 If the design of the frame does not permit the use of the standard hole pattern at the top of the frame, an adapter plate which mounts on the top of the frame shall be provided.
- 2.2.6 When spacers, (i.e. spacer junction, frame extender, cable spacer, spacer box) are required between equipment frames, the space between frames shall include a base filler matching the guard box details of adjoining equipment frames and a full height filler panel covering the space between frame uprights (unless an AT&T standard drawing indicates that a filler panel is not required for a specific project).
- 2.2.7 The base filler shall be secured to the building floor with similar floor anchor hardware as used for equipment frame installation.
- 2.2.8 The filler panel shall be secured to the equipment frame uprights with junction plates and mounting hardware at intervals of no greater than 3 feet increments.
- 2.2.9 Filler panel and base filler shall be finished to match color of equipment frames.
- 2.2.10 All equipment frames, relay racks, bays, and floor-mounted cabinets shall have a hole pattern on the base of the frame for anchoring to floors.
- 2.2.11 Equipment frames shall be supported and anchored per BSP 800-000-101MP and BSP 800-068-150MP
- 2.2.12 Stiffening plates shall be engineered as required per drawing ATT-E-00447-E.
- 2.2.13 An ESD Jack and label shall be provided on the front of new equipment racks (right upright as viewed from the front). It shall be electrically continuous with the rack. Exceptions to this requirement apply to power distribution racks / bays and to equipment racks that have no accessible space on which to install an ESD jack. An ESD jack and label shall be provided on the front of an existing equipment rack upright when specified by AT&T engineering. Refer to Note 7 of ATT-E-00174-E and ATT-TP-76300.
- 2.2.14 The location of the ESD jacks shall be at a height of 45" above the finished floor, plus or minus 1" and adjacent to the shelf mounting area.
- 2.2.15 The ESD socket shall be a nominal 4mm (0.160 inches) in diameter to accommodate standard wrist-strap plugs.
- 2.2.16 Any frame, when packaged for transit and accompanied or supported by the usual handling facilities, shall fit through entrances four feet wide and eight feet high.

- 2.2.17 All frames shall comply with the following requirements to ensure a diversity of frame types will fit together in straight, orderly equipment frame line-ups:
- a) No part of any frame or apparatus attached to the frame shall extend beyond the front or rear edges of the base or guardrail of the frame
 - b) The fronts of the base of all frames shall be aligned
 - c) When the depths of the frames are different, transition devices shall be used from one frame to the next
 - d) Rear aisle clearance shall allow for ladder access to all bays
 - e) End guards, end panels or end shields shall be provided on all frame uprights not adjacent to another frame or a building obstruction
 - f) End guards for equipment shall be as wide as the depth of the adjacent equipment frame cable ducts
 - g) End guards shall be the same height as the frames they are installed on
 - h) End guards or end panels that do not match the same depth or overall foot print of the adjacent bay framework shall require a transition device (guard rail closing detail). This transition device shall be required either on the front, rear or both sides of the end guard or end panel whichever is appropriate,
 - i) End guards shall be provided at the end of each lineup.
- 2.2.18 The floor load from equipment frames, excluding the cable distribution system, averaged across the associated floor area, should not exceed 80 pounds per square foot above 7-foot environments and 115 pounds per square foot above 11-foot 6-inch environments. The DESP shall coordinate with the ATT LEC Equipment Engineer to ensure equipment frames do not exceed floor load capacity.
- 2.2.19 With the exception of digital switch cabinets, the base of each frame behind the front and rear guardrails shall have space for AC power distribution for convenience outlets. The sides of the frame base must have holes or be sufficiently open to facilitate distribution wire running through frames. The frame base/guardrail shall provide a means and location for appliance outlets.

3. COLLOCATION

3.1. General

- 3.1.1 Cages and other floor space arrangements for collocation shall be in accordance with the ATT LEC Interconnectors' Technical Publication for Collocation.

TABLE 5-1 – SUMMARY OF CHANGES IN SECTION 5

Change	Item in 11/1/05 Issue	Item in This Issue
Revised	2.2.17 e 2.2.17,h	2.2.17 e) 2.2.17 h)
Deleted		
Added		2.2.17 i)

[END OF SECTION]

**SECTION 6--CENTRAL OFFICE EQUIPMENT BUILDING ENVIRONMENT
REQUIREMENTS**

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1. INTRODUCTION

1.1. General

- 1.1.1 This section outlines environmental requirements for Central Offices (COs). Included are such considerations as temperature, humidity, and air quality. Specifically excluded are those considerations that fall under the control of the Environmental Protection Agency (EPA); i.e., air and ground pollution that results from Central Office (CO) activity.
- 1.1.2 Changes in this issue of this section are summarized in Table 6-1.
- 1.1.3 Requirements in this section apply to building engineering service providers. To ensure satisfactory operation of the equipment, the DESP shall consider the environment in which the equipment will be working.

2. THERMAL

2.1. General

- 2.1.1 Specific equipment heat dissipation requirements shall be coordinated with the AT&T LEC Equipment Engineer.
- 2.1.2 The operating ambient temperature will be maintained by CRE to the levels in Table 6-2.

Operating ambient temperature indicates the central office aisle temperature rather than return air or thermostat temperature. Per Telcordia GR-63-CORE, ambient temperature should be measured 59" above the floor, 15.8" from the face of the equipment. The upper limit of the temperature range may be lowered in a specific CO if

NOTE:

All new equipment is tested for reliable operation at much larger range of continuous and short-term ambient temperatures than stated in table 6-2 (i.e., max 104°F continuous and 122°F short-term). Most equipment should continue to operate reliably when CO ambient temperatures exceed the ranges stated in this table when:

- the CO average ambient temperature¹ does not exceed 78°F and the ambient temperature measured in front of the equipment ("hot spot") does not exceed 85°F, and
- the CO average ambient temperature does not exceed 90°F for over 4 consecutive days.

- 2.1.3 Before the ambient temperature in COs operating in the traditional Narrow Band range (60°F to 72°F) can be changed to the Wide Band range (65°F to 78°F) an audit of the facility must be performed by CRE per the Wide Band checklist. Refer to ATT-812-000-016 for details.
- 2.1.4 Details on Power Room thermal maintenance and upgrades are located in ATT-812-000-016.

In COs with Wide Band temperature protocol (see below), CRE should be notified when any ambient temperature measurement exceeds 83°F, or the average CO ambient temperature exceeds 80°F for 24 hours.

3. FIRE RESISTANCE

3.1. General

- 3.1.1 Data processing interconnecting cables and connecting cables run through an air plenum do not require a plenum rating if the plenum meets the criteria of the National Fire Protection Association (NFPA) 70-465, and the plenum has a smoke detection system.
- 3.1.2 Building or central office equipment that does not meet, or has not been tested to, ATT-TP-76200 fire resistance standards shall be compartmentalized with no less than a one hour fire rated wall and sectionalized air handling. The DESP shall coordinate this with AT&T LEC Engineer.

4. FIRE AVOIDANCE AND CONTAINMENT

4.1. General

- 4.1.1 This section is not a stand-alone document. It shall be used in conjunction with ATT-TP-76200, ATT-TP-76300 and ATT-812-000-032.

4.2. Products

- 4.2.1 The DESP shall specify that only approved smoke and firestopping products, as specified in ATT-812-000-032, Appendix 1, shall be used.

4.3. Cable Openings

- 4.3.1 All openings in floors, fire rated walls and partitions shall be fire stopped to an equivalent structure fire rating, per ATT-TP-76300. This includes openings for building-related services, house telephone equipment service, openings for power (AC and DC), switchboard and other cables.

4.4. Fuel Containment

- 4.4.1 Fuel level indicators on the day tank shall be provided.

5. BATTERY ROOM VENTILATION

5.1. General

- 5.1.1 In shared spaces, where batteries are not compartmentalized from other equipment, the DESP shall follow the most stringent of the following ventilation alternatives:
 - a) One air change every four hours;
 - b) Two cubic feet per minute per string;
 - c) Twenty cubic feet per minute per person (when occupied);
 - d) Applicable codes.

- 5.1.2 In separate battery rooms, an outside air ventilation of two cubic feet per minute per string is required with a minimum of one air change every twelve hours.
- 5.1.3 Battery room air shall not be exhausted through any other equipment or administrative space, but shall be exhausted directly outdoors away from any building intake.

6. SEISMIC AND OFFICE VIBRATION

6.1. General

- 6.1.1 The DESP shall verify that the equipment is engineered to meet the criteria presented in the following AT&T LEC Practices:

ATT-TP-76408, Network Facility Auxiliary Framing and Bracing Requirements

ATT-TP-76409, Network Facility Cable Rack Requirements

ATT-TP-76201, Common Systems - Hardware Products and Materials Specifications

BSP 800-000-101MP, Network Equipment Anchoring Requirements

BSP 800-000-102MP, Central Office Equipment Framework Design Requirements

BSP 800-068-150MP, Central Office Equipment Framework Support Requirements

BSP 800-000-104MP, Bracing Requirements For Network and Data Equipment On Raised Floor System

- 6.1.2 Equipment shall be engineered for the appropriate conditions of the site. All offices in Zones 3 and 4 shall be designed to high seismic risk requirements as detailed in each of the above referenced documents.
- 6.1.3 Low seismic risk requirements have incorporated minimum equipment securing measures required for all sites to reduce risks for equipment overturning or equipment walking due to building vibration, accidental impacts, unbalanced loads or other physical mishaps.
- 6.1.4 Only seismic Zone 4 approved equipment framework shall be used for network equipment in all AT&T offices. Approved seismic framework permits future reuse of equipment in any AT&T site with minimal difference in framework costs. Approved seismic framework also permits freestanding configuration installation in all AT&T sites as recommended in above referenced documents.

7. AIRBORNE CONTAMINANTS

7.1. General

- 7.1.1 CRE will assure that minimum building filtration of "65% ASHRAE dust spot rating" shall be provided. Some local regulations are more stringent and shall supercede this stated requirement.

8. ILLUMINATION

8.1. General

- 8.1.1 Illumination measurements can be affected by light meter characteristics and accuracy, the way the meter is used, and by the arrangement of lighting equipment. Field measurements shall be made with a light meter that gives relative responses to light arriving from all hemispheres.
- 8.1.2 Excessive luminance (photometric brightness) differences within the field of view cause discomfort, fatigue, and reduced efficiency. The luminance of surfaces immediately adjacent to the visual task shall be at least one-third that of the task, and they shall not exceed the luminance of the task. For more remote surfaces (i.e., an adjacent frame, bay or cabinet), the luminance of any significant surface normally viewed directly shall be between one-third and five times the luminance of the task.

8.2. Equipment Lighting

- 8.2.1 Fluorescent lighting shall be used to illuminate CO equipment, power and maintenance areas. Equipment lighting for network equipment frames and equipment related work areas shall be appropriate for the performance of routine network administration functions. Lighting for the performance of detailed equipment installation and circuit/service management activity shall be provided by the use of portable light fixtures appropriate for the activity being performed. Unless otherwise specified for a particular network element or technology, equipment lighting shall be provided above equipment maintenance (front) aisles only.
- 8.2.2 Unless otherwise directed by AT&T's local real estate representative, LumiCool fixtures shall be EF&I'd for all new equipment line-ups scheduled for installation as part of NP&E's normal site conditioning or detail equipment engineering processes. Traditional lighting fixtures shall only be used to finish out existing lighting arrangements and where required due to space restrictions or special equipment/area requirements. Reference ATT-TP-76202 for engineering details for the LumiCool fixture.
- 8.2.3 In all new installations, T8 fluorescent lamps and electronic ballasts shall be used in equipment and operating areas because of their relatively high light output per watt. Fluorescent lamps with the most color correct rating shall be used (i.e., do not use pink, blue or other tinted lamps).
- 8.2.4 Minimum levels of illumination shall be maintained in CO equipment areas. New lighting systems shall provide initial illumination levels as least 25 percent higher (to account for losses due to lamp lumen depreciation and dirt accumulation in the lighting system), but no more than 50 percent higher than the levels listed in Table 6-3, "Maintained" column.
- 8.2.5 Low intensity lighting shall be provided as required on an individual office basis. Typically, low intensity equipment lighting practices shall be used in all equipment areas larger than 2000 ft.² and where multiple equipment areas are contained on a single floor. Low intensity lighting consists of assigning the end fixtures of alternating rows of equipment lighting to a separate circuit and control switch so that a person can pass through an equipment area without having to turn on all of the equipment lineup lighting fixtures.
- 8.2.6 High-intensity lights in each equipment aisle are to be controlled by a switch designated for that aisle. In small central offices all lighting can be switched at a single location.
- 8.2.7 Motion detector lighting controls (infrared technology) shall only be used in central offices where special circumstances dictate their use (e.g., some collocation spaces). Typically, one

motion detector should be used for every 30 feet of aisle space and connected in series with the light switch. Economic studies show that the pay back rate for motion detector equipment investments is typically 3 to 5 years or longer.

8.2.8 Light fixtures shall not be placed directly over batteries.

8.2.9 Additional frame and aisle lighting requirements are given in Section 8 of ATT-TP-76400.
Illumination

8.3. Building Lighting

8.3.1 General building lighting for central offices is provided by Corporate Real Estate.

8.3.2 Additional information may be found in ATT-812-000-016

9. EMERGENCY LIGHTING

9.1. General

9.1.1 General building lighting for central offices is provided by Corporate Real Estate (CRE).

9.1.2 General emergency lighting as defined by local and state building codes is considered part of the building architecture and are independent of the DC Network Access protected lighting system.

9.1.3 The DC Network Access protected lighting system is used exclusively for operation and restoration of network equipment.

9.1.4 Only Network Access protected power lighting (as defined in Table 6-4 shall be fed from the DC Power Plant. All other emergency lighting and egress systems shall be on CRE supplied equipment.

9.1.5 Network Access protected lighting fixtures shall contain DC elements as defined in table 6-4.

TABLE 6-1 – SUMMARY OF CHANGES IN SECTION 6

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

TABLE 6-2 – OPERATING TEMPERATURE & HUMIDITY LEVELS

Area	Normal Operating Ambient Average Temperature Range	Normal Operating Relative Humidity Range ²
Switch/Transport	65°F - 78°F ¹	5 – 55%
Power Room without Batteries	50°F - 85°F	5 – 55%
Power Room with Batteries; and/or Battery Rooms/Areas	50°F - 77°F	5 – 55%

1. See NOTE for paragraph 2.1.2
2. Bellcore studies show that it may be economically advantageous to humidify up to 15% when existing humidification equipment is present. In COs that have existing humidification equipment and the RH values drops below 15% for periods longer than short-term durations*, the humidification equipment shall be activated such that the relative humidity levels will not fall below 15%. Bellcore studies also state that humidification should be considered for mission critical equipment, in unhumidified spaces where Tandems, 911 Routers, or STPs are located. Design considerations should be supported by environmental load analysis. Installation of humidification should be considered with levels set at 15% RH.

*Per Telcordia GR-63 short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year (i.e. no more than 360 hours or 15 occurrences during a 1-year period.)

TABLE 6-3--MINIMUM MAINTAINED ILLUMINATION LEVELS

AREA	LEVEL (Maintained) (FOOT CANDLES)
EQUIPMENT FRAME AREA Maintenance aisle Wiring aisle - general (Use portable lighting units during maintenance) Wiring aisle - behind equipment designated as requiring rear aisle lighting	15 (Note 1) No design level 15 (Note 1)
DISTRIBUTING FRAME AREA Maintenance aisle Wiring aisle	20 (Note 1) 10 (Note 1)
POWER AND BATTERY AREAS Aisles and open spaces AC switchboards and DC Battery Distribution Boards (BDB)'s (Measure at center of board)	30 (Note 2) 20
CABLE ENTRANCE AREA Aisles and open spaces (Use portable lighting units during maintenance)	5 (Note 2)
CONTROL, TEST, AND MAINTENANCE AREAS Control center or test frame (measure on shelf) Print display board (measure at center of board) Desk top (measure on writing surface Computers)	50 50 50-70 20-30

- NOTES:**
1. Measure illumination on vertical equipment surface 30 inches above floor with meter aimed across aisle. Do not allow shadows to fall on light sensitive cell.
 2. Measure illumination in aisle center, five feet above floor, with meter aimed upward.

TABLE 6-4 – LOCATIONS AND ACCEPTABLE POWER SOURCES OF THE OVERALL FACILITY LIGHTING SYSTEM:

ELEMENT	Building	Network
General Building Lighting and emergency egress	X	
Exterior Security Lighting	X	
House Service Board (HSB)		X
DC Power Plant(s)		X
Network Operations control area (e.g. MAP area)		X
ATS (when independent of the HSB)		X
Standby engine control panel		X
Network lighting between control areas		X

[END OF SECTION]

SECTION 7—WIRE, CABLE and FIBER REQUIREMENTS

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1. GENERAL

1.1 Introduction

- 1.1.1 This section covers the requirements for engineering switchboard cable, AC wiring, DC power cable, ribbon cable, coaxial cable, treatment of loose wires and the requirements for coaxial, ABAM, and terminal type connections.
- 1.1.2 Changes in this issue of Section 7 are summarized in Table 7-1.
- 1.1.3 The Detail Engineering Service Provider (DESP) shall ensure that all equipment added, rearranged, modified or removed is properly engineered and in conformance with the AT&T LEC Telephone Equipment Order (TEO) and ATT-TP-76400.

1.2 Cable Holes

- 1.2.1 The addition of new cable hole penetrations shall be coordinated with the AT&T LEC Equipment Engineer.
- 1.2.2 Work items shall be included to ensure that all cable holes, sleeves and slots are properly closed and permanently fire stopped per ATT-812-000-032.

1.3 Cable Routing

- 1.3.1 The DESP shall provide for cost effective cable routing, minimal number of cable holes, and minimal number, length and size of cable. Specific applications may require diverse routing and/or unique construction. In order to provide efficient and effective cable routing the DESP shall:
 - a) Avoid blocked routes and cable rack overloading when determining routes for cabling operations;
 - b) Provide the most direct available route;
 - c) Select cable type to minimize the number of cables required;
 - d) Provide the minimal required length and sized cable.
 - e) Not engineer or otherwise direct the use of cable routes that require cable to waterfall/exit the sides of the cable rack except at points of cable termination. Refer to Figure 7-1.
- 1.3.2 If specified by the equipment manufacturer or the AT&T LEC Equipment Engineer, power and switchboard cables shall be run on separate cable racks. Unless otherwise specific by the AT&T LEC Equipment Engineer, power cable shall not be run on panned switch rack.

2. SWITCHBOARD CABLING

2.1 General

- 2.1.1 P-wire and switchboard cable shall not be routed on dedicated power cable racks unless directly associated with power circuits.
- 2.1.2 P-wire and switchboard cable shall not be routed on fiber cable racks or raceways.

2.2 Common Items

- 2.2.1 When the equipment manufacturer provides a cabling method, that method shall be utilized, except as shown on an AT&T Standard Drawing.
- 2.2.2 All switchboard cable, connectorized cable, P-wire, and cross connection wire shall be insulated tinned copper. Untinned wire is not approved for use in the central office except for CAT-5 and RS232 cables.
- 2.2.3 Tip and ring conductors shall always be paired. Single leads and split pairs are not acceptable for tip and ring applications.

2.3 Distributing Frames

- 2.3.1 Horizontal Side - The leads from one cable may be spread over a maximum of five consecutive, physical terminal blocks in each direction
- 2.3.2 Vertical Side - A cable may be formed over an entire vertical or any portion of it, as required.

2.4 Synchronization Cable

- 2.4.1 See Section 11 of ATT-TP-76400 for synchronization cable requirements.

2.5 Relay Racks

- 2.5.1 The leads from one cable may be formed over one or more groups of mounting plates or relay rack units, but shall not be spread over more than one relay rack bay.

3. AC WIRING REQUIREMENTS

3.1 General

- 3.1.1 Per the NEC, all newly placed AC panels and serving equipment with AC input voltages 150v AC or greater shall maintain a minimum working clearance of 48 inches. This does not include the rear or sides when the equipment is built for no access.
- 3.1.2 All wiring and conduit ordered for AT&T LEC central offices shall meet the requirements of the National Electric Code (NEC), Nationally Recognized Testing Laboratory (NRTL) tests, and local code.
- 3.1.3 AC feeders in telecommunications equipment areas (including power rooms) shall be enclosed in rigid conduit, intermediate metallic conduit (IMT), electric metallic tubing (EMT), bus duct or metallic raceway. If EMT is used, compression couplings and junction boxes shall be used; screw type couplings are not acceptable.
- 3.1.4 For network equipment applications where rigid conduit connections are not practical, Jacketed Metallic Clad (JMC) conduit enclosed cable may be used, as follows:
 - a) All final AC equipment connections, or conduit transitions from walls or columns in Seismic Zones 3 & 4, with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed three feet (**including 6" of slack**).
 - b) All final AC lighting fixture connections with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed six feet.
 - c) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet only within bay end-guards and bases to

connect light switches and bay test receptacles. The JMC shall not have excessive slack or be coiled within the bay end-guard or base.

- 3.1.5 AC branch circuits shall be enclosed in non-flexible metallic conduit or raceway. Metallic Armored Clad (MAC) cable may be used only when factory installed within bay end guards, and AC outlet extensions between bays, within the base of the bay.
- 3.1.6 JMC cable shall not be secured to the side of cable rack stringers, auxiliary framing or cable brackets over equipment areas or placed on a separate primary power distribution cable rack segregated from DC power cables.

4. DC POWER CABLE AND WIRE

4.1 Approved Cable

- 4.1.1 All DC power cable (750 kcmil - 14 AWG single conductor, stranded or flex) shall be of the type approved by the AT&T LEC for the specified application as listed on the Minor Materials List (MML). Coated or tinned power cable shall be utilized, unless otherwise specified and approved by the AT&T LEC. Run all leads in continuous lengths unless it is necessary to reduce cable size at the equipment ends.
- 4.1.2 Previously installed power wire and cable shall not be reused.
- 4.1.3 When the equipment manufacturer provides a cabling method, that cabling method shall be utilized.
- 4.1.4 Flexible DC power cables listed on the MML are approved for limited use as follows:
 - a) Where sharp bends are necessary;
 - b) Within battery systems and rectifiers;
 - c) Where equipment is subjected to shock and vibration.

4.2 Battery and Battery Return Leads

- 4.2.1 The battery and battery return leads are a pair and shall be run closely coupled.
- 4.2.2 The battery return leads shall be approximately the length of its associated battery lead. Exception: When the primary battery return lead is required to pass through the ground window, the battery return lead may be run separately.
- 4.2.3 Primary battery and battery return leads shall be run on unpanned dedicated power cable rack.
- 4.2.4 Secondary power leads shall be run on existing, dedicated secondary power cable racks, whenever possible. If dedicated cable rack is not available, secondary power leads shall be run on existing non-dedicated cable rack.
- 4.2.5 Unfused battery conductors and their accompanying battery return leads, such as those between the batteries and power boards, shall not be run on racks with other conductors. The rack shall be designated accordingly.
- 4.2.6 Unfused battery conductors between the batteries and power board shall have properly sized, redundant leads to allow routine battery maintenance.

4.3 Vertical Power Cable Runs

- 4.3.1 Vertical power cable runs shall be made on cable racks no greater than 20" wide and should not exceed an ultimate pileup or accumulation of 7".
- 4.3.2 Vertical power cable runs of three or more floors without intermediate 20 foot horizontal runs or loops require one clamp (cable break) per floor. No clamps are required when power cable runs are one or two floors.

5. RIBBON CABLE

5.1 General

- 5.1.1 Ribbon cable shall not be run on cable rack. Panduit type plastic trough (or equivalent) shall be provided for interbay installation.

6. COAXIAL CABLE

6.1 General

- 6.1.1 Waveguides and coaxial cables shall be routed outside the perimeter of the isolated bonding network, unless the cables are terminated within the isolated bonding network.
- 6.1.2 DS3 and STS1 cables shall be 75 ohm coaxial with a single tinned copper shielded braid.
- 6.1.3 When 734 and 735 type soft dielectric coax cable is terminated, clear heat shrink is NOT required.
- 6.1.4 Only 735C and 734C coaxial cable is approved for use in AT&T's network per ATT-E-00067-E note 12

7. SHIELDED CABLE

7.1 General

- 7.1.1 All DS1 cables shall be shielded and sized according to length.
- 7.1.2 Low Speed Digital (below DS1), and RS232 cables shall be shielded cables.
- 7.1.3 Shielding requirements for timing cable can be found in Section 11.

8. WIRE NOT IN SWITCHBOARD CABLE

8.1 General

- 8.1.1 Supplier documents shall be consulted for the insulated wire to use in a particular system. If the insulated wire is not specified, the following guide shall be used in selecting insulated wire.
 - a) Local cable or loose wiring solder type terminations: 22, or 24 gauge solid copper conductor;

- b) Local cable or loose wiring non-soldered terminations: 22, 24 or 26 gauge, solid tinned copper conductor;
- c) Bay fuse panel outputs to rack mount unit inputs (local power cable): 20, 22, or 24 gauge solid tinned copper conductor. 16 gauge local power cable, when required, may be either solid or stranded depending upon the termination requirements at either end;
- d) Surface wiring: 22 or 24 gauge solid tinned copper conductor;
- e) Extra strength/abrasion resistance: 20, 22 or 26 gauge solid tinned copper conductor;
- f) Shielded wire: shielded 22, 24 or 26 gauge solid tinned copper conductor with a solid shield and drain wire that are common with each other and run the entire length of the cable;
- g) Wiring not in switchboard cable run on cable racks: Use 20, 22, or 24 gauge solid tinned copper conductor. In general, only one to four leads shall be run without using cable;
- h) Wire run in conduit: 20, 22, of 24 gauge solid tinned copper conductor.

8.1.2 Surface wiring is run loose and dressed near or against the mounting plate or panel, or adjacent to the plane of the mounting surface. The DESP shall use the following color guide for surface wiring:

Green - general wiring (except battery and ground wires).

Red - battery wires.

Black - battery return or ground wires.

Other colors may be used, when required for a specific purpose, or to facilitate supplier requirements.

8.2. Cross-Connect Wire

8.2.1 The AT&T LEC shall provide cross-connect wire for distributing frames unless otherwise specified.

8.2.2 If the DESP is required to provide the cross-connect wire, the type, gauge, and color of the wire shall be determined from ATT-002-531-050. A copy of the ATT-002-531-050 may be obtained from the AT&T LEC.

9. CONNECTIONS

9.1. DC Circuits

9.1.1 DC power lead mechanical connections (e.g., thread pressure type, spring-pressure, etc.) shall not be used. Reuse equipment shall be updated to replace all mechanical connections.

9.1.2 Compression connections for DC power shall be used and shall be in accordance with the Section 12 of ATT-TP-76400.

9.2. AC Circuits

9.2.1 All AC connections shall be made in accordance with the NEC.

9.2.2 Wire nuts (UL94-V1 or better) shall be used only for AC circuits installed in a metallic enclosure.

9.3. Coaxial Connections

9.3.1 Coaxial cable connections shall be 75 ohm, crimp type BNC connectors.

9.4. Corrugated Shielded Cable (aka. ABAM or 600B)

9.4.1 The U-shaped "B" Bond Clip shall be used for attaching the ground wire to the aluminum sheath of the corrugated shielded cable. See standard equipment drawings for additional information.

9.5. 710 and Similar Type Connectors

9.5.1 When cable is spliced using modular splicing apparatus, these splices shall be done in accordance with the manufacturer's specification. The AT&T LEC Equipment Engineer must approve any use of these connectors.

9.5.2 When connectors are placed on cable racks or pressed into adjacent cables they shall be covered with heat shrink tubing.

9.6. Terminal Type Connectors (#10 AWG and Smaller)

9.6.1 Connections made to screw type terminals with #10 through #26 gauge tinned copper wire shall be made using the correct color coded insulated ring type terminal, such as the T&B STA-KON, Burndy VINYLUG, Lucent Technologies WP91412 or Panduit nylon insulated.

9.6.2 Ring terminal type connectors except #24 and #26 gauge shall be NRTL listed, and made of tin plated copper, having a welded seam and an insulated barrel.

9.6.3 Use the following color coded terminals for the following size wire:

Yellow/Amber terminal #26-#24 wire*

Red terminal #22-#18 wire

Blue terminal #16-#14 wire

Yellow terminal #12-#10 wire

*Not NRTL rated or listed

10. FIBER

10.1. Fiber Patch Cords and Cable

10.1.1 The DESP shall order only AT&T approved fiber patch cords and fiber cable shown in ATT-E-00136-E notes 9, 11, 12 and 15.

11. ETHERNET CABLE

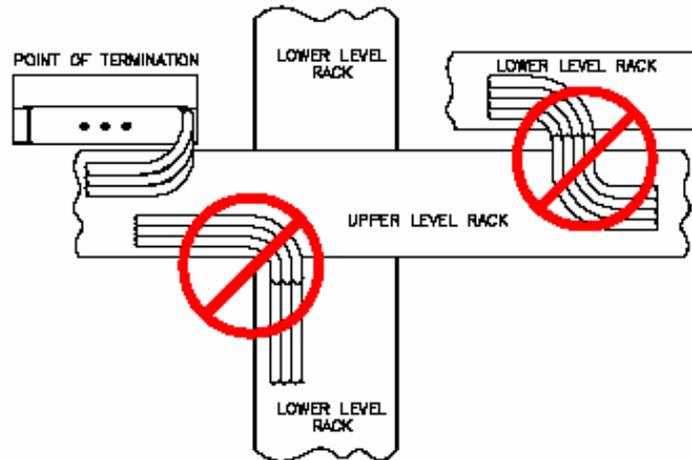
11.1. Ordering Ethernet Cable

11.1.1 The DESP shall order Ethernet cable per drawing ATT-E-00053-E.

TABLE 7-1 – SUMMARY OF CHANGES IN SECTION 7

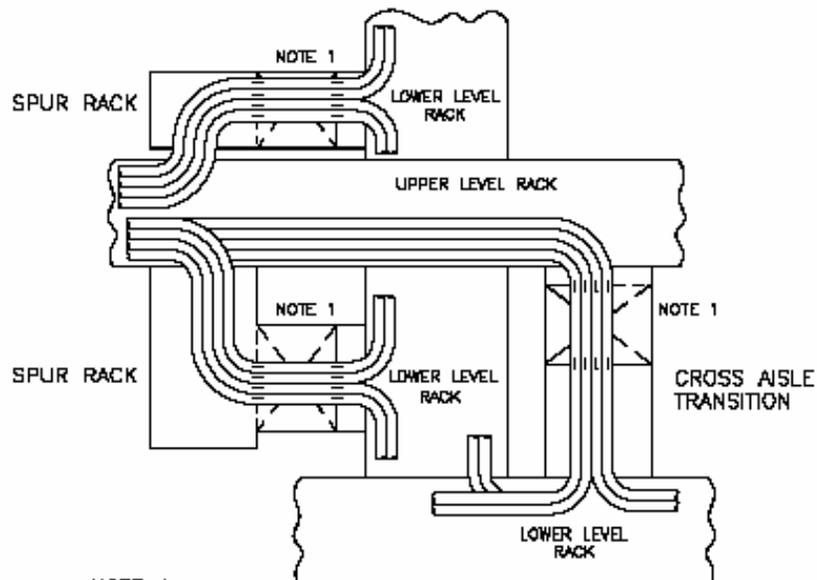
Change	Item in 11/1/05 Issue	Item in This Issue
Revised	3.1.4	3.1.4
Deleted		
Added		

Figure 7-1 – Typical Routing Of Cable Between Cable Racks At Different Levels



CABLE SHALL DROP/WATERFALL OFF THE SIDES OF
CABLE RACK AT POINTS OF TERMINATION ONLY.

EXCEPT FOR SBC-812-000-031 FIG. 6(F) ARRANGEMENTS,
CABLE SHALL NOT BE ROUTED BETWEEN VERTICALLY OFFSET
RACKS AT CABLE RACK INTERSECTIONS OR ALONG THE LENGTHS
OF PARALLEL CABLE RACKS THAT ARE AT DIFFERENT LEVELS.



NOTE 1
SBC-812-000-031 FIG. 6(F),6(G),6(H),6(M),8(B)
OR SIMILAR CABLE RACK TRANSITIONS.

TYPICAL CABLE TRANSITIONS BETWEEN
CABLE RACKS INSTALLED AT DIFFERENT LEVELS

[END OF SECTION]

SECTION 8--CABLE RACK, AUXILIARY FRAMING AND LIGHTING SYSTEMS

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1. CABLE RACK

1.1. GENERAL

- 1.1.1 This section covers apparatus requirements for cable racks in switching, transmission, and power equipment areas.
- 1.1.2 Changes in this issue of Section 8 are summarized in Table 8-1.
- 1.1.3 ATT-TP-76409 provides additional network cable rack requirements.

- 1.1.4 Anchoring requirements shall be in accordance with BSP 800-000-101MP and ATT-812-000-016.
- 1.1.5 Engineering of cable rack supports shall conform to the seismic risk level of the specific office,
- 1.1.6 Self-drilling anchors shall not be used to secure ironwork to ceilings under any circumstances.

1.2. Description And Sizes

- 1.2.1 All new installations of cable racks shall:
 - a) be solid stringer (outside dimension of 2 inches by 3/8 inch) ladder-type in network equipment areas.
 - b) be 1-inch by 1/2-inch channel spaced on 9 inch centers and shall be welded to the stringers.
 - c) have first, last, and each alternate strap of the cable racks wider than 24-inches reinforced with a welded 1 x 1/4-inch bar.
- 1.2.2 Cable rack shall have a non-corrosive plated or painted finish.
- 1.2.3 Cable rack assembly hardware, including bolts, studs, threaded rods, nuts, washers, clips, clamps and similar material shall have a non-corrosive plated finish. Refer to ATT-TP-76201 for on approved painted and electroplated finishes.
- 1.2.4 Refer to ATT-TP-76409. Only straight formed-wire bolt-on cable brackets (horns) shall be used for unsecured cable applications of office cable racks. The DESP shall:
 - a) Provide a sufficient quantity of cable rack horns to allow the installer to locate the horns on alternate straps of cable rack, spaced no more than 18 inches apart.
 - b) Provide additional cable horns, as necessary, for installation at crossing points and points where cables drop off the racks.
 - c) Provide additional cable horns, as necessary, for additional brackets to keep cable confined to cable racks.
 - d) Not provide cable horns with heights exceeding the cable rack's maximum allowable cable pile up per Section J of ATT-TP-76300.
 - e) Not engineer or instruct the installer to place cable rack pans on inclined racks.
- 1.2.5 Cable rack pans shall not be extended through a fire rated wall.
- 1.2.6 Metal is the only approved material that shall be used for cable rack pans.
- 1.2.7 Cable rack panning shall be provided in sufficient width to cover the cable rack without the need for multiple pans.
- 1.2.8 Cable rack with welded-on uprights (horns) shall not be provided.
- 1.2.9 Cable supporting brackets may be used for limited applications of dedicated cable runs.

1.3. Location

- 1.3.1 The location of a cable rack shall be such that the clearances required for installation and maintenance of the ultimate equipment arrangement will be maintained.
- 1.3.2 Cable racking above new equipment areas shall be arranged as indicated in figures 8-18 to 8-21 depending on how BDFBs installed in the new area will be cabled.
- 1.3.3 A cable rack shall not be located close to pipes, radiators, windows, doors, or any other equipment that may subject the cabling to detrimental conditions.

1.4. Engineering Requirements

- 1.4.1 Cable rack load limitations as stated in ATT-TP-76409 shall be considered when engineering new cable racks or when additional cables are added to an existing cable rack.
- 1.4.2 Cable racks shall not be supported from the cross-straps.
- 1.4.3 Horizontal cable rack should be supported on five foot centers, and the spacing between supports shall not exceed six feet.
- 1.4.4 Cable rack support shall be provided within 30 inches of the free end of a cable rack.
- 1.4.5 Adjustable cable rack stringer connectors or friction splices may be used.
- 1.4.6 Permissible pile-up of switchboard cabling on cable racks for normal and maximum spacing of supports is shown in ATT-TP-76409.
- 1.4.7 Vertical switchboard cable runs shall not exceed an ultimate pile-up of 12 inches for switchboard cable racks or 7 inches for power cable racks. To provide the space required to properly close and fire stop a cable hole, the pile-up on all vertical racks shall be additionally limited so that the cable is not closer than 3 inches to the face of the cable hole. .
- 1.4.8 The DESP shall engineer all cable mining activities to comply with ATT-TP-76300, Section Q.
- 1.4.9 The maximum width of horizontal and vertical dedicated power cable racks shall be limited to 1 foot 8 inches.
- 1.4.10 Safe loads for steel beam clamps, ceiling inserts, threaded rods, and lag screws, for the purpose of determining the spacing of supports other than normal are shown in ATT-TP-76409.
- 1.4.11 Cable leaving the cable rack shall not be unsupported for a distance greater than three feet for equipment bays and four feet for conventional distributing frames. For 2/0 or larger power cable, the unsupported distance shall not exceed three feet.
- 1.4.12 To protect cabling at T-intersections of bar-type cable rack and cross-aisle rack, finishing caps shall be provided for the ends of all cross-straps that project within the T-intersection area as shown in ATT-TP-76409.
- 1.4.13 Clamping details used for junctions of ladder-type cable racks are shown in ATT-TP-76409. Where separation of metallic continuity is required, fiber insulation shall be provided.

- 1.4.14 Sections of ladder-type cable rack shall be assembled so that support for the cabling is provided every nine inches. At turns or junctions, in vertical or inverted horizontal cable runs, where the turn of the cables is such that proper support is not provided for the cables, 1/8 inch by 1 inch flat bar shall be placed diagonally across the rack in a manner to provide proper support for the cables.
- 1.4.15 The longest length of sections, and the fewest parts practical, shall be provided. No more than one splice shall be placed between any two adjacent points of support on horizontal runs. Each cable rack section shall have at least one point of support. Cable rack splices shall not be construed as support. A splice shall not be used beyond the last point of support when the end of a rack extends in cantilever fashion.
- 1.4.16 Ladder-type cross-aisle cable racks may be installed at the same height as the ladder-type over-frame rack. Consideration shall be given to clear lighting conduit or other obstructions. Continuous runs of ladder-type cross-aisle cable racks fastened above and across, over-frame cable rack with J-bolt fastenings, are permitted for addition to existing office configurations only and where ceiling heights are favorable.
- 1.4.17 Power distribution cables and grounding conductors, when carried in main or end aisle and where intermediate frames are omitted in frame line-ups, shall be supported from the main or end aisle cable rack stringers by means of power cable support brackets. Where there are no main or end aisle cable racks, the cables shall be supported from auxiliary framing by means of power cable support brackets. In all applications, brackets shall be placed at a maximum interval of 18 inches.
- 1.4.18 The open ended sections of ladder-type cable rack shall be protected with an approved finishing cap.

1.5. Support of Cable Rack

- 1.5.1 Cable racks shall be supported by high- or low-type framing, other cable rack, threaded rods, floor-mounted pipe stanchions, and approved wall or ceiling mounted brackets.
- 1.5.2 In low seismic risk locations both stringers shall be bolted at each end of the run and only one bolt is required at intermediate supports on alternate sides of the rack.
- 1.5.3 In high seismic risk locations, both stringers shall be bolted at every support.
- 1.5.4 Splicing of threaded rods should be avoided. When splicing is necessary, there shall be no more than one splice per rod. In no case shall splicing be done on threaded rod used to support mezzanine platforms.
- 1.5.5 Split nuts shall not be used to extend or add framing to existing threaded rods.
- 1.5.6 Where ceiling or framework support cannot be provided, cable rack may be supported by pipe stanchions at intervals not to exceed six feet. Additional support may be required where extended runs of stanchion supported cable racks are provided. Pipe stanchions shall not be used in high seismic risk locations for permanent support.
- 1.5.7 When replacing frames with stanchions, removing existing stanchions, or removing bays or cable mining, the DESP shall not exceed spacing and load limits for framing and cable

- 1.5.8 Refer to ATT-TP-76409 for approved methods of wall supported cable rack.
- 1.5.9 Vertical cable rack used to support cables in shafts shall be supported at each floor and ceiling level at the cable rack supporting framework.
- 1.5.10 Extended vertical runs of power cable rack, in excess of three floors, must have a minimum of 20 foot horizontal cable rack provided on every third floor to alleviate cable weight build-up.

2. AUXILIARY FRAMING

2.1. General

- 2.1.1 This section discusses the engineering of auxiliary framing.
- 2.1.2 Auxiliary framing above new equipment areas shall be arranged as indicated in figures 8-18 to 8-21 depending on how BDFBs installed in the new area will be cabled.
- 2.1.3 The following Bell Service Practices provide additional information on auxiliary framing and bracing requirements
 - ATT-TP-76408 "Common Systems Network Facility Auxiliary Framing and Bracing Requirements"
 - BSP 800-000-101MP "Network Equipment Anchoring Requirements"
- 2.1.4 Auxiliary framing shall be provided in longest sections and largest increments possible to minimize splice joints and provide greatest continuity in performance. In high risk seismic offices, minimum auxiliary frame installations should cover a building bay area for consistent bracing requirements.
- 2.1.5 Splices of horizontal runs of auxiliary framing shall be staggered at alternate runs and limited to no more than one splice between supports.
- 2.1.6 Primary auxiliary framing is the framing installed perpendicular to present or planned equipment frame lineups. This auxiliary framing serves as the primary means of support for office cable racks, equipment lighting and equipment frames within the equipment area.
- 2.1.7 Secondary auxiliary framing (sometimes referred to as supplemental framing) is framing installed above and perpendicular to the primary framing for seismic stiffening and supplemental cable rack support purposes. Secondary framing is generally a permanent component of the office auxiliary framing (superstructure) arrangement.
- 2.1.8 Auxiliary framing and auxiliary framing components shall be a non-corrosive plated type or painted. All assembly and securing hardware, including bolts, studs, threaded rods, nuts, washers, clips, clamps and similar material shall be non-corrosive plated type. Refer to ATT-TP-76201 for specifications on approved painted and electroplated finishes.
- 2.1.9 The protruding ends of lower level auxiliary framing shall be protected with an approved finishing cap

2.2. Support Requirements

- 2.2.1 Where one or more additional row of frames is to be ultimately installed, the auxiliary framing shall be extended to allow for ultimate cable rack, ladder track, or lighting conduit.
- 2.2.2 In the placing of auxiliary framing a minimum clearance of 5 inches shall be maintained between the ends of the framing bars or channels and any building obstruction.
- 2.2.3 Locating the auxiliary framing under ceiling inserts will facilitate supporting the framing structure where frames are omitted. By locating alternate lines or sets of auxiliary framing immediately under the ceiling inserts, the auxiliary framing and cable rack can be temporarily supported by means of hanger rods.
- 2.2.4 Splicing of threaded rods should be avoided. When splicing is necessary, there shall be no more than one splice per rod. In no case shall splicing be done on threaded rod used to support mezzanine platforms.
- 2.2.5 Split nuts shall not be used to extend or add framing to existing threaded rods.
- 2.2.6 Auxiliary framing at the ends of frame line-up shall be located so that the distance between the end of the line-up and the last point of support will not exceed 2 feet 6 inches.
- 2.2.7 Frames and bays bolted together and supported from overhead to form, a continuous lineup shall have a top support approximately every 5 feet not to exceed 6 feet. Top support shall be understood to mean fastening with approved hardware to bars, channel or cable rack, independent of the frame itself, which are so constructed as to maintain the top positioning of the frame. Junction hardware between frames shall not be considered as top support. Cabinets and frameworks designed to be floor supported do not require top support
- 2.2.8 Physically isolated frames that normally require overhead bracing must be provided with two top supports. Isolated frames shall be understood to mean frames which cannot be fastened to adjacent frames with junction hardware.
- 2.2.9 In general, regular auxiliary framing shall not be placed over main or end aisles except as required for support of ladder track. Where support of main or end aisle cable racks extending into or across aisles is required, the framing shall be arranged as indicated in the unit covering cable racks.
- 2.2.10 Equipment frames taller than seven feet shall be secured to auxiliary framing in accordance with BSP 800-068-150MP.
- 2.2.11 Seven foot frames shall not be secured to auxiliary framing, except when adding to an existing line-up that is top supported.
- 2.2.12 Auxiliary framing over power boards shall be installed only where required for the support of bus bars or a cable rack above the power board.

2.3. Bracing

- 2.3.1 The entire auxiliary framing structure shall be braced in accordance with ATT-TP-76408.

- 2.3.2 Auxiliary framing shall be provided at cable holes and other openings in floors or walls as required to support the cable racks. Care shall be taken that framing will not interfere with the cabling at these openings.

3. ROLLING LADDERS

3.1. General

- 3.1.1 This unit covers the engineering requirements for rolling ladders and associated equipment such as ladder brakes and ladder track.
- 3.1.2 Surplus ladders, as provided by the AT&T LEC Equipment Engineer, shall be utilized. The requirement for brakes for rolling ladders will be determined by the AT&T LEC engineer based on local policy.

3.2. Rolling Ladders - Track Type

- 3.2.1 Rolling ladders, 14 inches in width of the straight-type as shown in Figures 8-1 and 8-2, or of the platform-type as shown Figure 8-3, shall be furnished where aisle widths will permit. Ladders 12 inches wide may be furnished when aisle widths will not permit the use of 14 inch ladders. Ladders ten inches wide are considered special and are to be used only at the direction of the AT&T LEC Equipment Engineer.
- 3.2.2 The number of steps for straight-type ladders of a particular vertical height may be determined from Figures 8-1 and 8-2. Straight-type ladders are furnished with 15 or fewer steps. Steps shall be finished wood, not coated with other covers, i.e., sandpaper, etc.
- 3.2.3 The number of steps for platform-type ladders of a particular vertical height may be determined from Figure 8-3. Platform-type ladders are furnished with eight or fewer steps below the platform.
- 3.2.4 Where a ladder serves both a Distributing Frame (DF) and other equipment frames, the handrail shall be located on the side away from the DF. The installer shall be directed to drill the left side of the ladder for handrail brackets, where required.
- 3.2.5 Rolling ladders shall be equipped with fenders as follows:
- a) Where the frame guardrails are located above the shoulder of the ladder wheel brackets.
 - b) Ladders used in offices with cable duct frames having removable guardrails, shall be equipped with two wheelguards.
 - c) Rolling ladders shall also be equipped with two wheelguards in line-ups where frames with guardrails extending to the floor are installed.
 - d) Ladders used at DFs shall be equipped with one wheelguard located on the side of the ladder adjacent to the DF
- 3.2.6 The ladder shall be suspended from the upper support or hanger step by threaded rods. The effective length of the rods shall be such that the steps of the ladder are level.

- 3.2.7 Rolling ladders and ladder track at DFs shall be located as shown in Figure 8-4 and in accordance with the following:
- a) Where a ladder serves a DF on one side and relay racks or other frames on the other side, the ladder shall be located with respect to the DF;
 - b) When a ladder serves a narrow-type DF of approximately the same width as, and in line with, relay racks or frames, the ladder shall be located as shown in Figure 8-5;
 - c) Where a single line of ladders is located between DFs or between a protector frame and a DF, the ladders shall be located in the center of the aisle;
 - d) When the distance from the centerline of the ladder to the guardrail exceeds that recommended in Figures 8-4 through 8-6, the question of safety shall be reviewed with the AT&T LEC Equipment Engineer.
- 3.2.8 At relay racks and Fuse Bays (FBs), ladders and ladder track shall be located as shown in Figure 8-5. Where a ladder is to serve a double line of frames, only one line of which is installed initially, the ladder shall be located in the center of the aisle between the present and future line of frames.
- 3.2.9 For frames, racks, or other equipment not specifically covered herein, the ladder locations shall agree with the locations shown on the illustrations for the equipment they most closely resemble.
- 3.2.10 The minimum clearance for a single or double line of ladders shall be as shown in Figure 8-6.

3.3. Rolling Ladder Track

- 3.3.1 Ladder track shall be provided, wherever practical, in sections eight feet and ten feet in length. The number of sections required for various overall lengths is given in Figure 8-7.
- 3.3.2 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.
- 3.3.3 The length of the ladder track shall provide an overhang at the ends of the line-up for access to all of the equipment on the frames. It shall also be long enough to permit proper support from the auxiliary framing or other details provided.
- 3.3.4 A clearance of not less than 1 foot 3 inches between one end of the track and the wall toward which the ladder slopes shall be provided for the removal of the ladder trolley or brake from the track.
- 3.3.5 Ladder tracks shall ordinarily run continuously across aisles so as to permit concentration of ladders when necessary.
- 3.3.6 The end of the track toward which the ladder is inclined shall, where practical, extend sufficiently to permit placing a ladder stop 4 feet 2 inches beyond the end frame upright. The other end of the track shall extend a minimum of three feet beyond a ladder stop to permit entrance of maintenance equipment into the frame aisle. Ordinarily, the location of the stop in line with the end upright as shown in Figure 8-15 will meet this requirement.

- a) Where the ladder track is installed close to and beyond a column so that the rolling ladder cannot pass the column, a platform-type rolling ladder is used and the stops located so that the ladder can approach the column without touching it;
 - b) Where the ladder track serves equipment in close proximity to partitions or walls, so that platform-type ladders have to be used to reach all of the equipment, the minimum distance from the end of the last frame to the center of the ladder stop shall be 12 inches.
- 3.3.7 Where low-type auxiliary framing is used, ladder track shall be attached directly to the underside of the auxiliary framing.
- 3.3.8 Ladder track shall be located as high as cable racks will permit where frames are supported by high-type auxiliary framing. At DFs supported by high-type auxiliary framing, it is desirable that the ladder track be located to take advantage of available headroom.
- 3.3.9 Continuous runs of ladder track shall be supported at approximately 5 foot intervals and in no case shall the spacing between adjacent supports exceed 6 feet 5/8 of an inch.
- a) Provide at least two supports for each length of track supported from high-type auxiliary framing;
 - b) Provide at least one support for each length of track supported from low-type auxiliary framing or cable rack, except that end pieces shall have not less than two supports;
 - c) Track shall not extend cantilever-fashion more than three feet beyond a support if the trolley traverses the entire length of the extension. If the travel of the trolley in the extension is limited by a stop bolt, the total extension beyond the last support shall not exceed four feet. In this case, the distance from the last support to the stop bolt may be up to three feet and the track may extend beyond the stop bolt. Figure 8-15 illustrates conditions that may be encountered.
- 3.3.10 Tracks shall be supported from auxiliary framing or the ceiling in steel frame and concrete buildings as shown in Figures 8-8 through 8-11. Where proper support cannot be obtained with auxiliary framing, additional framing shall be installed.
- 3.3.11 When support from a cable rack is required, tracks shall be fastened as shown in Figures 8-9 through 8-14. The supporting details shall be fastened not more than one foot from the cable rack support.
- 3.3.12 When tracks are to be supported from cable racks that utilize hanger rods, 5/8"-11 hexagon nuts shall be placed above the cable rack hanger clips as outlined in this Section 8.
- 3.3.13 Where tracks are to be under cable racks that are supported by low-type auxiliary framing, the track shall be attached to the cable rack bars as shown in Figure 8-11. If track supports are required at points between the cable rack supports, pairs of bars or channels shall be attached to the cable rack as shown in Figure 8-12, and the track supported from these bars are channels as indicated by the appropriate exhibits.
- 3.3.14 A ladder stop shall be installed at each end of the track as shown in Figure 8-15. Ladder stops shall be equipped with cotter pins as shown in Figure 8-16. Where rubber plugs per Figure 8-17 are installed, the plug may be used as a stop.

- 3.3.15 Ladder track plugs are to be furnished for the ends of track that is exposed. The plugs shall be installed as shown in Figure 8-17.
- a) Ladder track plugs shall be provided where two lines of track are noncontinuous in the same aisle and the ends of the track overlap;
 - b) Ladder track plugs shall be provided at both ends of a track run. In those cases where a stop would normally be provided, the plug shall serve as the stop.

4. CABLE DISTRIBUTION SYSTEMS

4.1. General

- 4.1.1 This section covers the equipment requirements for engineering of a system of cable racking called cable distribution systems.
- 4.1.2 For specific hardware and application information for cable distribution systems, refer to the manufacturer's documentation.
- 4.1.3 Cable distribution systems are a cable management system which provides a means for cable separation and are generally designed to attach to the top of six or seven foot equipment frames. Cable distribution systems may be independently mounted to allow for future frame growth.
- 4.1.4 Cable distribution systems are intended to be switch system specific and are not designed to carry cables to common applications systems such as Distributing Frames (DFs) and power. Cable distribution systems may provide access between major like systems or unlike systems with proper hardware separation.
- 4.1.5 Cable distribution systems and assembly hardware shall be of a non-corrosive finish.

4.2. Applications

- 4.2.1 Cable distribution systems are provided over line-ups of equipment frames and are fastened to adjacent line-ups by cross-aisle racks, which are considered to provide a unitized top support for associated frames. Equipment frames which are bolted back to back and provided with cable distribution system are considered to be adequately supported.
- 4.2.2 Where frames are not provided under cable distribution systems, support stanchions shall be provided at five foot, not to exceed six foot intervals and at junctions of cable distribution system sections. Sufficient clearances shall be maintained to allow for future addition of frames. Support stanchions are not allowed in High Risk seismic zones (Seismic Zones 3 and 4).
- 4.2.3 Cable distribution systems shall be provided for the ultimate growth of an individual line-up whenever possible to allow for proper distribution of cabling and top support.
- 4.2.4 Cable distribution systems provide a completely or partially enclosed system for the running of unsecured cable. Cable separation within the cable distributions systems vary by design between manufacturers. Brackets, separators, or individual compartments may be used.

4.2.5 Where cable from cable distribution systems is run to common systems such as DF and power, gray ladder type cable rack and support shall be provided per applicable paragraphs of this Section 8.

4.2.6 Where cable distribution is part of an isolated bonding network, separation or insulating hardware shall be used between the two cabling systems

CAUTION - When cable distribution systems and associated equipment are located within the isolated bonding network, separation from all common bonding network members must be maintained.

4.2.7 Application of cable distribution systems shall take into consideration cable access to frames. Certain types of cable distribution systems limit access to high cable volume frames and may require cover removal or modification.

4.2.8 Cable distribution systems shall be designed in conformance with local seismic risk conditions.

4.3. Cable Distribution Systems for Fiber Optic Cable and Associated Equipment

4.3.1 Fiber optic cable and jumpers/patchcords to be run within cable distribution systems shall be provided with a dedicated protective pathway. Fiber cable slack shall not exceed 5 feet and will be stored in the cable vault.

4.3.2 The use of interduct shall not be used within the cable distribution system or between equipment lineups.

4.3.3 Refer to Section 9 of ATT-TP-76400 for equipment requirements for fiber optic cabling and its associated equipment, including: Fiber Splice Facilities (FSF), and the Fiber Distribution Frame (FDF). For specific hardware and application information for fiber protection systems, refer to the manufacturer's documentation.

4.3.4 When OFNR cable transitions from the horizontal to the vertical plane, a preformed turndown shall be required.

4.4 Fiber Protection System(FPS)

4.4.1 The Fiber Protection System represents a separate and unique fiber optic protection system used only for fiber optic cross connect patch cords between Transmission and Switch equipment and the FDF. All equipment which uses fiber optic connectivity will hub to the FDF for all intraoffice connections. This protection system will provide both separation from all other cable racks and will provide a protection of the fiber optic patch cords from installation activity in a Central Office. As an additional means of providing fiber separation and protection from other types of cabling within the Central Office, The Fiber Protection System will also be identified by it's own unique color which is yellow. **Note: The only color approved for use within the AT&T 13State region for Fiber Protection Systems is Yellow. No other color is approved for use.** The Protection System will provide routing capability for the SONET ring paths for both primary and protect connections from the Transport/Switch equipment to the FDF. The fiber pairs will be cross connected at the FDF to either OSP facilities or to other intraoffice equipment.

4.4.2 Diverse routing capability from the NE to the FDF for the primary and protect paths shall be required. Diverse routing may be accomplished in two ways: example 1) by placing working and protect fiber patch cords on opposite sides of the same physical raceway or example 2) by placing working and protect fiber patch cords in completely separate physical raceways. It is not necessary to add multiple raceways down the same line-up simply to achieve route diversity, thus a maximum of only one raceway path per lineup will be allowed. Route diversity will be achieved via main aisles not line-ups. Once a high speed Optical Carrier system such as OC-192, its equivalent or higher speed system has been placed in the central office, diverse routing for connections between the high speed Optical Carrier and the FDF shall be accomplished via example 2 listed above. Fiber diversity for Optical Carrier speeds less than OC-192 may be accomplished by example 1 or 2. Figures 8-22 through 8-27 provide examples of diverse fiber routing.

4.4.3 The FDF will be treated as the common cable entrance and cross-connect point. The Fiber Protection System will be the primary tool for fiber optic patch cords on each floor. When there is a need for a fiber optic connection to equipment on another floor or at a distant location on the same floor, a tie cable will be terminated in a shelf on the FDF and will be directly terminated on a new satellite FDF bay on that other floor or distant location using an FOT shelf. This will be accomplished in one of the following three methods:

A) The preferred method is to place an OSP fiber shelf with a pre-terminated and pre-connectorized cable stub in the existing FDF. An FOT shelf should be placed in the satellite frame and the pre-connectorized end should be terminated on the rear of the FOT shelf. The stub should be measured to the nearest exact length between the two shelves.

NOTE: In most cases, it is well advised to dedicate an entire bay for tie cables between the existing and the satellite FDF's.

B) The preferred alternative to the above is to place an OSP fiber shelf with a pre-terminated and raw ended stub in the existing FDF. An FOT shelf should be placed in the satellite frame and the raw ended stub should be field mounted with the appropriate connectors and then terminated on the rear of the FOT shelf. The stub should be measured to the closest available length between the two frames.

C) The following should be used only when absolutely necessary. Place an OSP fiber shelf equipped with a FLIP Splicing panel in the satellite FDF and a pre-terminated shelf in the existing FDF. Place the pre-terminated IFC cable measured to the closest appropriate length between the frames and splice the raw end at the FLIP panel.

D) The DESP shall insure that all fiber optic cables terminating between Fiber Distributing Frames (FDF) or between Fiber Distributing Frames and Network Elements shall be required to utilize cable clamps and grommets to secure cables. Clamps and grommets shall be attached to the terminating shelf if there is designated place on the shelf itself to do so. If there is no designated place on the terminating shelf then the clamp and grommet shall be placed on the bay upright. Multiple clamps and grommets may be used if necessary to facilitate proper cable slack management. Nine cord may be used as an additional cable securing instrument on the bay upright once the primary clamp and grommet have been placed.

- 4.4.4 Fiber Optic Cables (not to be confused with fiber optic patch cords or jumpers) shall not be placed in the raceway/duct work of the Fiber Protection System. Fiber Optic Cable placements within the Central Office will adhere to merged practice standards as outlined in ATT-TP-76305.
- 4.4.5 An approved Fiber Protection System (FPS) shall be used for fiber optic patch cords between the FDF and the equipment/network element. The FPS shall be dedicated for "fiber only" and clearly marked as such. The Fiber Protection System shall be provisioned along the entire length of the FDF and extended from the FDF to the associated network element.
- 4.4.6 The Fiber Protection System will be provided to within 6 inches of the Fiber Distribution Frame (FDF) and located to the adjacent vertical trough and at the same level horizontally as the Transport/Switching Equipment termination point on the working and protect routes. Each bay in the FDF lineup should have a downspout positioned directly over its vertical troughs to within two inches of the top horizontal trough of the FDF.
- 4.4.7 With the deployment of high capacity Optical Carrier systems such as OC-192 and higher, to the Fiber Distribution Frame, it is strongly recommended that any FDF that has the forecast to provision OC-192's within the next 5 years should have raceway routes from the Optical Multiplexers to the FDF provisioned with 12" wide Fiber Protection System troughs.
- 4.4.8 The Fiber Protection System over the FDF should have 12" wide horizontal troughs and 4" wide vertical troughs as a minimum throughout its length. The minimum trough size is 4 inches on a going forward basis. The use of the 2-inch FPS for horizontal Fiber Optic jumpers shall be prohibited.
- 4.4.9 When placing 12" Fiber Protection system, if threaded rod supports are required, the installation vendor shall use 5/8" threaded rod only.
- 4.4.10 Straight sections of 12" Fiber Protection System shall be supported on both sides of each junction within 6" to 12" of the junction. A maximum distance of 5' between supports shall be required.
- 4.4.11 12" Fiber Protection System fittings i.e. T's, elbows, crosses, downspouts etc., shall have support brackets placed directly beneath each fitting. If it is not possible to place the support bracket directly beneath the fitting then the support bracket shall be placed beneath the Fiber Protection System straight section as close to the fitting as possible.
- 4.4.12 When placing 12" Fiber Protection System fittings, whenever possible, support brackets shall be attached to the underside of the fitting with the self drilling screws supplied by the manufacturer. If support brackets cannot be attached to the underside of the fitting using the self drilling screws, then variable fitting support locators shall be used
- 4.4.13 Connectivity between the overhead Fiber Protection system (FPS) and C.O. network elements i.e. drop options, may be accomplished in one of two methods. Method 1 would be a Rigid arrangement and method two would be a Flex Tube (or corrugated split tube) arrangement. The overhead layout position of the FPS relative to the turndown and its position relative to the network elements uprights will determine which method or drop option

should be used. In cases when the overhead FPS is positioned in such a manner as to allow the turndown to align directly with the network element bay uprights, the Rigid drop option arrangement shall be used. In cases when the overhead FPS is positioned in such a manner that it does not allow the turndown to align directly with the network element bay uprights the Flex Tube drop option shall be used. Both Rigid and Flex Tube drop options can be configured using either Express Exits or Downspouts . Examples of the Rigid and Flex tube drop options can be found in **Figures 8-28** and **8-29** of this section. **Note: Spiral wrap shall no longer be used as a drop option method.** The length of spilt flex tube shall not exceed 18 inches from the horizontal FPS to the top of the bay. If the distance from the horizontal FPS to the bay is greater than 18 inches, the DESP shall provide rigid vertical FPS from the horizontal FPS to within 18 inches of the top of the bay.

- 4.4.14 Do not permit cable buildup of fiber jumpers to exceed 2-inches in depth at any point within the Fiber Protection System. Fiber patch cords shall not be placed within the FPS with excessive slack or with a bend radius of two inches or less.
- 4.4.15 Fiber optic cross connect jumpers shall be ordered in the near correct lengths in order to properly place the connection from the two fiber panels (OSP-FOT), (FOT-FOT), (OSP-OSP) on Generation I Frames. On Generation II and beyond FDF systems, the fiber jumpers shall not be less than 6 feet and ordered in 5-foot increments. Sufficient storage is available on 72/96 port fiber panel systems. The new Generation 3(HDFDF) which is currently approved for use in AT&T Ameritech only, can have panel sizes from 72 to 216 port fiber panel systems; all other regions will be given this option in 3Q02. In any case, the fiber optic jumpers shall be ordered from an approved manufacturer. The use of Fusion Splices is rated as Standard in the AT&T LEC.
- 4.4.16 Fiber cable shall only be placed on its own dedicated fiber (ONFR) cable rack. Fiber cable shall not be placed in the Fiber Protection System (FPS).
- 4.4.17 For Fiber Protection System standards, refer to the **ATT-13-STATE** Standard Drawing: ATT-C-50001-E-00.

5. FRAME AND AISLE LIGHTING - FLUORESCENT

5.1. General

- 5.1.1 This section outlines engineering requirements for framework supported lighting systems employing fluorescent fixtures. See Section 6 of ATT-TP-76400 for emergency lighting and general building lighting.
- 5.1.2 Network access lighting (lighting placed for the specific purpose of maintaining
- 5.1.3 Network operations or restoral while on protected battery power) shall have battery back-up (either integrated in the lighting fixture or provided via essential AC) or DC ballast powered by associated DC power plant. (See Table 6-4, Section 6)
- 5.1.4 General building lighting shall be on Essential Power.

- 5.1.5 In some Processor Logic Control (PLC) systems fluorescent lighting is provided as an integral part of the equipment. In such cases, the manufacturer's specifications for lighting shall be followed.
- 5.1.6 All wiring, conduit and fixtures installed in AT&T LEC locations shall meet or exceed the requirements of the National Electrical Code (NEC) and local building codes.
- 5.1.7 For lumen levels see Section 6 of ATT-TP-76400.
- 5.1.8 See Section 13 of ATT-TP-76400 for grounding of equipment in the conduit system.
- 5.1.9 AC lighting in battery, power and engine rooms shall utilize fixtures with protective covers that will reasonably prevent the dislodging or shattering of the light due to activity (e.g., "egg crate" grill or cage assemblies)..
- 5.1.10 All fluorescent light fixtures shall be equipped with positively fixed lamp guards.
- 5.1.11 Any 120 Volt AC branch circuit shall be as follows:
 - a) 15 Ampere Fuse/ACB shall not exceed 1440 Watts;
 - b) 20 Ampere Fuse/ACB shall not exceed 1920 Watts.Electrical load for circuits supplying electrical load for fluorescent fixtures shall be calculated by multiplying the lamps wattage by 1.25 (this will compensate for the step-up voltage transformer/ballast).
- 5.1.12 Typical arrangements shown on manufacturer's drawings may be varied to meet job requirements. Lighting fixture assemblies, other than those specified on the manufacturer's standard equipment drawings, shall be furnished only with the approval of the AT&T LEC Equipment Engineer.

5.2. Engineering Requirements

- 5.2.1 The DESP shall provide the installer specific work items for the placement of conduit, fixtures and switches for frame and aisle lighting.
- 5.2.2 All equipment lighting apparatus including wire and electrical raceways shall be listed for its purpose by a nationally recognized testing laboratory.
- 5.2.3 Conduits should be securely fastened at 5'0" intervals, and shall not exceed 6'0".
- 5.2.4 Conduit shall not be run in locations normally occupied by auxiliary framing, cable racks, etc.
- 5.2.5 Conduit shall, where possible, be run parallel and adjacent to superstructure to assure maximum headroom and to provide easy access to cable racks.
- 5.2.6 Conduit shall not be run on cable racks.
- 5.2.7 All conduit and fittings shall be metallic and nonferrous.
- 5.2.8 The conduit system for a light fixture shall support only that fixture. The conduit connectors shall be positive locking or threaded into junction boxes and light fixtures. Screw type couplings are not acceptable.

- 5.2.9 Lighting circuits supplied by multiphase service shall be assigned to balance the load on the different phases as closely as practicable.
- 5.2.10 Lighting equipment and appliance outlet circuits shall not be supplied by the same branch circuit.
- 5.2.11 Wiring for both shall be run in the same conduit wherever possible.
- 5.2.12 Motor wiring shall be run in a separate conduit.
- 5.2.13 No more than ten trolley-type appliance outlets shall be assigned in a single-branch circuit.
- 5.2.14 All fluorescent type lighting fixtures over equipment areas shall be rigidly attached and shall not be supported with chains.
- 5.2.15 NRTL listed solderless connectors shall be used for making all splices in junction boxes and fixtures.
- 5.2.16 When 3-way switches for controlling equipment aisle fixtures are located in the endguard, the switches shall be located at each end of the aisle.
- 5.2.17 For aisles having an ultimate length of 15 feet or less, a single switch shall be used to control the aisle fixtures. This switch shall be mounted on the end toward the main cross-aisle. In cases where only one aisle fixture is required, this fixture shall be connected to the essential AC bus.
- 5.2.18 If the line of frames is less than 15 feet, but it is to be extended at a later date, a 3-way switch shall be provided at the originating end. Initially, this switch is connected for single-pole operation, when the line-up is extended beyond 15 feet, another 3-way switch shall be provided for the growing end, and the switches shall be connected for 3-way operation.

6. APPLIANCE OUTLETS AND MISCELLANEOUS CONDUIT

6.1. General

- 6.1.1 In Stored Program Control System (SPCS) equipment, the appliance outlets will be provided as an integral part of the switching system in the maintenance area (e.g., MAP, MCC) only. Any appliance outlets added to any SPCS equipment shall meet all interface and grounding requirements of that SPCS equipment.
- 6.1.2 All wiring, conduit, and fixtures installed in AT&T LEC locations shall meet or exceed requirements of the NEC and NRTL.

6.2. Appliance Outlets

- 6.2.1 The DESP shall provide the installer specific work items for placement of appliance outlets and risers.
- 6.2.2 Appliance outlets shall be furnished in accordance with the drawings associated with the equipment to be served. All appliance outlets shall have 3-wire parallel polarized receptacles of the duplex type.
- 6.2.3 Only grounding type receptacles shall be used for general purpose appliance outlets.

- 6.2.4 Appliance outlet risers shall be located at the nongrowth end of partial lines of frames or at either end of frame gaps or complete lines.
- 6.2.5 Appliance outlets for non-voice switch equipment shall be spaced every third bay, not to exceed 10 feet. A single or stand-alone frame shall have an outlet provided and placed in the base. When required, appliance outlets shall be placed in the front and rear of bays.
- 6.2.6 The maximum number of duplex appliance outlets allowed on a branch circuit shall not exceed 20 for a 15 Ampere circuit breaker or 26 for a 20 Ampere circuit breaker.
- 6.2.7 Branch circuit conductors serving appliance outlets shall be, at a minimum, #12 AWG copper and no larger than #8 AWG copper. All conductors shall be insulated to 600 volts and meet the requirements of the National Electrical Code.
- 6.2.8 From a PDSC to the end of a branch circuit serving duplex appliance outlets, the length of the branch circuit shall not exceed:
 - 145 feet for #12 AWG conductors
 - 225 feet for #10 AWG conductors
 - 360 feet for #8 AWG conductors

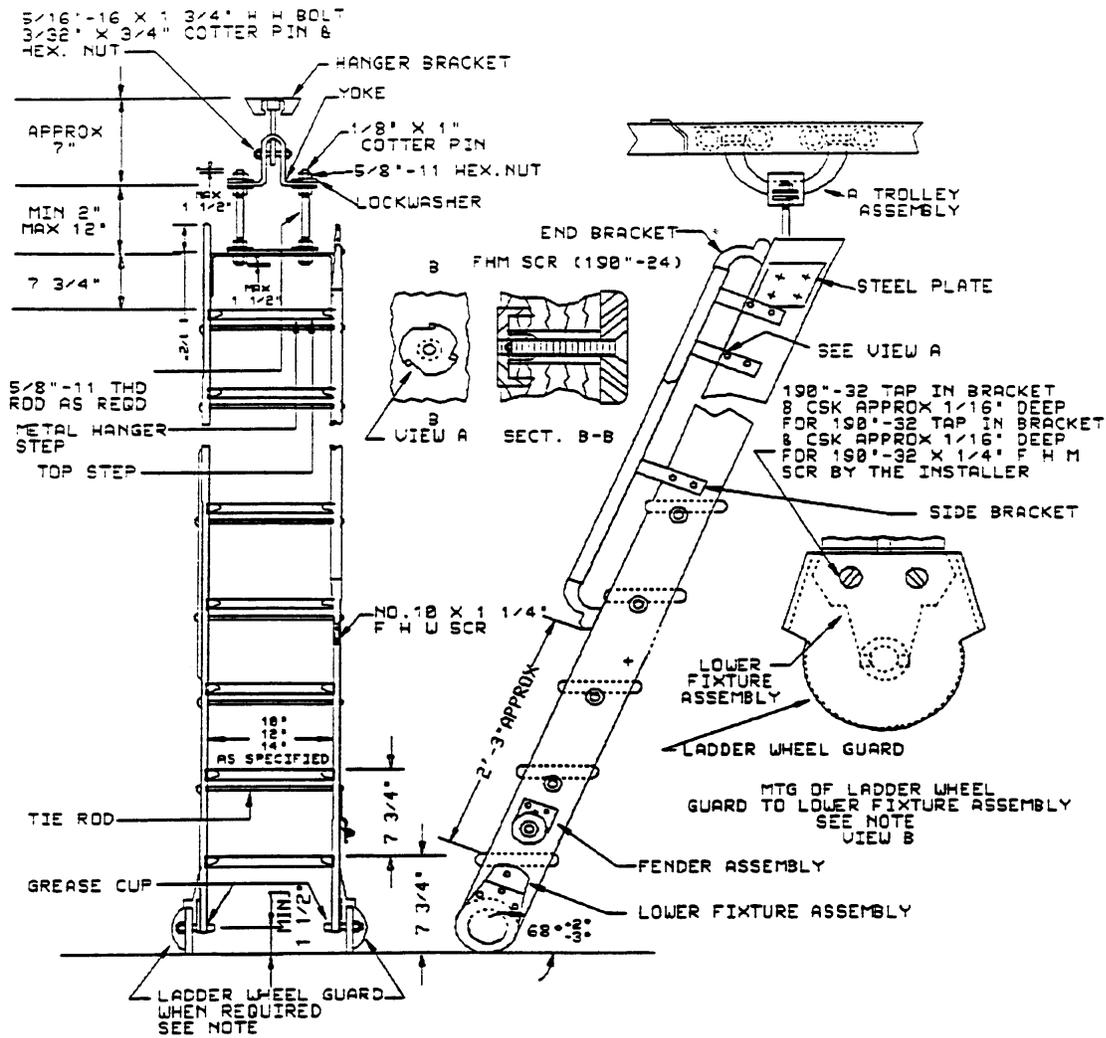
TABLE 8-1 – SUMMARY OF CHANGES IN SECTION 8

Change	Item in 11/1/05 Issue	Item in This Issue
Revised	5.1.3 4.4.13	5.1.3 4.4.13
Deleted		
Added		6.2.6 6.2.7 6.2.8 4.4.3

TABLE 8-2 -- CABLE RACK, AUXILIARY FRAMING & LIGHTING SYSTEMS REFERENCES

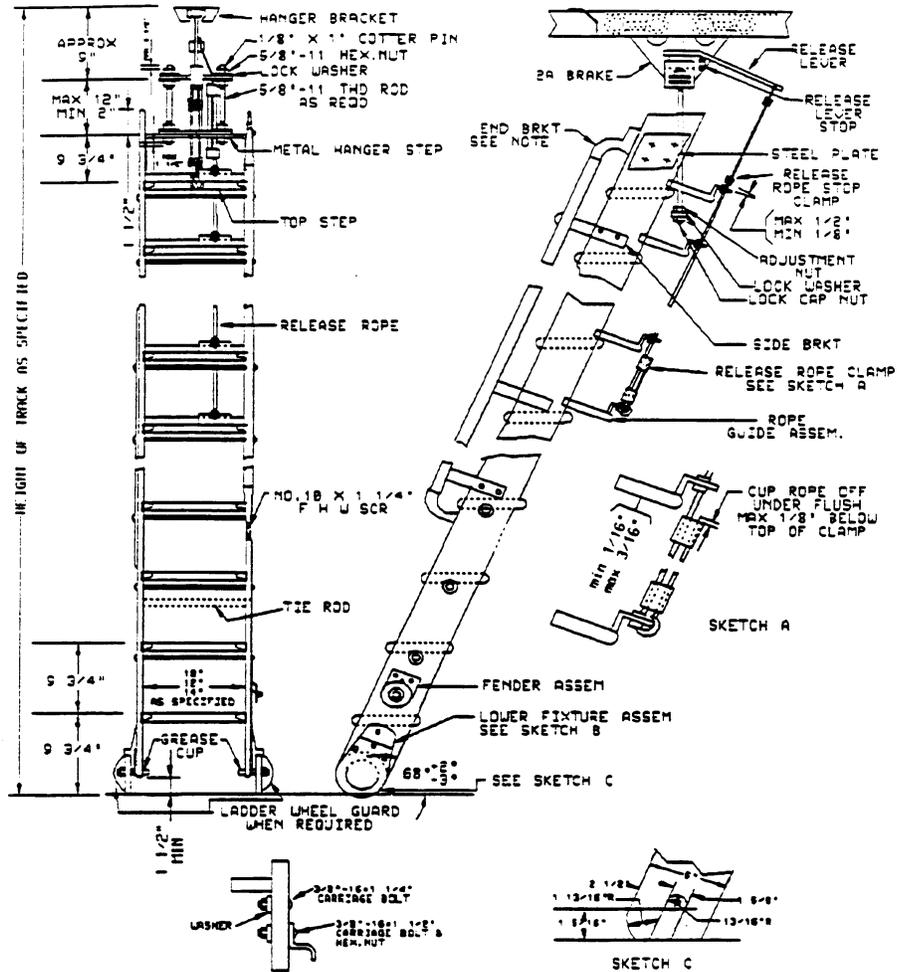
DESCRIPTION	REFERENCE NUMBER
Network Cable Rack Requirements	ATT-TP-76409
Network Facility Auxiliary Framing and Bracing Requirements	ATT-TP-76408
Network Equipment Framework Support Requirements	BSP-800-068-150MP
Network Equipment Anchoring Requirements	BSP-800-000-101MP
Floor Stanchion Supported Cable Rack System Requirements	BSP-800-006-152MP
Network Equipment Fiber Distribution Systems	ADC Fiber Management System Application & Installation Manual
Network Facility Hardware Products and Materials Specifications	ATT-TP-76201

FIGURE 8-1--STRAIGHT-TYPE ROLLING LADDER ASSEMBLY WITHOUT BRAKE



NOTE - Lower fixture assemblies are to be tapped to mount wheelguard when guard is required on lower fixture assembly; the fixture shall be drilled and tapped by the installer.

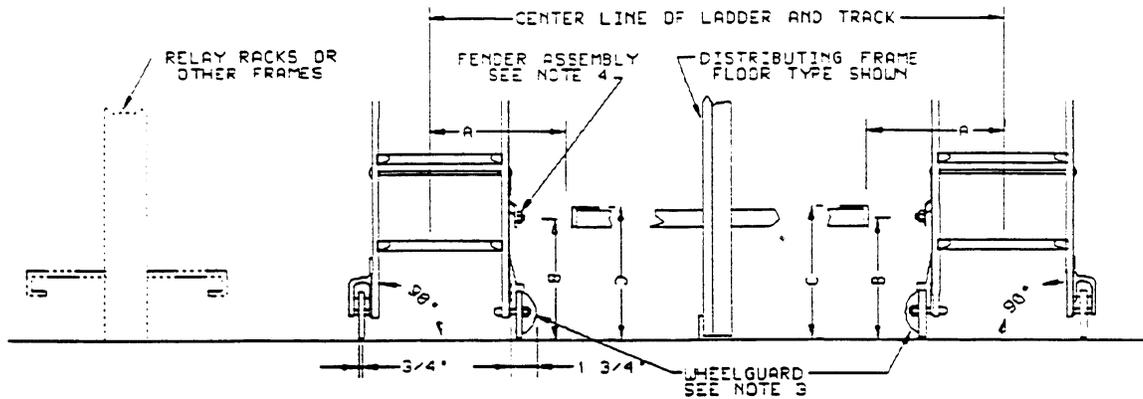
FIGURE 8-2--STRAIGHT-TYPE ROLLING LADDER ASSEMBLY WITH BRAKE



SKETCH B

NOTE - When handrail is assembled to the siderail, the end brackets shall be so located that the handrail is tight between the two end brackets.

FIGURE 8-4--LOCATION AND CLEARANCE FOR LADDERS AT DISTRIBUTING FRAMES



FRAME	B	C
FLOOR TYPE DISTRIBUTING OR GROUPING FRAMES WITH ANGLE IRON GUARD RAILS	10 1/4"	11"
WALL TYPE DISTRIBUTING FRAME	1'-1 1/8"	1'-1 7/8"
DISTRIBUTING OR GROUPING FRAMES WITH SHEET METAL BASE	SEE NOTE	

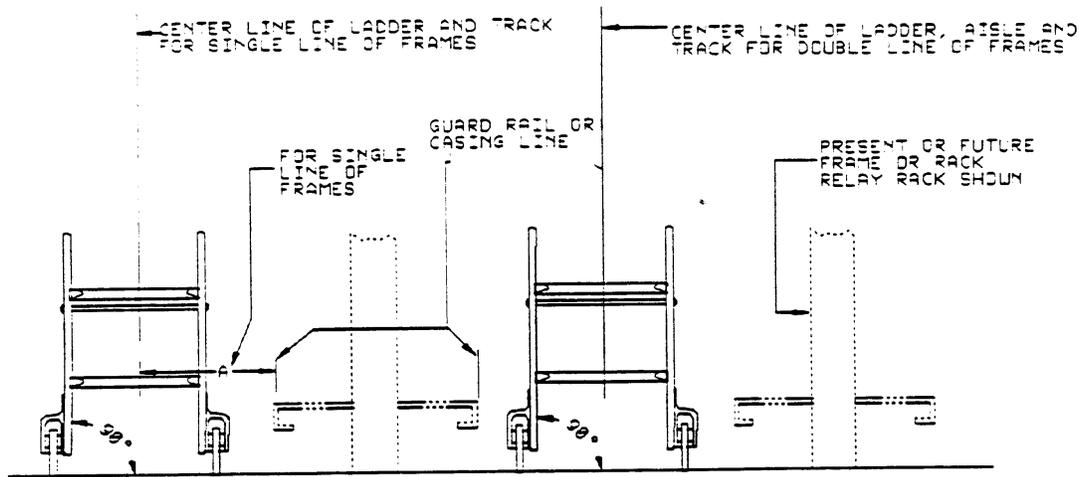
LADDER	A	
	USUAL	MIN.
18"	8"	7 1/4"
12"	5"	8 1/4"
14"	10"	9 1/4"

NOTES:

(SEE NOTE 2)

1. Certain distributing and grouping frames in crossbar offices have a sheetmetal base with guardrail six inches from the floor similar to that used on all crossbar switch frames. Ladder fenders, therefore, are not necessary at these frames.
2. Dimension "A" for the crossbar Line Distributing Frame (LDF) shall be 12" because of 6 point bunching blocks located in the upper portion of the frame. A 14" ladder will always be used at the LDF. Dimension of "A" for all of the various grouping frames in crossbar and toll switching offices shall be as shown where the frames are isolated; where they are arranged with regular crossbar frames to that one ladder will serve two lines of frames, the ladder track shall be located in the center of the aisle.
3. In order to prevent jumper wire from becoming entangled with lower fixture assemblies, a wheelguard shall be furnished on the frame side of all ladders at DFs in all offices.
4. The fender assembly shall be located on the siderail adjacent to the guardrail with the caster contacting the center of the guardrail.

FIGURE 8-5--LOCATION AND CLEARANCE FOR LADDERS AT RELAY RACKS FUSE BAYS, CROSSBAR, AND STEP-BY-STEP FRAMES

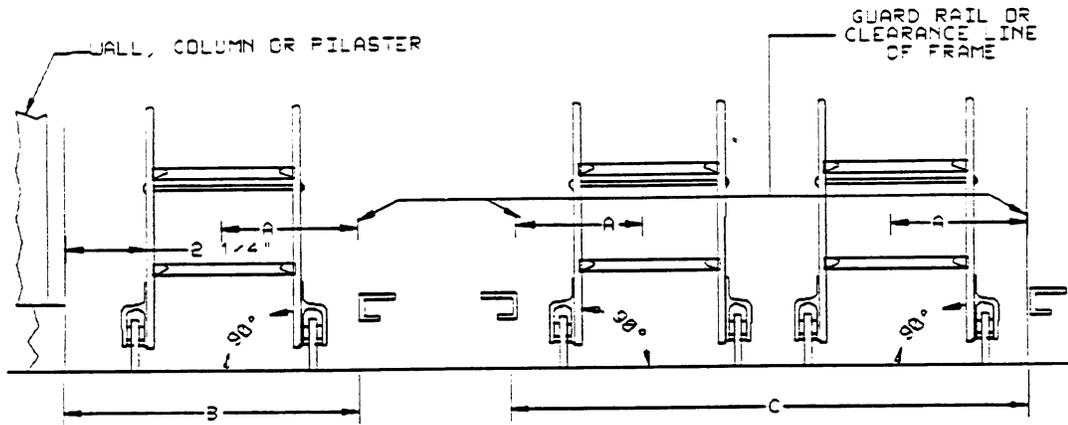


NOTES:

1. Dimension "A" for fuse boards having a 12 inch guardrail shall be 8-1/2 inches, 9-1/2 inches or 10-1/2 inches for 10 inch, 12 inch and 14 inch width ladders respectively.
2. Wherever in crossbar offices (all types) a 14 inch width ladder serves a single line of frames and space will permit, the track shall be located 13 inches from the guardrail.

LADDER WIDTH	A	
	USUAL	MIN.
10"	8"	7 1/4"
12"	9"	8 1/4"
14"	10"	9 1/4"

FIGURE 8-6--MINIMUM CLEARANCE FOR SINGLE AND DOUBLE LINES OF LADDERS



NOTE:

Where the "B" dimension is greater than that shown, the ladder shall be centered between the guardrail and the centerline of the column deviating from this location only to the extent required to maintain the necessary 2-1/4 inch clearance between the ladder siderail and the base of the column. Where print display boards are located on the centerline of the column row, this 2-1/4 inch minimum shall be increased to 3 inch to allow a 5 inch clearance between the ladder siderail and the display board lighting fixture.

LADDER	A	B	C
10"	7 1/4"	1' - 2 1/2"	2' - 5 3/4"
12"	8 1/4"	1' - 4 1/2"	2' - 9 3/4"
14"	9 1/4"	1' - 6 1/2"	3' - 1 3/4"

FIGURE 8-7--NUMBER OF SECTION OF TRACK REQUIRED FOR VARIOUS LENGTHS OF TRACK

LENGTH OF TRACK	NUMBER OF SECTIONS OF TRACK REQUIRED		LENGTH OF TRACK	NUMBER OF SECTIONS OF TRACK REQUIRED	
	10' SECT	8' SECT		10' SECT	8' SECT
8		1	66	5	2
10	1		68	6	1
12		2	70	7	
14		2	72	4	4
16		2	74	5	3
18	1	1	76	6	2
20	2		78	7	1
22		3	80	8	
24		3	82	5	4
26	1	2	84	6	3
28	2	1	86	7	2
30	3		88	8	1
32		4	90	9	
34	1	3	92	6	4
36	2	2	94	7	3
38	3	1	96	8	2
40	4		98	9	1
42	1	4	100	10	
44	2	3	102	7	4
46	3	2	104	8	3
48	4	1	106	9	2
50	5		108	10	1
52	2	4	110	11	
54	3	3	112	8	4
56	4	2	114	9	3
58	5	1	116	10	2
60	6		118	11	1
62	3	4	120	12	
64	4	3			

NOTE: For total length greater than 120 feet, the number of lengths of track may be determined by adding the number required for the length in excess of 120 feet to the number required for 120 feet as listed in above table.

FIGURE 8-8--TRACK SUPPORTED PARALLEL TO/OR AT RIGHT ANGLES TO AUXILIARY
FRAMING, PARALLEL SHOWN

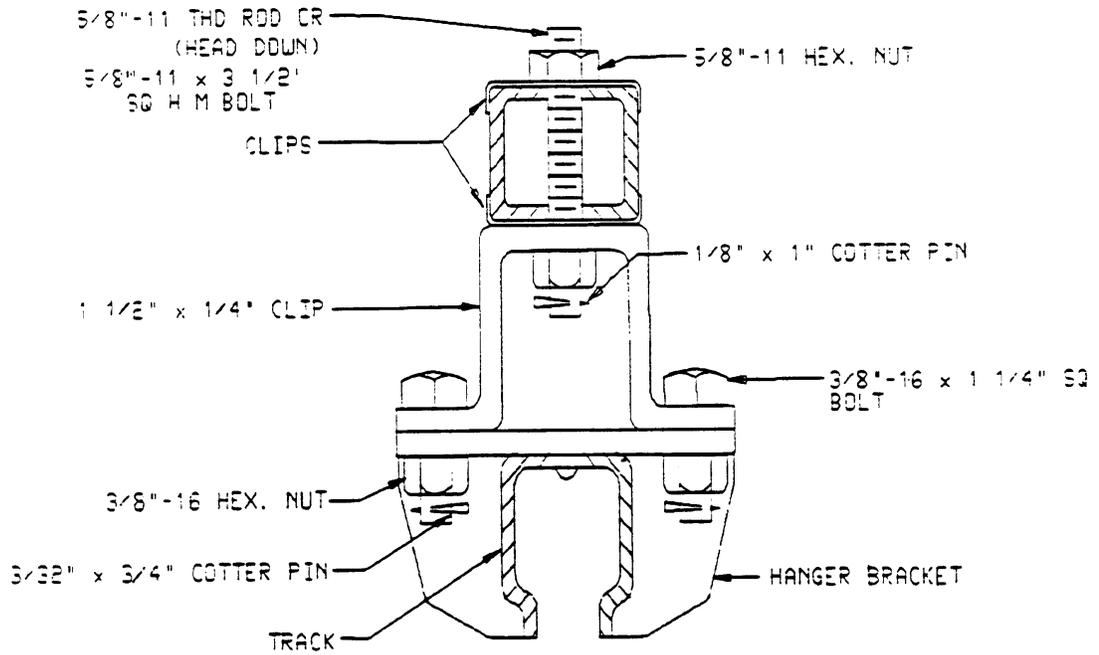


FIGURE 8-9--TRACK SUPPORTED DIRECTLY FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING

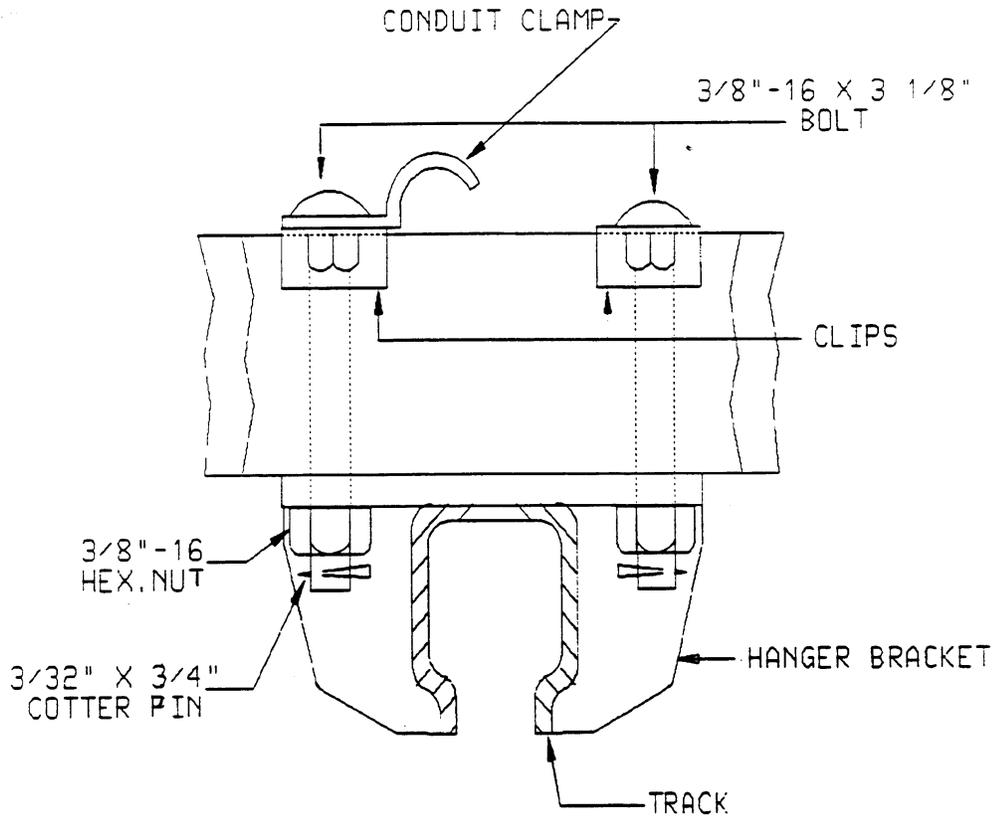


FIGURE 8-10--TRACK SUPPORTED FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING -
 SLOPING TRACK - 2 INCH DIFFERENCE IN AUXILIARY FRAMING LEVEL

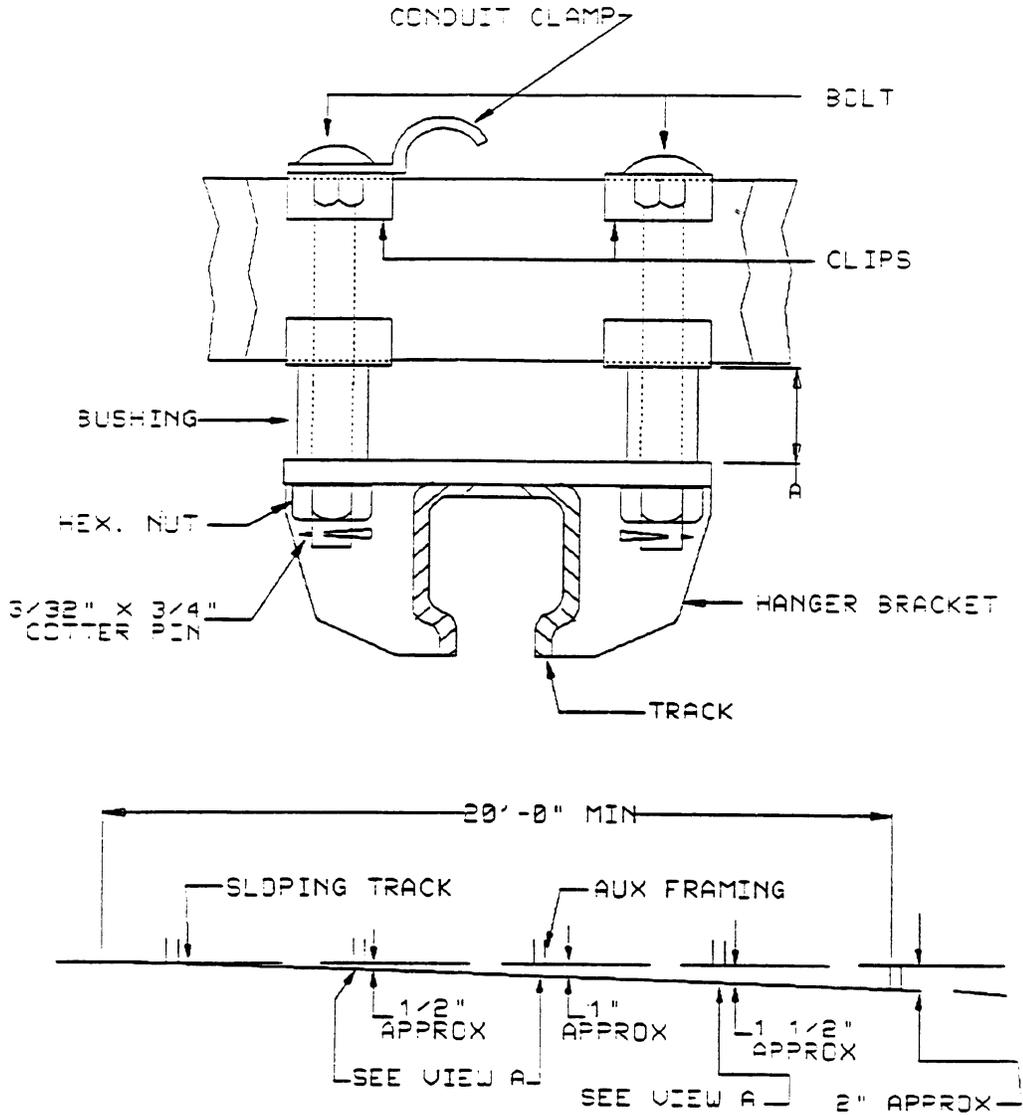


FIGURE 8-11--TRACK SUPPORTED FROM AUXILIARY FRAMING WITH EXTENSION ROD

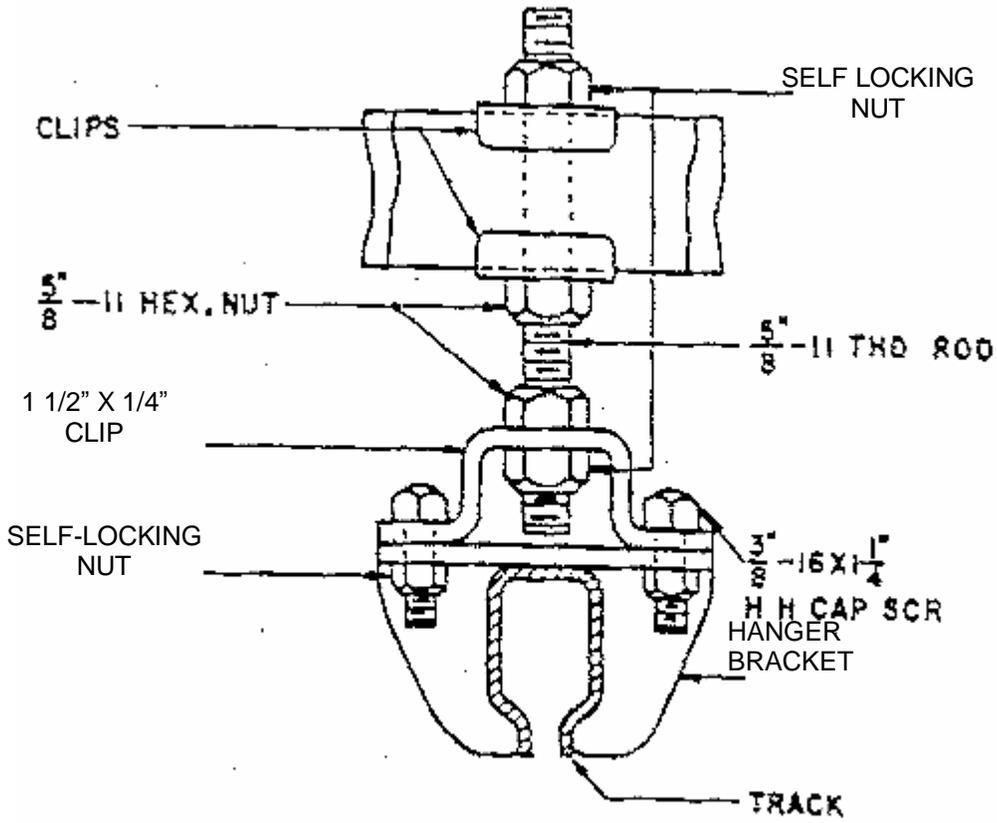


FIGURE 8-12--TRACK SUPPORTED WITH EXTENSION RODS FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE - TRACK AND PARALLEL WITH CABLE RACK

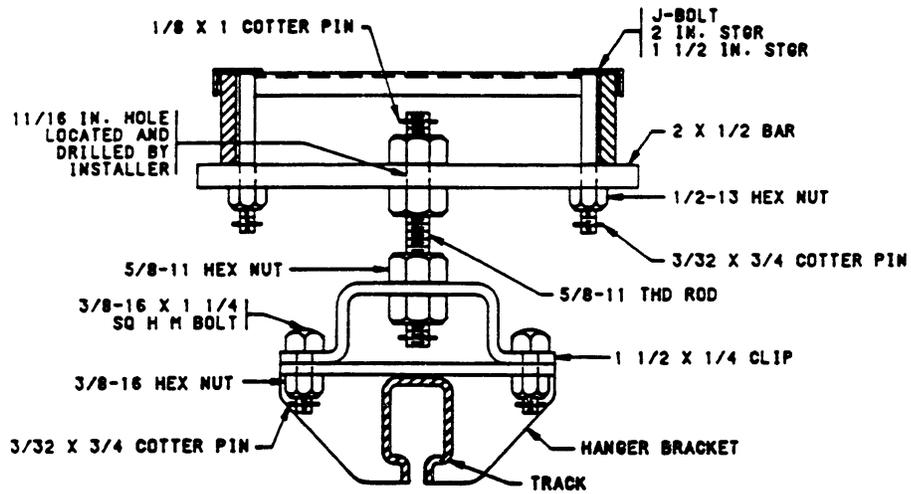


FIGURE 8-13--TRACK SUPPORTED WITH EXTENSION ROD AND CABLE RACK MORE THAN 2 FEET 1 INCH IN WIDTH

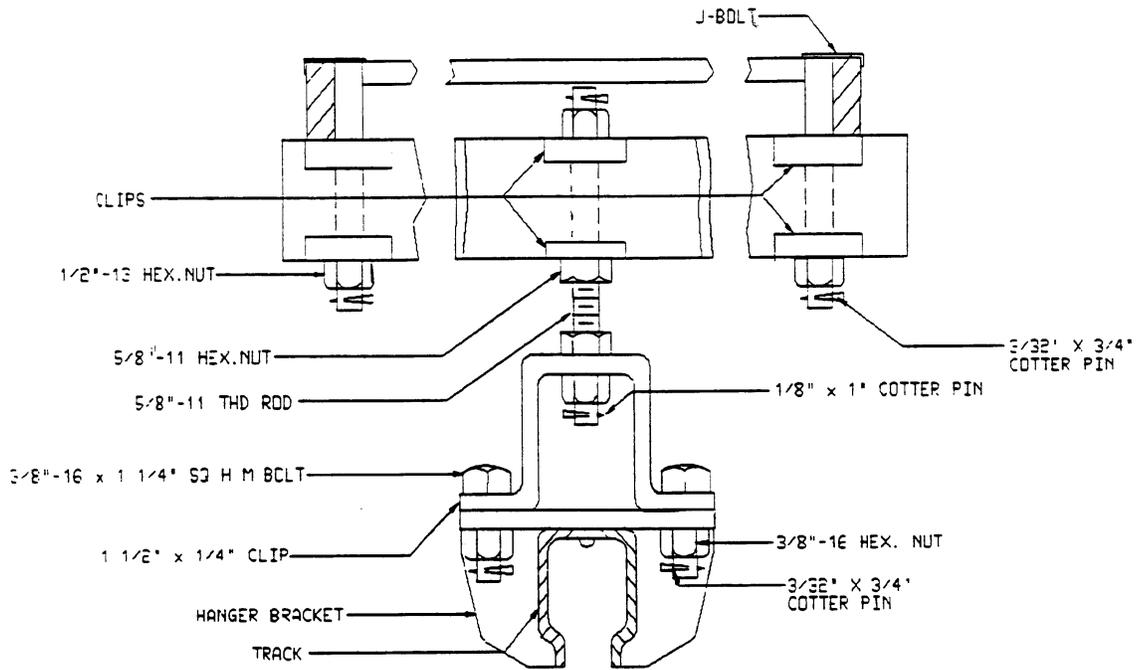


FIGURE 8-14--TRACK SUPPORTED WITH SINGLE BAR DIRECTLY FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE

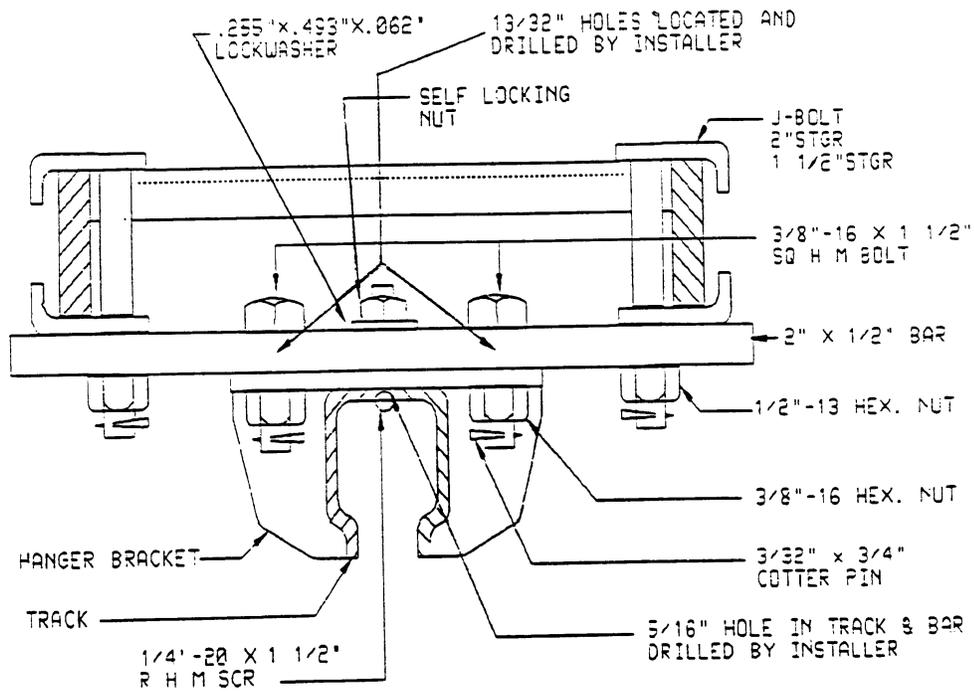
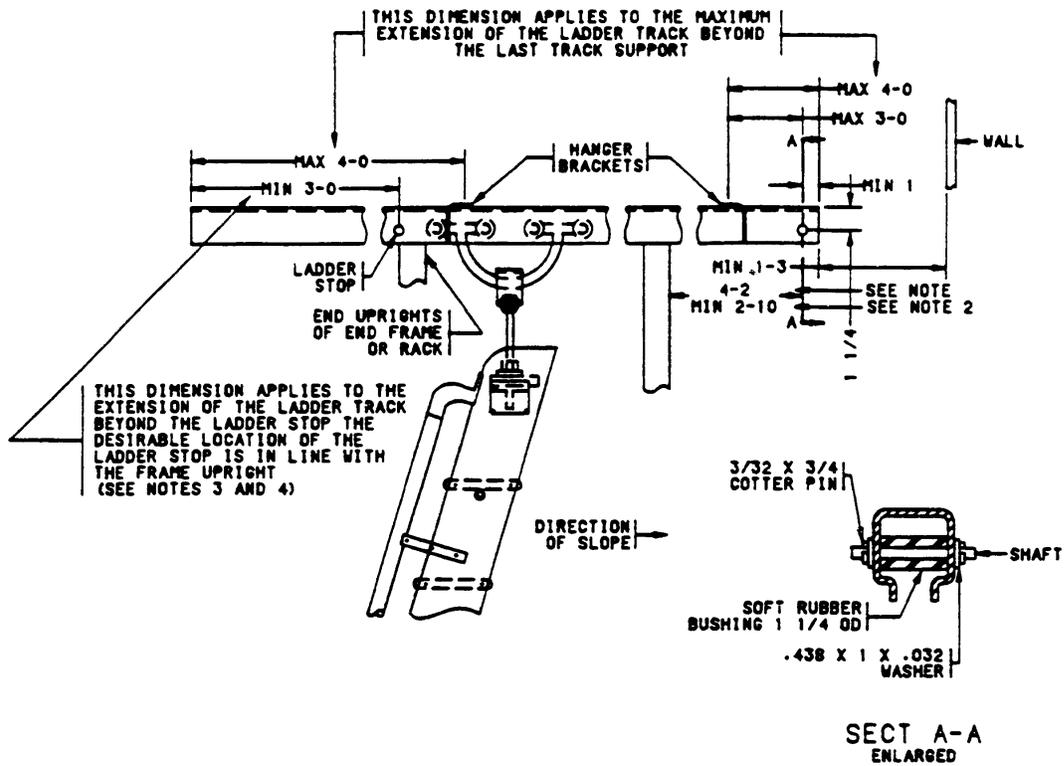


FIGURE 8-15--LOCATION OF END SUPPORTS AND LADDER STOPS IN TRACK



NOTES:

1. Preferred location but not necessarily a maximum. Where space permits and if requested by SWBT, the end of the track may be extended to permit the stop to be located any distance beyond the 4' 2" shown, providing the requirements governing the number and spacing of the track supports are met.
2. When the ladder track serves equipment in close proximity to partitions or walls, so that platform-type rolling ladders have to be used to reach all the equipment, the minimum shall be 1" - 0".
3. When the ladder track is installed close to and beyond a column so that the rolling ladder can not pass the column, a platform - type rolling ladder is used and the stop located so the ladder can approach the column without touching it.
4. When ultimate requirements for an office are furnished initially, the ladder stops shall be located at the ends of the ladder track.

FIGURE 8-16--LADDER STOP AT SUPPORT BRACKET

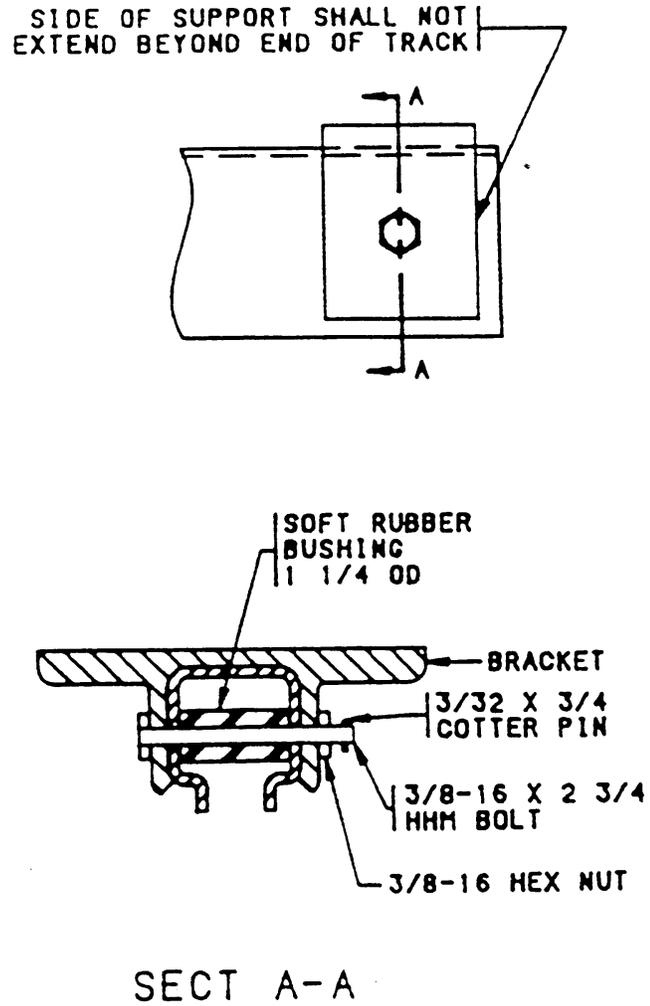


FIGURE 8-17--LADDER TRACK PLUG

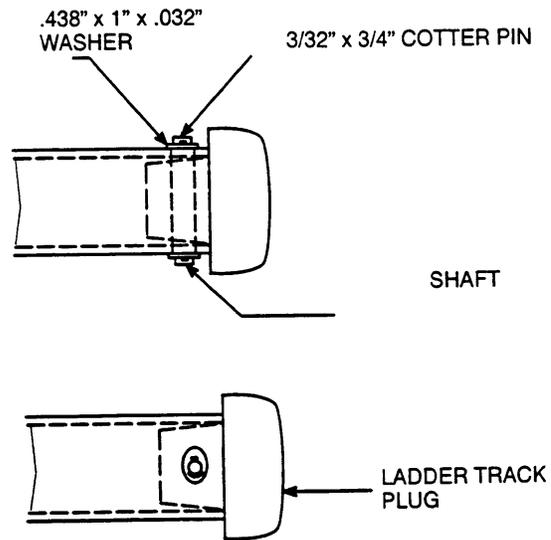


FIGURE 8-18A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING
 INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

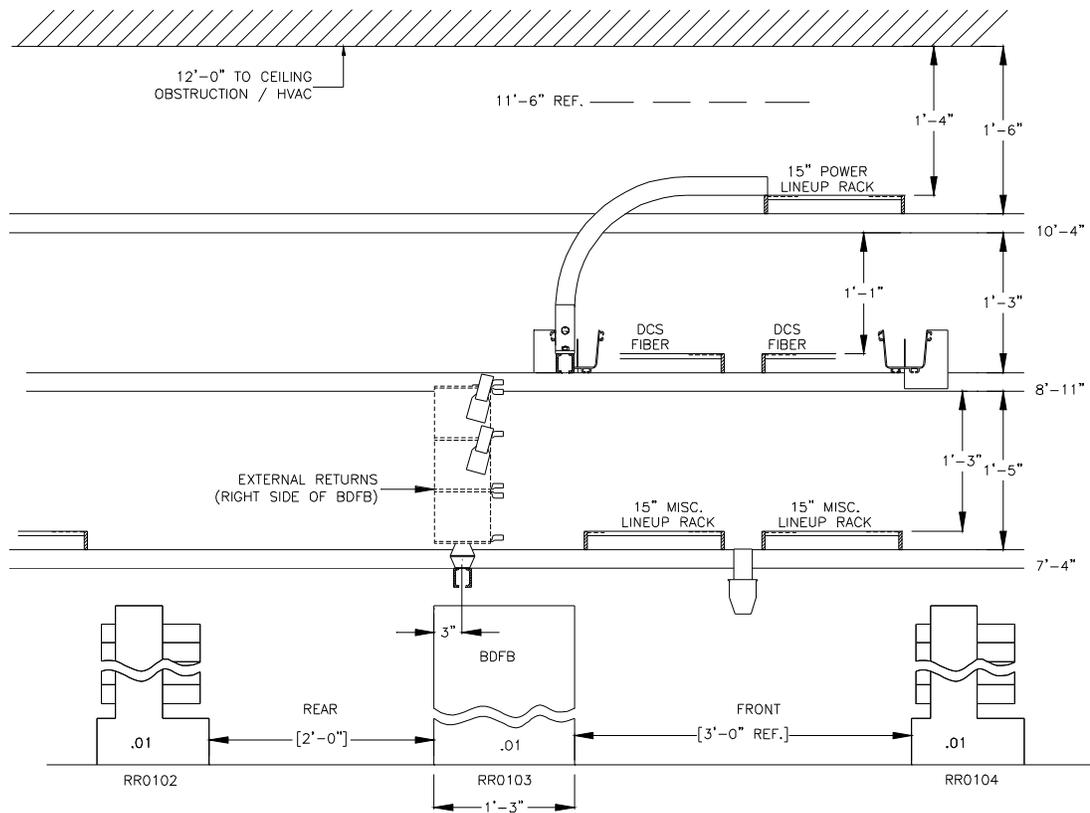
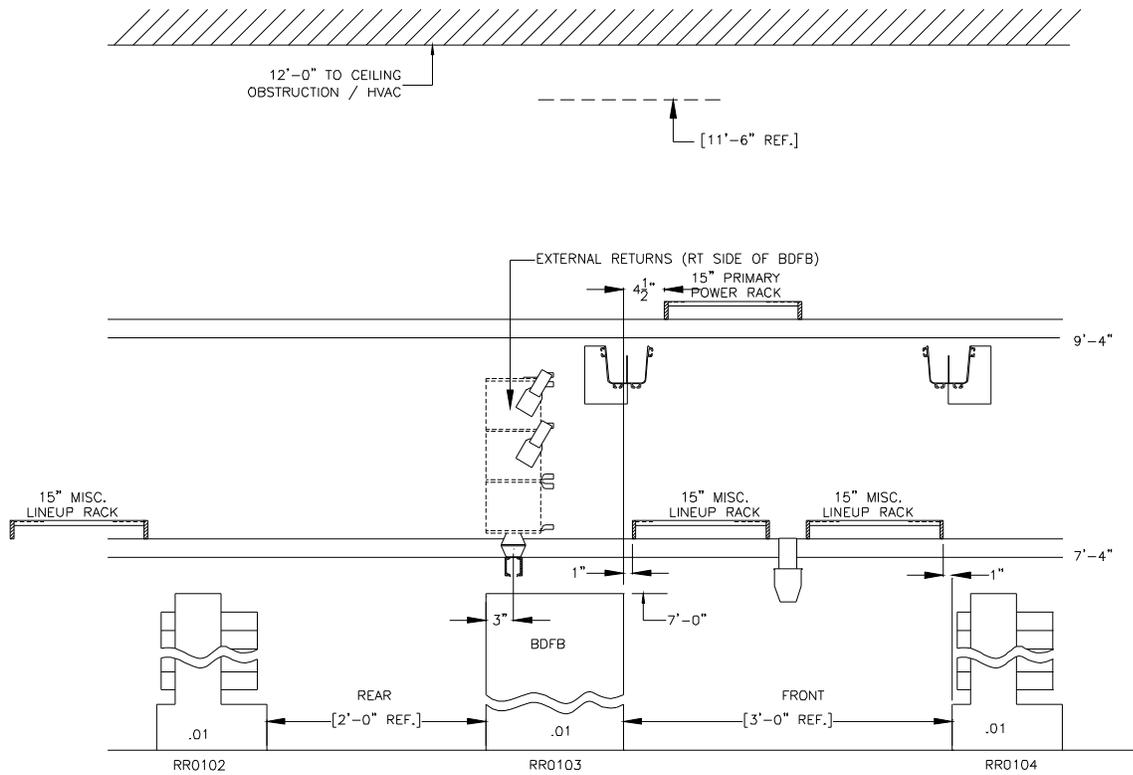
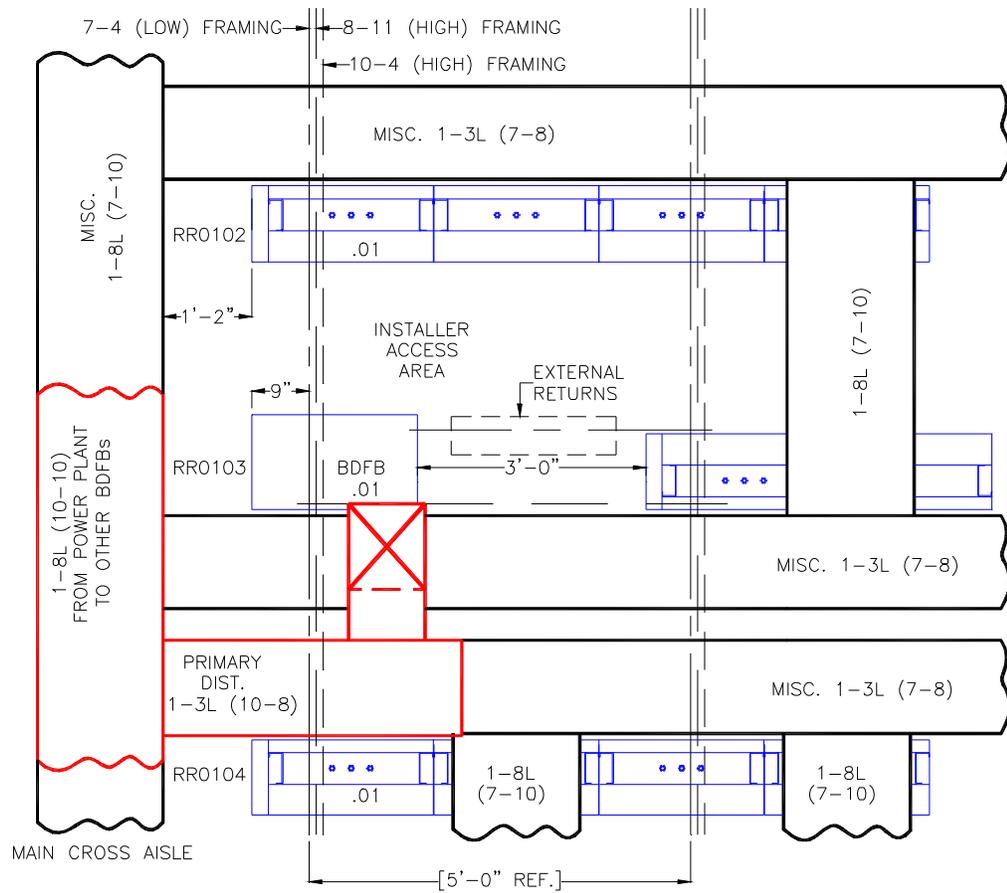


FIGURE 8-18B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING
INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs



**FIGURE 8-19A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING
 INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs**



**FIGURE 8-19B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING
 INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs**

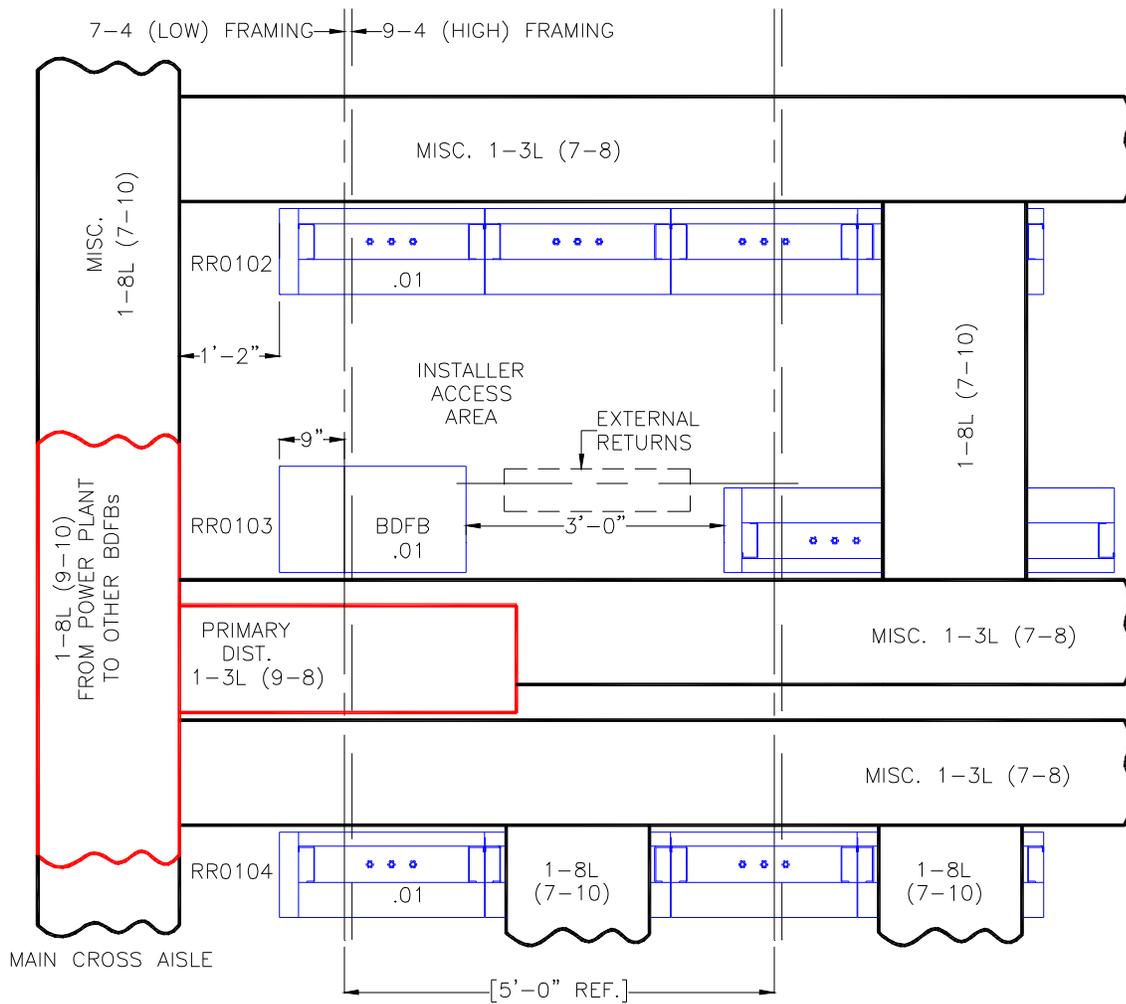


FIGURE 8-20A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

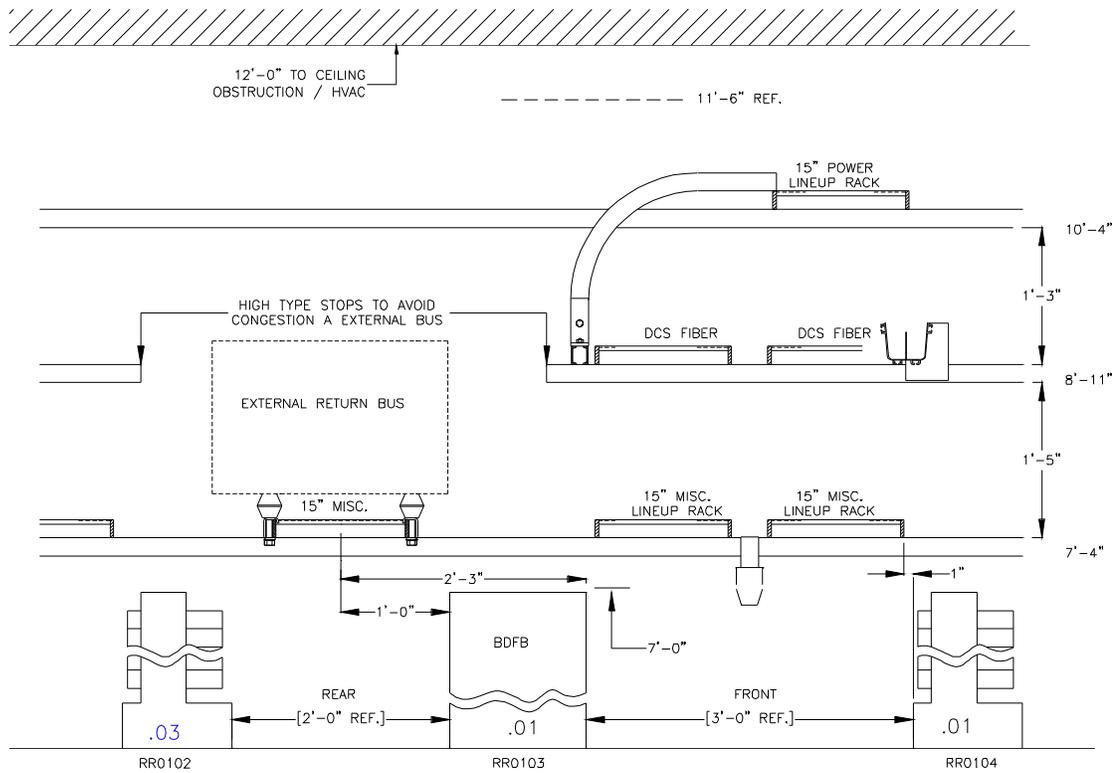
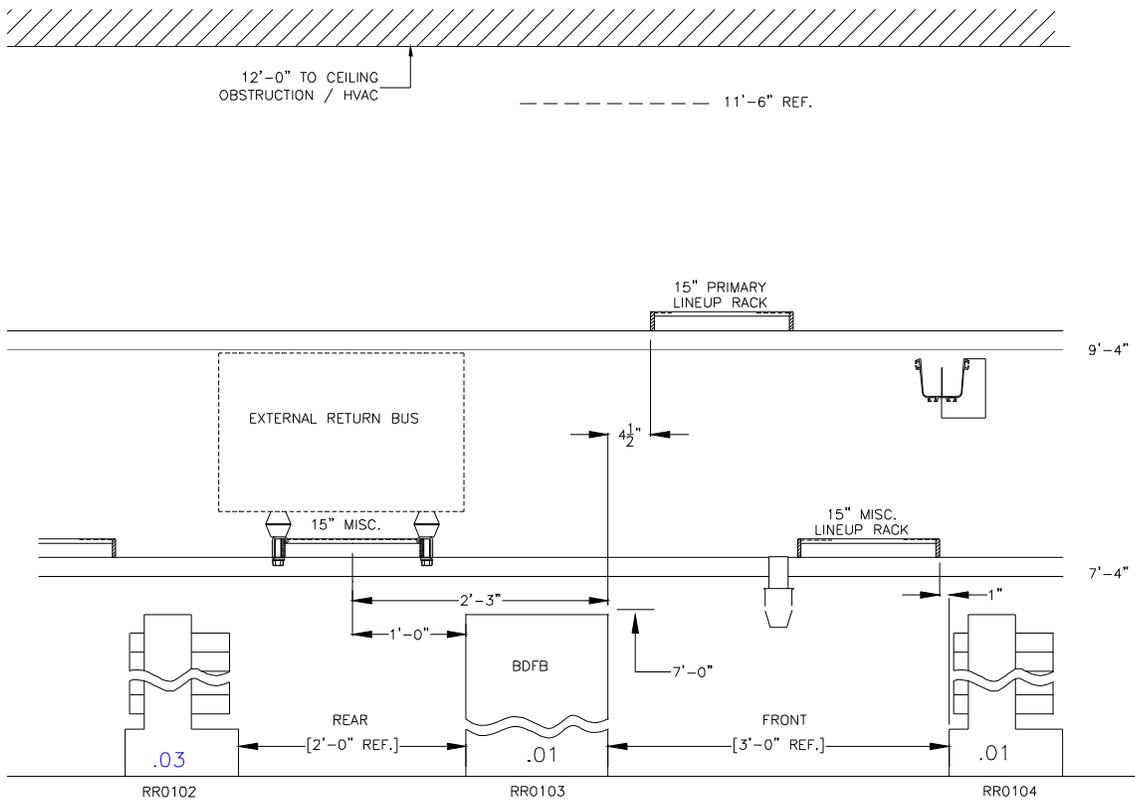
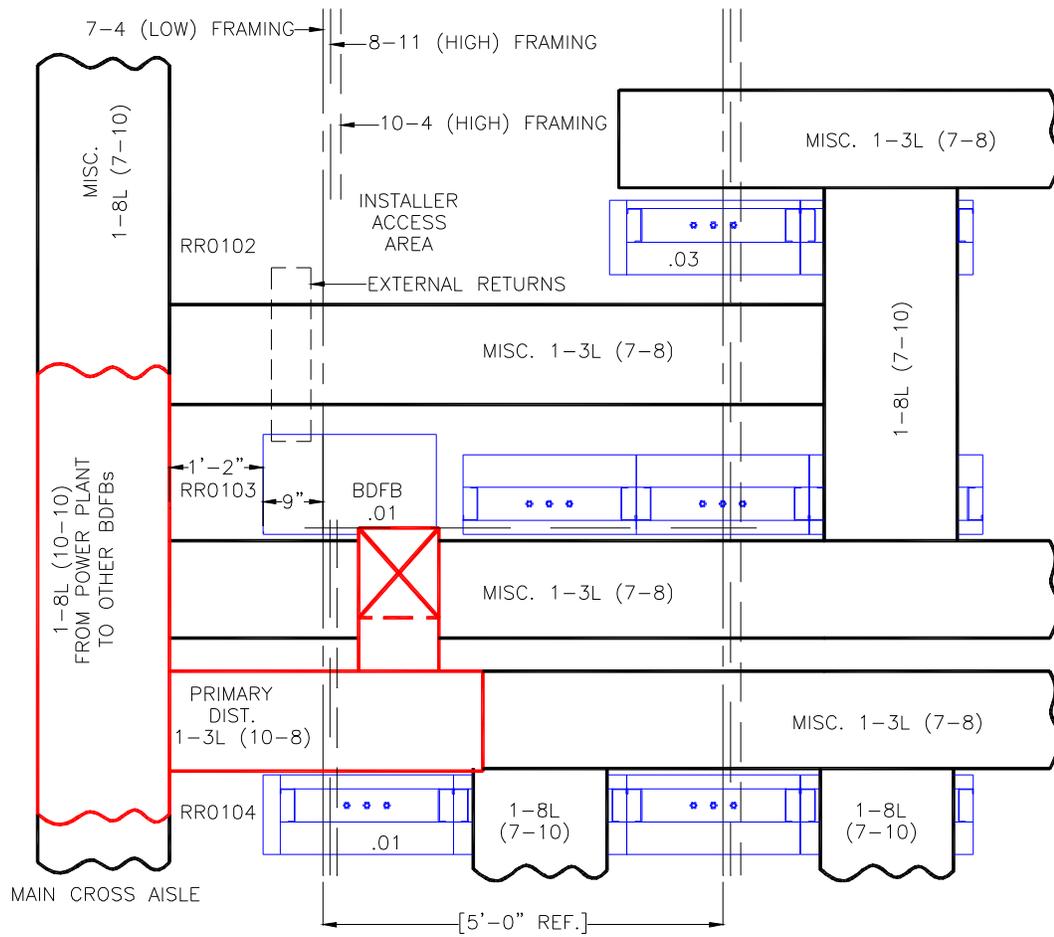


FIGURE 8-20B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING
EXTERNAL RETURNS AT REAR OF BDFBs



**FIGURE 8-21A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING
EXTERNAL RETURNS AT REAR OF BDFBs**



**FIGURE 8-21B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING
 EXTERNAL RETURNS AT SIDE OF BDFBs**

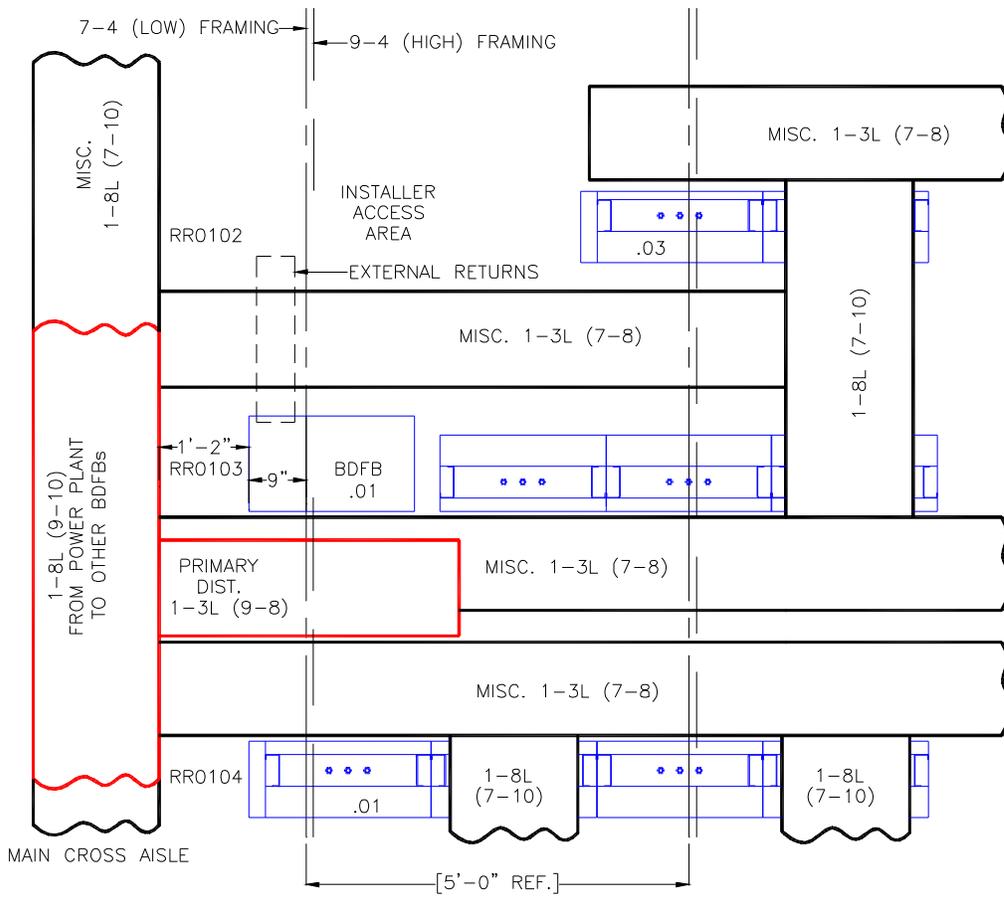


FIGURE 8-22 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH

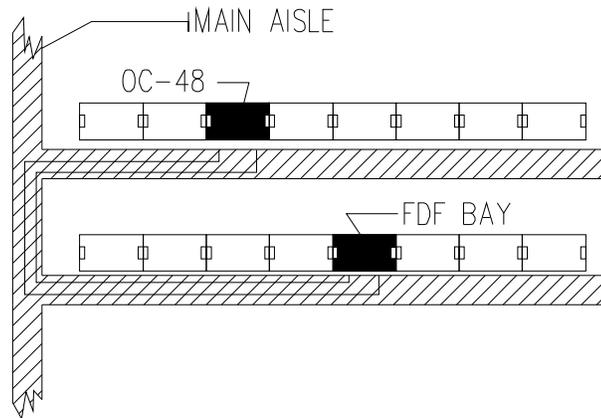


FIGURE 8-23 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH AND FROM FDF TO OC192 USING SEPARATE PATHS

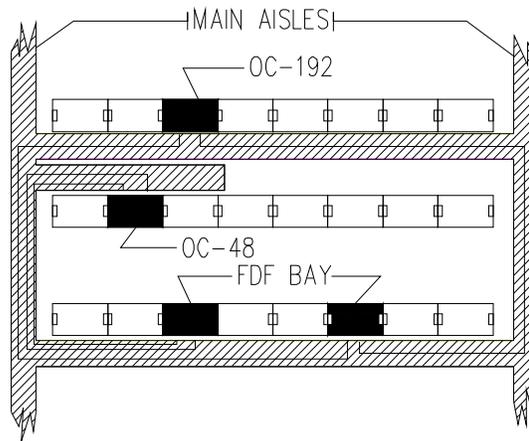


FIGURE 8-24 – DIVERSE ROUTING FROM FDF TO OC48 AND FROM FDF TO OC192 USING DIFFERENT PATHS.

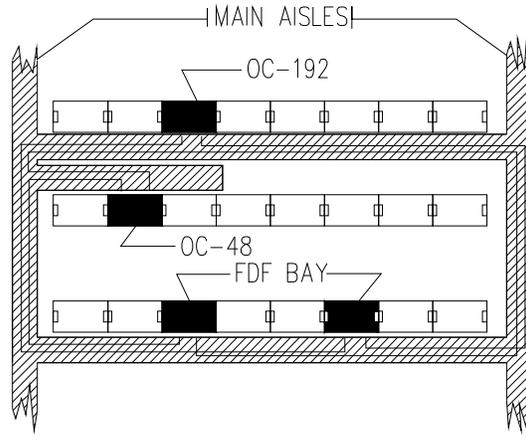


FIGURE 8-25 – DIVERSE ROUTING FROM FDF TO OC192 USING SEPARATE PATHS.

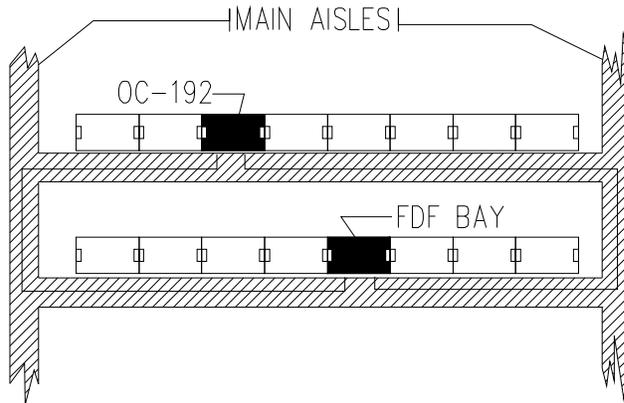


FIGURE 8-26 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH AND FROM FDF TO OC192 USING SEPARATE PATHS.

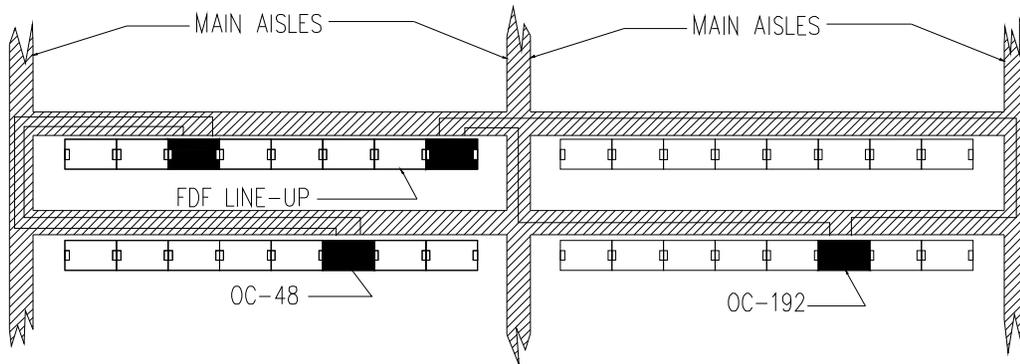


FIGURE 8-27 – DIVERSE ROUTING FROM FDF TO OC48 USING SEPARATE PATHS AND FROM FDF TO OC192 USING SEPERATE PATHS.

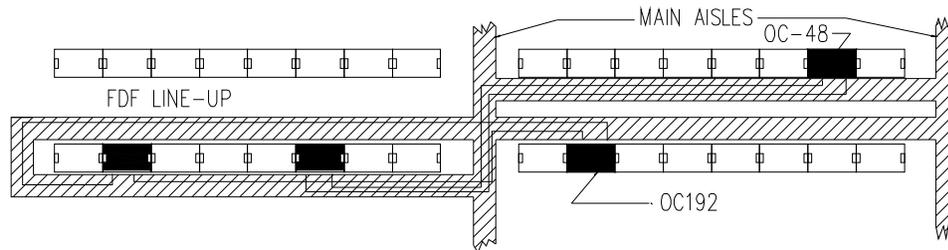


FIGURE 8-28 – DOWNSPOUT DROP OPTIONS

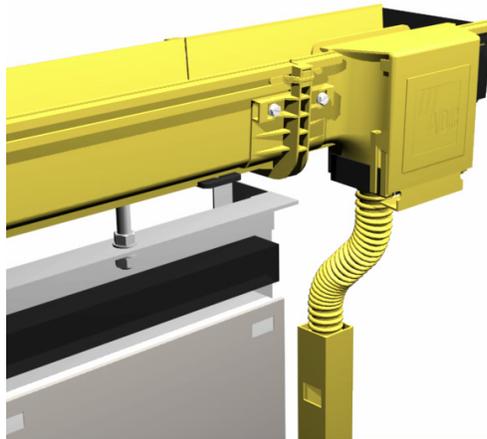
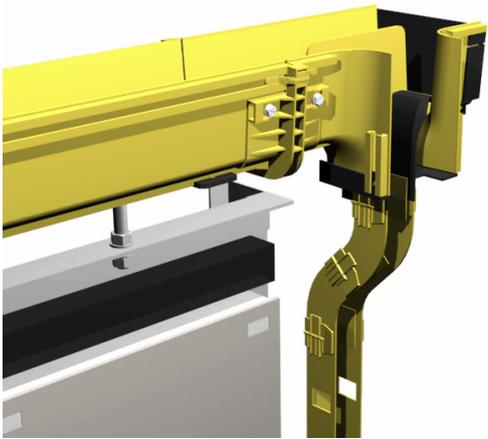
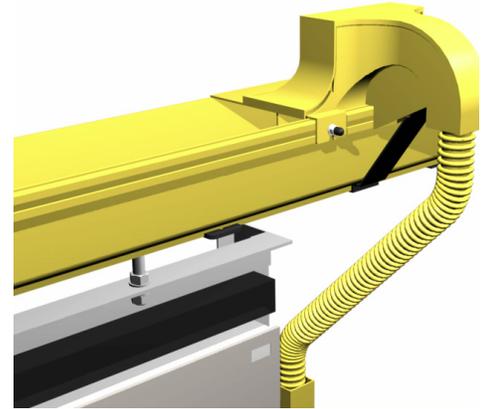
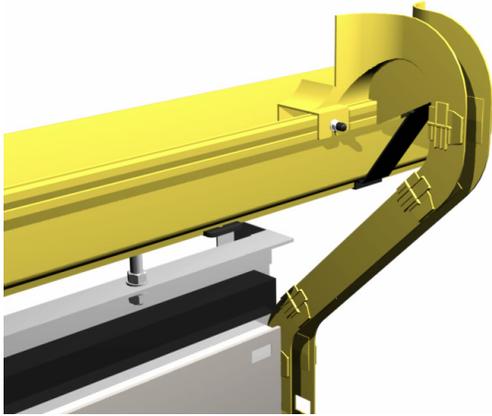


FIGURE 8-29 – EXPRESS EXIT DROP OPTIONS



[END OF SECTION]

SECTION 9--CROSS-CONNECT SYSTEMS

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1. GENERAL	
1.1. Introduction	

- 1.1.1 The cross-connect network is comprised of conventional Distributing Frames (DF), modular DF, manual Digital Cross-connect (DSX1 and DSX3) frames, Fiber Distributing Frames (FDF), and Ethernet Distributing Frames (EDF).
- 1.1.2 Changes in this issue of Section 9 are summarized in Table 9-1.
- 1.1.3 Providing optimum flexibility and economy in the network is the objective of cross-connect engineering. Successful engineering of the network components requires efficient work operations, while avoiding blocked line-ups, premature jumper trough congestion, lack of equipment spread, and tie cable overuse.

2. DISTRIBUTING FRAMES (DF)

2.1. General

- 2.1.1 Distributing frames (DF's) are manually operated, cross-connection devices used for the efficient connection between central office equipment and outside plant cable facilities.
- 2.1.2 The Distributing Frame supports the interconnection needs for customers, carriers, other telecommunications providers (CLEC's), switches, transport equipment, and cable facilities within the serving Wire Center (WC) area.
- 2.1.3 Distributing frames fall into two functional configurations: Main Distributing Frames (MDF) and Intermediate Distributing Frames (IDF). MDF's and IDF's are available in two physical forms: conventional distributing frames and Universal Modular distributing frames.

2.2. Zoning and Spread

- 2.2.1 All MDF's shall be zoned. Zoning refers to the practice of logically dividing the frame into multiple vertical sections, or zones. The vertical and horizontal sides of an MDF are zoned independently of each other. Zoning is utilized to exploit the short jumper concept, in which an assignment algorithm is used to ensure the shortest possible jumper lengths.
- 2.2.2 Spreading is defined as the placement of related equipment in several locations on the frame, e.g. rather than placing all OE in a concentrated location on the DF, it is spread across the frame. This is done in conjunction with the corresponding spread of OSP terminations on the vertical side of the frame. This keeps the jumper wires that are run on the frame shorter, the frame less congested, and prevents premature exhaustion of the frame hardware.

2.3. Distributing Frame Functions

- 2.3.1 Main and Intermediate Distributing Frames. The primary copper facility frame is known as the Main Distributing Frame (MDF). The MDF is the frame that has the standard terminations of the local indigenous switch OE/LEN facilities, cable pairs to the customers and tie pairs to other frames and equipment.
- 2.3.2 In multiple frame central offices, the MDF shall not have transport or CLEC terminations.
- 2.3.3 Transport, CLEC and other miscellaneous terminations, shall be located on the Intermediate Distributing Frame (IDF) and shall be connected via Inter-Frame Tie cables to the MDF.

2.3.4 MDF's may be either conventional or modular. If the MDF is modular, a conventional IDF is required and shall be placed to support it.

2.3.5 The primary functions of distributing frames are:

- Termination of Facilities/Equipment.
- Equipment cross-connect point.
- Electrical Protection.
- Test and Cable Access

3. DISTRIBUTING FRAME TYPES

3.1. Protector Frames

3.1.1 Protector frames (PF) may be either conventional or modular.

3.1.2 Protector frames are provided for the protection and termination of outside plant copper cable pairs. These frames have no provisions for cross-connections, and are used in conjunction with separate distributing frames. Outside plant cable pairs are terminated on protector blocks on the PF. A cable is then placed from the protector block on the PF to a corresponding terminal block on the MDF. The outside plant cable pairs on the MDF can then be cross-connected to central office equipment terminations elsewhere on the MDF. The use of separate Protector Frames (PF's) generally facilitate higher density MDF configurations since more connector blocks can be mounted on the MDF than protector blocks.

3.1.3 A protector frame only provides termination and protection capabilities for outside plant cable pairs.

3.2. Modular Distributing Frames

3.2.1 Modular distributing frames currently in service include the below listed products. The existing product may be grown to the completion of the next zone or end of lineup.

- Lucent Technologies ESS Modular Distributing Frame (Non-Standard - Manufacturer Discontinued)
- COSMIC I - Common Systems Main Inter-Connecting Frame with separate Protector Frame (Standard - Restricted Use)
- COSMIC II -Common Systems Main Inter-Connecting Frame with integrated Protector Frame (Standard – Restricted Use)
- PORTA Systems - CAM DF (Non-Standard)
- Reltec Systems – COS II (Non-Standard).

3.2.2 New Modular Distributing Frames shall be the CommScope COSMIC I or II for new modular installations and applications, subject to the limitations noted in ATT-002-216-025, Switching IDG, Tab 11, and ATT-PAN-20011072, Restricted Use PAN for Avaya COSMIC Frames (Now CommScope).

3.2.3 The modular distributing frames are a sheet metal structure designed for single-sided cross-connect operation. This means that all terminations from both subscriber facilities and from office equipment are accessible for cross connection from one side. Outside plant cable pairs (CP) and line equipment (LE) pairs are normally terminated in alternating modules. The modular framework groups consist of vertical jumper troughs between modules and express wiring troughs at the top and bottom of each module. With the proper spread of cables and equipment, the jumpers need be no longer than from one module to the next adjacent module. They can be engineered with or without separate protector frames for most applications.

3.2.4 Modular distributing frames use the preferential assignment concept. Computerized frame administration systems are used to spread the outside plant cables and equipment cables over the length of the frame. Facilities and equipment are selected based on physical proximity on the DF. The resulting short jumpers reduce congestion and improve network operations efficiency. The AT&T LEC uses FrameMate as a mechanized DF administration system for this purpose.

3.3. Conventional Distributing Frames

3.3.1 Conventional distributing frames are characterized by open ironwork construction with vertical apparatus mounting frame members on one side and horizontal members on the opposite side. Most conventional frames are designed for double-sided cross-connection operations; however, some single-sided versions are available. Adapters used to mount different types of apparatus on frames are identified on manufacturer's frame hardware drawings. Virtually all conventional frames can be arranged for application with or without separate protector frames.

3.3.2 Conventional distributing frames, unlike protector frames, have cross-connecting features including shelves or troughs to route jumper wire and connecting apparatus specifically designed for frequent jumper connections and disconnects.

3.3.3 There are many variations in conventional frame heights, widths, and hardware-mounting dimensions to accommodate specific applications and central office building sizes. The standard for new installations shall be the 8' 10" high double-sided DF system.

3.3.4 Copper cable pairs and derived pair gain terminations on conventional frames are mounted on vertical uprights. Transport/Switch and other miscellaneous termination units are mounted on horizontal levels.

3.3.5 Verticals shall be spaced on 8-inch centers unless otherwise specified by the AT&T LEC Equipment Engineer. Some special application frames have 6 1/2-inch vertical spacing.

3.3.6 Horizontals shall be spaced on 8-inch centers. Older frames may have 10-inch spacing. Current standards call for 8 inch centers for both verticals and horizontals, on a going forward basis.

3.3.7 Verticals shall be numbered consecutively (usually from the non-growth end to the growth end) starting with number 1. The first vertical is ordinarily not furnished with jumper rings and is not used for terminating facility cable pairs.

3.3.8 The first vertical of a frame is usually reserved for plug-up and test line protectors.

- 3.3.9 Horizontal levels shall be identified by letter designations starting with the letter A at the bottom, omitting letters I and O. Individual blocks/terminal strips on the horizontal level shall be identified by the associated vertical number. Designation instructions shall be provided to the installer via a specific installation supplier note.
- 3.3.10 Designations shall be provided at various points to identify the vertical number on both sides of the conventional frame. See Section L of ATT-TP-76300 for details. Designation instructions shall be provided to the installer via a specific installation supplier note.

4. FRAME BLOCKS

4.1. General

- 4.1.1 Frame blocks fall into two general categories – Connector or Connecting Blocks and Protector Blocks. The connector block provides no electrical protection functions. Protector blocks provide electrical protection for OSP cable facilities that are terminated on the MDF.
- 4.1.2 Frame assignments shall be provided by the authorized AT&T LEC Engineer, commonly the Frame Planner/CSPEC, however, local policy shall dictate the appropriate authorized engineer.
- 4.1.3 The DESP shall contact the authorized individual (generally the CSPEC/Frame Planner), specified by the AT&T LEC Equipment Engineer in the TEO.
- 4.1.4 All blocks on the frames shall have wire wrap terminations, unless the embedded base of existing blocks on the frame is made up of Quick-Clip/punch down, type blocks. In that case the quick clip blocks will be allowed.
- 4.1.5 Bifurcated (read dual) pins are required for connecting blocks used for line equipment and CLEC CFA terminations. This facilitates half taps for cutovers, cable throws and “from/to” service orders.
- 4.1.6 Only AT&T LEC approved frame blocks shall be used per drawing ATT-E-00136-E Note 11.
- 4.1.7 No variances from 4.1.6 shall be allowed.
- 4.1.8 Fanning rings shall be placed on transverse arms that are equipped with a frame block. A 15A fanning ring is required on the horizontal side. A 16A fanning ring is required on the vertical side.

4.2. Connector/Connecting Blocks

- 4.2.1 The standard connecting block for conventional frames is the non-connectorized 89-type block.
- 4.2.2 The standard connecting blocks for modular distributing frames are:
- COSMIC I and IA - 78 or 112 type connecting block are the common units.
 - COSMIC II, IIA and II mini - 112 type connecting block is the common unit
 - Existing Reltec or Porta Frames may continue to use their respective proprietary blocks for frame continuity and consistency. (Shall require OTA.)

4.2.3 The 78 and 112 type connector block shall not be mixed on the same COSMIC DF.

4.3. Protected Connectors

4.3.1 Protected connector blocks provide access, electrical protection, unit sockets and testing appearances for OSP cable pairs and trunk cable pairs.

4.3.2 Low density connectors are approved as alternative connectors for use in offices that have an existing installed base of 302 or 303 type connectors. This use of the low density connectors shall be limited to filling a vertical that is partially equipped with the same connectors.

4.3.3 Empty verticals shall use the higher density connectors.

4.3.4 The new connectors shall be wire wrap models and equipped with 5 pin protector sockets. The connector type will be specified by the AT&T LEC Equipment Engineer.

4.3.5 The plug-in protector units are not included with the various connector blocks and shall be ordered separately. The new purchase shall be the 4C Gas Tube Type Protector. Several colors of protector are available:

- Black: POTS/Voice Grade Services
- Red: Special Circuit

4.3.6 Several markers and protector covers have been standardized for further identifications. The AT&T LEC Equipment Engineer should be contacted for information on these items.

4.3.7 All outside plant pairs entering a central office shall have protection at the protector blocks since there is the potential for High Voltage applications to be present. These protectors safeguard personnel, equipment, and the network from hazards such as electrical shock, equipment damage, and fire caused by lightning and AC power faults.

4.3.8 Coil Test devices shall be provided for pre-testing of protectors before use.

4.4. Distributing Frame References (Some may be proprietary)

Telcordia Practice BR 781-822-005

BSP 201-222-050, COSMIC DSS System-General

ATT-002-316-003, Frame Forecast M&P

BSP 201-220-101, Conventional Frames-General

BSP 201-219-101, Protector Frames-General

5. MANUAL DIGITAL SIGNAL CROSS-CONNECT (DSX)

5.1. General

5.1.1 A DSX frame provides a manual method of cross connecting DS1, DS1C, DS3 and STS1 services, in addition to Digital Cross Connect Systems (DCS). The recommended services and applications which should terminate on a DSX1/DSX3 are ones such as: "Nail Up" services, Collocation, Synchronous/Asynchronous equipment, and Electrical interconnection of step down rings.

5.1.2 By contrast, the DCS is an electronic and/or optical cross-connect method for the same services. The recommended services and applications which should terminate on the DCS are ones such as: Potential rearrangement customers, Transport traffic, DS3-STS1-DS1-DS0-OC Multiplexing functionality, Software conversions from DS3-STS1 and back, Regeneration of signals, and Network reconfiguration services.

5.1.3 The following fundamental functions performed at a DSX frame are: Termination, Cross-Connecting, Testing, Patching and Rolling.

5.2 DSX-1 Considerations

5.2.1 Planning of the DSX1 lineup will dictate careful consideration of the central office layout. It is important to place the DSX1 lineups (if multiple) in a parallel arrangement with appropriate troughs for adequate jumper placements.

5.2.2 The length of the lineup may be up to 120 feet with the correct provisions.

5.2.3 DSX-1 Rear Cross Connect bays/line-ups shall require rear aisle lighting to meet with the minimum foot candle requirement for Equipment Frame Area Maintenance Aisle standards as described in Table 6-3 of Section 6 in ATT-TP-76400.

5.3 Interbay Patch Panels

5.3.1 Interbay patch, or Beltline, panels, give local personnel the ability to patch/restore circuits without using excessively long cords (short cords to the panels on either end with engineered cable between the panels).

5.3.2 New DSX1 and DSX3 lineups shall have one inter-bay patch panel appearance every five bays.

5.3.3 For any existing four bay interbay panel configuration, continue to use those same bays for additional interbay panels from new lineups and extensions of existing bays using the five bay format. When the next new interbay is identified, place it five bays away from the last four bay interbay panel on the end cap. Continue on the existing lineups using the five interbay format. Connect these to the existing four bay interbay panels interspersed throughout the frame. Any existing pattern other than the one per five arrangements shall be capped.

5.4 Cross-Aisle Tie Pair Panels & Bridges

5.4.1 Cross-aisle tie pair panels are used in DSX1/DSX3 lineups to provide the ability to cross-connect two DS-1 or DS-1C/DS-3 or STS-1 circuits terminated on different DSX1/DSX3 lineups.

5.4.2 The DSX1 cross-aisle tie circuits consist of five wires terminated at each end on the rear of a cross-aisle tie pair panel. Some older DSX1 equipment may use six wire cross-connection, with the sixth wire used to connect the ground leads from the fuse and alarm panels. This insures a consistent ground reference for tracing lamps.

5.4.3 These tie pair panels shall be strategically placed in the same interbay panel bays in both DSX1/DSX3 lineups to avoid tie pair cable congestion and long cross-connect jumpers.

5.4.4 New Cross-Aisle Bridges shall be a preferred alternative to Cross-Aisle Tie Pair Panels.

5.5 DSX-1 Cross-Connect Rules

- 5.5.1 In order to maintain complete flexibility, planning of the office size is of primary importance and determines the ultimate size and layout of the DSX1 and should be made according to the following guidelines:
- A.) Minimize the amount of multiple jumpers.
 - B.) Use both the bottom and top horizontal troughs for jumpers that will traverse over two panels distance.
 - C.) Each Central Office shall maintain the consistent standard at which point the jumpers are reversed to connect two T1s.
 - D.) Larger troughs shall be purchased and installed when the jumper depth reaches the top of the trough panel at any point in the lineup.
 - E.) Work all disconnects and remove all jumpers and inter-bay cross-aisle panels and erase the circuit identification on the faceplate of the panels.
 - F.) Provide slack on the horizontal trough of each panel not to exceed 4 inches nor be less than 2 inches.
- 5.5.2 To alleviate cable congestion in the relay rack duct, 5 inches of space shall be provided between each 56 port/panel-bay.
- 5.5.3 To alleviate cable congestion in the relay rack duct, 7-1/2 inches of space shall be provided between each 84 port/panel-bay.
- 5.5.4 It is recommended to either install a skeleton bay (subject to future availability) to pre-equip the required horizontal troughs and appropriately sized vertical rings or to place a complete set of troughs and vertical rings (subject to future availability) when each new bay is installed in a lineup. Additional bays in a DSX1 lineup may result in possible cable congestion in the overhead racks.
- 5.5.5 DSX-1 panels shall be located no more than 9 feet above the floor in new installations of 9ft and 11ft-6in bays.
- A.) In Grandfathered locations where there is an 11 foot 6 inch environment, the existing lineups will be finished out at the existing height.
- 5.5.6 Any tie cable panels should be mounted at the top of the DSX-1 bay at the 6-7 foot level.
- 5.5.7 For new DSX-1 lineups in central offices high-density bantam type jack panels shall be provided.
- 5.5.8 All DSX patch panels shall be physically and electrically compatible in the same DSX1 lineup.
- 5.5.9 An upper and lower express trough shall be provided for each bay.
- 5.5.10 All hardwired cables between the connecting equipment and the DSX1 (DCS panel) shall be sized according to length as follows. The 22, 24 and 26 gauge cables preferably should be wire wrapped at the switch or network element end; but may be connectorized at the factory

using 24 gauge cables.. The following length limitation tables from a DSX1 or DCS panel apply to switch elements as well as network elements.

A. Length limitation from DSX1 panel to switch element or network element using wire wrap technology:

- 1.) 26 gauge 407.5 feet (This gauge cable shall be the FIRST CHOICE until the length limitation is exceeded)
- 2.) 22 gauge 612.5 feet (This gauge cable shall be the SECOND CHOICE after 26 gauge except for cross-aisle applications or when the 26 gauge length limitations are exceeded)
- 3.) 24 gauge 507.5 feet (This gauge cable is NOT NORMALLY USED as LBO range settings are typically listed for 26 gauge and 22 gauge cables)

B. Length limitation from DCS to switch element or network element using wire wrap technology:

- 1.) 26 gauge 900 feet (This gauge cable shall be the FIRST CHOICE until the length limitation is exceeded)
- 2.) 22 gauge 1310 feet (This gauge cable shall be the SECOND CHOICE after 26 gauge except for cross-aisle applications or when the 26 gauge length limitations are exceeded)
- 3.) 24 gauge 1100 feet (This gauge cable is NOT NORMALLY USED as LBO range settings are typically listed for 26 gauge and 22 gauge cables)

C. When hardwired DS1 Cable length runs are in excess of the transmission range of 26 gauge cable, use 22 gauge cable. In some instances 24 gauge will be used due to connectorization requirements as defined in AT&T Standard Drawings.

The above stated Length limitations from DSX-1 panel or DCS to a switch element or to a network element may be adjusted downward/reduced in length to allow for longer DSX-1 Y2, 24 gauge Cross-Connect Lengths, in excess of the stated 85 foot limitation, which may be up to a maximum of 120 feet in length.

5.5.11 Transmit and receive signals shall be in separate cables from the transport equipment to the DSX1 except as manufacturer requirements dictate.

5.6 DSX-3 Considerations

5.6.1 All hardwired cables between the connecting equipment and the DSX-3 shall be 75 ohm coaxial cable with a single tinned copper shielded braid. When hardwired cable length runs are in excess of the transmission range of 735C coaxial cable, use 734C coaxial cable. Note: 734C is the thicker, longer range, coaxial cable and 735C is the thinner, shorter range, coaxial cable.

5.6.2 The maximum hardwired cable length between the DSX-3 and connecting equipment is 427.5 feet for 734C coaxial cable. If 735C cable is used, the maximum cable length between the DSX-3 and connecting equipment is 227.5 feet. The above stated length limitations from DSX-3 panel and connecting equipment may be adjusted downward/reduced in length to allow

for longer DSX-3 standard outer diameter (735C/734C type) cross-connect cords, in excess of the stated 45 foot limitation, which may be up to a maximum of 88 feet in length.

- 5.6.3 To alleviate coaxial cable congestion in the relay rack duct, 5 inches of space shall be provided between each front cross-connect DSX-3 bay.
- 5.6.4 To alleviate coaxial cable congestion in the relay rack duct, 7 ½ inches of space shall be provided between each rear-rear cross-connect DSX-3 bay.
- 5.6.5 Vertical rings shall be provided for each bay between the troughs.
- 5.6.6 Cross-aisle jumper troughs shall be mounted in the rear for rear cross-connect bays and at the front for front cross-connect bays.
- 5.6.7 Kings BNC connectors are the LEC standard, and shall be provided, in all of AT&T, except for AT&T Midwest. Trompeter BNC connectors are the LEC standard and shall be provided in AT&T Midwest. Special crimp tools will be required to crimp these connectors. It is very important to understand that the tools specifically identified as Newhall Pacific Tools are used ONLY for crimping the center pin and outer hex sleeve of the Kings connectors. Also, the tools specifically identified as Trompeter Electronics Tools are used ONLY for crimping the center pin and outer hex sleeve of the Trompeter connectors. NEVER use the Newhall Pacific Tools to crimp Trompeter connectors and NEVER use the Trompeter Electronic Tools to crimp Kings Connectors; otherwise BNC connector failures WILL OCCUR.
- 5.6.8 The hardwired cables from the connecting equipment to the DSX-3, or from the connecting equipment directly cabled to the DCS, shall be provided in one of the following *two* ways, as authorized by the AT&T Equipment Engineer:
 - A. One end factory crimped and the OTHER end field crimped, within an AT&T central office, by an AT&T approved Installation Supplier.
 - B. Bulk coaxial cable requiring field crimping, within an AT&T central office, by an AT&T approved installation supplier on BOTH ends.
- 5.6.9 In large offices, DCS equipment shall be terminated on different DSX-3 bays to provide an even spread of equipment. If multiple line-ups are present at that location an even distribution of terminations shall be provided.
- 5.6.10 All Network Equipment DS3s originating from an equipment unit should appear on the same DSX-3 bay.
- 5.6.11 The maximum number of bays in a DSX-3 lineup shall not exceed 20, but the most critical issue is the maximum cross connect length.
- 5.6.12 In the 7-foot environment, two horizontal troughs, one on the bottom and one at 7 feet 6 inches shall be provided. In the case of the 11'6", three troughs, one on the bottom, one at 7'6" and one at the top of the bays shall be provided.
- 5.6.13 DSX3 lineup interconnects should not exceed three parallel adjacent lineups.
- 5.6.14 Tracer lamp colors shall be as follows:
 - A.) DS3 shall be Red
 - B.) STS1 shall be Yellow

5.6.15 DSX-3 Rear Cross Connect bays/line-ups shall require rear aisle lighting to meet with the minimum foot candle requirement for Equipment Frame Area Maintenance Aisle standards as described in Table 6-3 of Section 6 in ATT-TP-76400.

5.7 DSX Cross-Connect References

ATT-002-316-041, DSX-1 Deployment Standards

ATT-002-316-042, DSX-3 Deployment Standards

ATT-E-01115-W AT&T-Interconnect Drawings (DSX-3) FX

ATT-E-01115-E AT&T-Equipment Drawings (DSX-3) FX

ATT-E-01175-E AT&T-Equipment Drawings (DSX-1) RX

ATT-E-01175-W AT&T-Interconnect Drawings (DSX1) RX

ATT-E-01117-W AT&T-Interconnect Drawing DSX-3 RX

ATT-E-01117-E AT&T-Equipment Drawing DSX-3 RX

ATT-E-01150-E AT&T-Drawings BOR-SWBT version DS3/STS-1 IOR/BOR

ATT-E-01150-W AT&T-Drawings BOR-SWBT version DS3/STS-1 IOR/BOR

ATT-E-01101-E AT&T-Equipment Drawings DS1-IOR

ATT-E-01101-W AT&T-Interconnect Drawings DS1-IOR

6. FIBER DISTRIBUTING FRAMES (FDF)

6.1. General

6.1.1 An FDF architecture shall serve as the primary interface between outside plant (OSP) fiber optic facilities entering and leaving a building and the fiber optic equipment installed within a building.

6.1.2 The FDF shall provide a centralized point for the organization and administration of the fiber optic facility and intrabuilding equipment cables, providing a flexible platform for future fiber growth, and providing rearrangeable connections between any two terminations or appearances.

6.1.3 FDF systems are suitable for use in both large and small offices, digital loop carriers, controlled environmental vaults (CEVs), and customer premises.

6.1.4 FDF systems are modular in design and shall serve as centralized termination, test access, cross-connect points and distribution for all fiber network elements.

6.1.5 The FDF shall be the primary interface and cross-connect point for all FiberOptic products, cabling and equipment such as Optical Multiplexers, DWDM, FTM, and Optical Amplifiers.

6.1.6 The FDF shall be the direct cable cross-connect point for all AT&T Network Elements to one another.

- 6.1.7 Connectivity from one Network Element to another within the same Network Equipment footprint shall only be permitted as a hardwire (permanent) arrangement for connectivity of equipment issues.
- 6.1.8 Circuit level activity or cross-connects from one network element to another within the same Network Equipment footprint shall not be permitted.
- 6.1.9 Passive devices such as Optical Splitters and WDM technologies shall fit within modules developed for use in the Miscellaneous 12-slot vertical shelf or will be required to be hard-cabled to an off-site location from the FDF.
- 6.1.10 Optical Carrier systems that use primary and protect paths for signal transmission shall have path diversity for cross-connects and cabling within the Central Office beyond the initial Network Equipment lineup in accordance with ATT-002-316-087, *Intraoffice Routing Diversity for the Central Office*.
- 6.1.11 Fiber cabling **within** a Network Element system using one or multiple bays within the same footprint may be cabled directly without termination on a FDF.
- 6.1.12 Fiber provisioning between the Fiber Distribution Frame and Network Equipment within one Central Office floor not separated by a firewall, floor or ceiling shall be accomplished in either one of the two methods listed below
 - A. Fiber patch cords via the Fiber Protection System (FPS).
 - B. OFNR Cable via dedicated cable rack.Network Elements placed outside of this area that need to be connected to another area shall require the use of OFNR cable, not jumpers, to be run and terminated to the FDF.
- 6.1.13 SingleMode SC-UPC connectors shall be used when terminating on the FDF.
- 6.1.14 MultiMode services are **not standard** within the Central Office and if used shall be self-contained within the CLEC or Network Element Bay.
- 6.1.15 The full cross-connect architecture provided by the Fiber Distributing Frame shall be used in the AT&T Local Exchange Companies.
- 6.1.16 Fire-retardant ribbon fiber optic cables should be pre-terminated on the Outside Plant (OSP) shelf in the FDF bay and shall be spliced to optical OSP facilities either in the cable vault or in the first manhole.
- 6.1.17 Fiber optic pre-connectorized interconnect cables from optical transmission and switching equipment shall be terminated on a Fiber Optic Termination (FOT) shelf in an adjacent FDF bay.
- 6.1.18 The FOT and OSP terminations shall be cross-connected via cross connect fiber optic jumpers at the time a service request is initiated.
- 6.1.19 Alternating bay arrangement shall be used except in offices that contain only one bay. The alternating bay arrangement segregates OSP terminations and Fiber Optic Transmission (FOT) equipment terminations into alternate bays and ensures an efficient and short jumper arrangement.

6.1.20 The FDF shall always utilize the cross-connect methodology. Transport/Switch equipment shall not be directly terminated on the front access ports of the OSP panels. Transport/Switch equipment shall be terminated on FOT panels and cross connected to any other panel.

6.2. Satellite Fiber Distributing Frame

6.2.1 When the equipment placement is located on another floor or a non-contiguous equipment area, a Fiber optic tie cable terminated on OSP panels shall be placed from the FDF to that remote area and terminated on a satellite FDF in its own bay.

6.2.2 When Satellite Fiber Distributing Frames are placed, Fiber Protection Systems (FPS) shall be placed to allow easy access to support the eligible area for each Network Element.

6.2.3 The remote area shall be supported through Fiber patch cords to the Network Element allowing for rapid fiber deployments at minimal dedicated long-term costs.

6.2.4 It must be emphasized that Fiber Protection Systems and Fiber Optic patch cords shall not traverse firewall partitions and floors.

6.2.5 Fiber Protection Systems shall be provisioned between the 8'6" and 9'0" heights, unless otherwise obstructed. This allows for fiber patch cord/fiber jumper placements for service requests, orders and/or equipment installations for the standard 7-foot height of FDF bays.

6.3. FDF Applicability

6.3.1 The **Generation I** is a low density Fiber Distribution Frame using a bay arrangement. This FDF has 24 to 48 fiber optic ports per panel and up to 11 panels per 7-foot high bay. **This FDF layout has been grandfathered and shall be capped with existing panels.** This type of FDF can be modified to a Generation II type, refer to applicable drawings and M&Ps. **This FDF will fit in a standard frame relay rack as a Network Bay having a 23-inch interior and 26-inch exterior width and a 15-inch depth.**

6.3.2 The **Generation II** is a medium density Fiber Distribution Frame using a bay arrangement. This is the AT&T LOCAL EXCHANGE company's **STANDARD FOR USE.** This FDF has 72 (96 standard in AT&T East with the option for 96 in AT&T Midwest operating companies) fiber optic ports per panel and up to 9 panels per 7-foot high bay. This FDF will fit in a standard frame relay rack as a Network Bay having a 23-inch interior and 26-inch exterior width and a 15-inch depth. This type of FDF may be grown to the end of the current lineup in any Category Central Office or Outside Plant Location. Changes to Generation III FDF should be made upon commencement of a new lineup or at such time that the location becomes constrained.

6.3.3 The **Next Generation** (NGF) is a High Density Fiber Distribution Frame (HD-FDF) that utilizes an innovative frame consisting of high –density port panels, which can be mounted into twelve Fiber Termination Block (FTB) mounting positions that are equally divided between vertical columns on the left and right side of the frame. This is a multi-trough frame that has front and rear access. This frame is only available for use in the **AT&T Midwest** region. This FDF will not fit in a standard frame relay rack. It will be required to fit within a large bay configuration having a 36" x 36" width and depth with actual dimensions of 30" wide by 24" deep.

6.3.4 The **Generation III** FDF is a High Density Fiber Distribution Frame (HD-FDF) that utilizes a new frame arrangement consisting of high-density port panels located within a multi-trough high-density bay arrangement. AT&T LOCAL EXCHANGE companies NP&E has approved the Generation III frame for general use within Category I and Category 2 Central Offices, as well as any Constrained Offices in any Category and Category IV Outside Plant Sites. This FDF will not fit in a standard frame relay rack. It will be required to fit within a large bay configuration having a 36" x 36" width and depth with actual dimensions of 30" wide by 24" deep.

6.3.5 **Generation III** FDF bays/line-ups shall require rear aisle lighting to meet with the minimum foot candle requirement for Equipment Frame Area Maintenance Aisle standards as described in Table 6-3 of Section 6 in ATT-TP-76400.

6.4. The FDF

6.4.1 Terminating capacity of a Generation II FDF shall be limited to 72/96 SingleMode SC-UPC fiber connectors per shelf with a maximum of 9 shelves per bay.

6.4.2 The top shelf (9) in each bay shall be reserved for special applications such as test access, administrative access, passive devices such as WDM and Fiber Splitter applications and interlineup FDF bridging.

6.4.3 All passive devices shall conform to the AT&T LOCAL EXCHANGE companies standard for the vertical Miscellaneous Panel (12-slots modules) only. The Miscellaneous panel shall be the only version permitted on the Generation II and future Generation III FDF.

6.4.4 The FDF shall be limited to a seven-foot environment.

6.4.5 The FDF shall be ordered to include storage of excess jumper slack between bays.

6.4.6 The Generation II FDF uses a high-density trough system that permits the routing of fiber optic cross-connect jumpers of varied lengths to fit into the system without the need to custom fit or splice connectors. **IMPORTANT NOTE:** Excess fiber jumper slack shall not exceed 6-feet in length.

6.4.7 In extremely small Central Offices, the first FDF bay can be used in a combination mode with the FOT panels on the bottom and the OSP panels on the top. Any growth beyond the first bay shall require the existing pattern be carried out through out the lineup. If in doubt as to the growth of the office, then care should be used to place the frames in the normal arrangement of OSP-FOT-OSP-FOT....

6.4.8 The Generation III FDF shall have a different physical placement requirement of the lineup. The lineup shall be placed to accommodate both front and rear access providing for a full 36-inches between parallel lineups on both front and rear. If a new lineup is started using the Generation III bays after an embedded Generation II (standard bay) arrangement is already in service, strive to place the new lineup adjacent to the Generation II lineup, or within the closest proximity. A transition bay from the NGF to the NG3 will be required to migrate from these two Generation III systems.

- 6.4.9 Standard bays (Generation II) and large bays(Generation III) FDF's shall not be intermixed in the same line-up without the office first being considered constrained which will require an OTA and the placement of special modified equipment as follows:
- A. Transitional end guards shall be provided
 - B. Fiber raceways shall be provided to compensate for transition choke points between these two types of frames.
 - C. Transition Bay
- 6.4.10 FDF layouts in the Central Office and Outside Plant sites will vary in size based upon the needs of business and the complexity of the existing office topology. The new Generation III FDF has three major components:
- A. The FOT Bay used for Network Equipment and CLEC terminations.
 - B. The OSP Bay used for Outside Plant Cabling terminations.
 - C. The Miscellaneous Bay used for additional slack storage, phone, drawer, etc.
- 6.4.11 It is expected that the FOT and OSP bays shall alternate in placement in the same lineup with the Generation III Miscellaneous bay being placed in the forecasted center of the overall frame lineup. It is not anticipated to have more than one Miscellaneous Bay per FDF lineup and will not be deemed necessary for bay arrangements less than 5 bays.
- 6.4.12 24 connector panels shall not be used in the Central Office but may be used in CEV's, RT's and Outside Plant Facilities.
- 6.4.13 A Fiber Optic Jumper is defined as a cross-connect jumper located at the FDF to cross-connect the OSP termination to the FOT termination. Fiber Optic Patch cord is defined as the connection between the Network Element and the rear of the FOT shelf located in the FDF.
- 6.4.14 Fiber optic cross-connect jumpers shall be ordered in the near correct lengths in order to properly place the connection from the two fiber panels (OSP-FOT), (FOT-FOT), or (OSP-OSP) on Generation I FDF systems. DO NOT PERMIT EXCESS CABLING TO BE ORDERED OVER 6 LINEAR FEET FOR ANY JUMPER.
- 6.4.15 On Generation II (ATT-Standard) and beyond FDF systems, the fiber jumpers shall be provided in 5-foot increments, but shall not be less than 6-feet for any one-jumper cross-connect. Sufficient storage is available on 72-96 panel fiber systems.
- 6.4.16 On Generation III (ATT-Standard) and beyond FDF systems, the fiber jumpers shall be provided in 5-foot increments, but shall not be less than 6-feet for any one-jumper cross-connect. Sufficient storage is available on 72 panel fiber systems.
- 6.4.17 Fiber Optic jumpers shall be ordered from a Procurement approved supplier.

6.5 Fiber Splitters

- 6.5.1 Optical Splitters are SingleMode optical glass devices used to distribute fiber optic signals to multiple fiber optic output locations. Optical Splitters produce output signals in varying combinations. The most common SingleMode splitters provide a 90/10 or a 50/50 percent split of the input signal intensity.
- 6.5.2 The Optical Splitter provides a tool for measurements that can be placed as a terminus point for ILEC provisioned services without interrupting the primary service. The Optical Splitter is to be used at the overall ends of a point-to-point service only.
- 6.5.3 FiberOptic Splitters shall not be placed in a back-to-back mode.
- 6.5.4 More than one FiberOptic Splitter shall not be placed in one Central Office on the same circuit path.
- 6.5.5 The number of fiber optic splitters in the overall circuit shall not exceed three.

6.6 Optical Terminations and Connectors

- 6.6.1 Fusion splices are rated as Standard in the AT&T LEC and shall be used.
- 6.6.2 Mechanical Splices will only be permitted on an exception basis for the immediate service restoration of damaged facilities.
- 6.6.3 Mechanical splices shall not remain in place for any longer than 30 days before conversion to a fusion splice.
- 6.6.4 Biconic Splices shall not be used for new Fiber Optic Services. Biconic Connectors do not meet the technical specifications necessary for optical transmission of OC-48 and higher services.
- 6.6.5 Existing Optical Signals and spare fiber terminations with Biconic Termination Connectors shall be replaced at the first opportunity e.g. activity associated with that facility or the forecasted deployment of OC-192 services within that location within the next five years.

6.7 Attenuators

- 6.7.1 Attenuators are placed at the Fiber Distribution Frame (FDF) panel supporting the Network Element. FOT and OSP panels in the FDF normally are ordered with a 0-dB (or no) attenuation. The connector may be changed in the FDF and replaced with the proper attenuator in the connector socket to pad the signal in 5-dB increments.
- 6.7.2 These "Bulkhead" attenuators are flush mounted with the panel face and are color coded for proper use. In addition, "In-Line" attenuators may be placed to pad the signal and shall only be placed between the FOT panel and the fiber jumper when services used have high power requirements as shown in the following table:

Service Type	Not Multiplexed	Multiplexed with WDM, DWDM, etc
OC-1	In-Line Optional ¹	In-Line Required

¹ In-Line Attenuators will be the long-term best value with higher capacity services.

OC-3	In-Line Optional	In-Line Required
OC-3C	In-Line Optional	In-Line Required
OC-12	In-Line Optional	In-Line Required
OC-48	In-Line Optional	In-Line Required
OC-48 (High Power)	In-Line Required	In-Line Required
OC-192	In-Line Required	In-Line Required
OC-768	In-Line Required	In-Line Required

6.7.3 Attenuators shall not be placed between two fiber optic jumpers in the Fiber Protection System (Yellow Raceway) or the FDF troughs.

6.7.4 Attenuators shall be placed in the FOT panel itself.

6.7.5 Attenuators shall not be placed on the Network Element equipment side of the fiber optic patch cord.

6.7.6 These bulkhead connectors can also provide a transition point from older ST-UPC cables to the SC-UPC types for ATT-Southwest, refer to FLASH-2001-015, *SWBT Transition to the SC Connector*, Issue 1, June 2001. Refer to ATT-NOT-000-000-473, *Optical In-Line Attenuators*, and Issue 1, dated June 2002 for In-Line Attenuator use.

6.8 FDF References

ATT-002-316-011, AT&T SingleMode Fiber optic Splitters

ATT-002-316-026, AT&T SingleMode Passive Wave Division Multiplexer (WDM) for the FDF

ATT-002-316-043, AT&T-FDF Frame Deployment Standards

ATT-002-316-053, AT&T-Fiber Raceway Deployment Standards

ATT-002-316-066, AT&T-Breakout Bay Deployment for the Nortel OPTera Connect DX System

ATT-002-316-072, AT&T-BPON FTTH Provisioning (AT&T-West Trial Only)

ATT-002-316-074, AT&T-Fiber optic Bridging for the FDF

ATT-002-316-078, AT&T Fiber Connector/Mode Policy

ATT-002-316-079, AT&T Fiber Connector/Mode Policy Addendum by Applied Services

ATT-002-316-090, AT&T-BPON Common Systems Provisioning Standards

ATT-E-00136-E, AT&T-Fiber Patch cords, Cable and Attenuators

ATT-E-01140-E-01, AT&T-Fiber Distributing Frame Drawings

ATT-C-50001-E-00, AT&T-Fiber Raceway Drawing

7 ETHERNET DISTRIBUTING FRAMES (EDF)

7.1 General

7.1.1 Ethernet signals are transported through one of two cabling media. Either electrical or optical.

7.1.2 Optical Ethernet signals within the Central Office or Customer Premise shall be terminated at a Fiber Distributing Frame (FDF) location. All rules and guidelines that define fiber requirements shall be adhered to as described in other sections of this document.

7.1.3 Electrical Ethernet signals within the central office or at a customer premise shall terminate at the Electrical Ethernet Distributing Frame (EDF). The EDF serves as the primary interface between AT&T's Ethernet network element bay and the far end termination point there by providing cross-connect capabilities between any two terminations or appearances.

7.2 Electrical Ethernet Distributing Frames

7.2.1 EDF design is suitable for use in both large and small central offices and customer premises.

7.2.3 All new Electrical Ethernet installations shall conform to NEBS requirements as described in ATT-TP-76200.

7.2.4 Electrical Ethernet provisioning will be bound by Category 5t and 6t cable restrictions and length limitations.

7.2.5 Ethernet interconnection between network transmission equipment and the EDF will be terminated on the rear of an Ethernet Termination shelf (Patch Panel). This connection will be made using RJ-45 type connectors and Category 5t or 6t type cable.

7.2.6 The cross-connect termination between the originating C.O. transmission equipment and the customer's far end receiving equipment will be connected via cross-connect jumpers at the time a service request is initiated.

7.2.7 The cross-connect between the originating C.O. transmission equipment and the customer's far end receiving equipment will be made in a front to front arrangement via RJ-45 type connectors and Category 5t or 6t cable at the EDF.

7.2.8 The EDF shall always utilize the cross-connect methodology. The interconnection of originating Ethernet equipment to the far end termination point within the Central Office will be through the full cross-connect design of the Ethernet Distribution Frame.

7.2.9 Under no circumstances will C.O. Ethernet equipment be directly terminated on the front access ports of the customer's far end termination panels but, shall be terminated on the rear of said panels and will be subsequently cross-connected via a patch panel at the EDF.

7.2.10 10/100 Base-T Ethernet circuits require the use of Cat5T cable in order to meet satisfactory transmission levels at 100 meters. 1000 Base-T (1Gig) circuits require the use of Cat6T cable in order to meet satisfactory transmission levels at 100 meters. Due to restrictive length limitations of Cat 5/5e and Cat 6 twisted pair cable, when the placement of Ethernet Equipment is such that the end to end distance between the termination points is greater than 100 meters (328ft), the use of Media Converters should be employed. Media Converters shall be deployed in pairs, one at the originating end and one at the terminating end, to convert an electrical Ethernet signal to an optical signal and back again.

7.2.11 When Optical signals associated with the EDF and Media Converters are being cabled between non-contiguous areas or floors, tie cable shall be required instead of fiber jumpers.

7.2.12 Optical signals associated with the EDF and Media Converters shall not be terminated on a Fiber Optic Distributing Frame (FDF).

7.3 Electrical EDF Components for the C.O.

- 7.3.1 The EDF shall consist of the following components: Patch Panels, Upper and Lower Troughs and Glide cable management system. If required, additional components may include Media Converter(s), Fuse Panel and Fiber Optic Management Tray.
- 7.3.2 For detailed information on EDF components refer to Common systems drawing ATT-C-20010-E and AT&T Equipment drawing ATT-E-01885 for appropriate panel selection.

7.4 Cable Requirements

- 7.4.1 The standard twisted pair arrangements used within the Telco environment shall not be used for any Ethernet Signals. All Ethernet Cabling products must adhere to the standards set forth in AT&T equipment drawings ATT-E-00053-E and ATT-E-01885.
- 7.4.2 If embedded cabling is used, the existing Cat 5/5e standards need to be used. New service provisioning from the telco to the Demarcation Point will meet or exceed Cat 5t standards.
- 7.4.3 The minimum length of patch cable will not be less than one meter (3.28 feet) and will not exceed nine meters (29.52 feet).

7.5 REFERENCES

- ATT-TP-76412, Ethernet Standards for the AT&T LOCAL EXCHANGE carriers
- ATT-002-316-076, Ethernet Architecture Standards
- ATT-E-01885-E, Ethernet Distributing Frame – Equipment Drawings
- ATT-E-01885-W, Ethernet Distributing Frame – Wiring Drawings
- ATT-E-01886-E, Ethernet Media Converter – Equipment Drawings
- ATT-E-01886-W, Ethernet Media Converter – Wiring Drawings
- ATT-C-20010-E, Ethernet Distributing Frame – Equipment Drawing (Common Systems)

TABLE 9-1 – SUMMARY OF CHANGES IN SECTION 9

Change	Item in 11/1/05 Issue	Item in This Issue
Revised	6.1.12	6.1.12
Deleted		
Added		

[END OF SECTION]

SECTION 10--ALARMS

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1. GENERAL

1.1. Introduction

- 1.1.1 This section provides alarm requirements for equipment deployed within the AT&T LEC network of central offices.
- 1.1.2 Changes in this issue of Section 10 are summarized in Table 10-1.
- 1.1.3 ATT 801-601-900 (Alarm Standards Practice) is the official repository of standard alarm information for all network elements, except switch equipment, deployed within the AT&T LEC network and is available to all authorized AT&T LEC employees and approved vendors. All unauthorized employees and vendors should refer to ATT-TP-76450 for alarm detail requirements. ATT 801-601-900 includes but is not limited to transport equipment, digital loop carrier, power equipment, and building or environmental standard alarms, as well as alarm systems and equipment. This document shall be the primary reference for engineering network element alarms.
- 1.1.4 Office alarms (audible and visual), as well as, remote surveillance alarm and controls shall be engineered for the equipment being added or as exempted by ATT 801-601-900 or ATT-TP-76450. Additional details, regarding the provisioning of telemetry alarms and local office alarms, may be found in ATT 801-601-900 or ATT-TP-76450.
- 1.1.5 The DESP (building) shall engineer standard building/environmental alarms in accordance with the specification provided by the AT&T LEC Real Estate Project Manager. The DESP (building) shall ensure that building/environmental alarms are connected to the office alarm system, as well as to the remote alarm telemetry device. Specific environmental alarm requirements may be found in ATT 801-601-900 or ATT-TP-76450.
- 1.1.6 Alarm testing requirements for all newly provisioned telemetry alarms are specified in ATT-TP-76900, ATT-TP-76450 and ATT 801-601-900.
- 1.1.7 When the added network element provides only audible and/or visual local office alarms, the office alarm visual leads (typically, CRV, MJV, and MNV) shall be used to initiate both telemetry alarm indications and office alarm indications. An approved splitter circuit shall be used to create telemetry alarms from local office alarms and vice versa. Additional details on splitter circuits may be found in ATT 801-601-900 or ATT-TP-76450.

1.2. Central Office Switches

- 1.2.1 Remote telemetry capability shall be provided for the surveillance of voice switches. This remote alarm telemetry device shall be unique and separate from alarm collection devices associated with other network elements.
- 1.2.2 Switch scan points shall be used only for voice switch alarm surveillance, except as noted in ATT 801-601-900, for "Battery On Discharge" and "Fire" alarms.

TABLE 10-1 – SUMMARY OF CHANGES IN SECTION 10

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

[END OF SECTION]

SECTION 11--SYNCHRONIZATION

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1. GENERAL

1.1. Introduction

- 1.1.1 This section has been prepared to provide general guidelines necessary to assure compliance with the AT&T LEC synchronization rules and policies.
- 1.1.2 Changes in this issue of Section 11 are summarized in Table 11-1.
- 1.1.3 Building Integrated Timing Supply (BITS) concept is the AT&T LEC's method of providing and sustaining interoffice synchronization. The BITS plan calls for each office to have one master clock set of signals (TSG = Timing Signal Generator) source called the BITS. Under the BITS concept, every timing capable digital Network Element (NE) in the office shall derive its timing signals from that single source within that office. A timing capable Network Element is defined as any digital equipment piece that can conform to the BITS concept by accepting timing signals from an external source. A Network Element is still timing capable although it may not be currently configured or equipped to accept external timing, but the option(s) exists to allow it to be so equipped.

2. SYNCHRONIZATION REQUIREMENTS

2.1. General

- 2.1.1 The minimum acceptable stratum level for any/all office master BITS clock is stratum 3E (ST3E). A master TSG shelf is that one shelf in each central office that houses the redundant ST3E/ST2E master oscillators, is redundantly DS-One signals fed, has PRS-traceability and has TL1 interoperability.
- 2.1.2 Each central office meeting any of the following conditions or qualifying under any of the categories must be modified to comply with BITS:

- a) An office with a digital switch (host or stand alone) or a digital switch remote that is external timing capable;
- b) An office with a SONET network element;
- c) An office with at least three independent timing capable digital network pieces of equipment.

2.1.3 For non-central office locations (i.e., repeater huts, CEVs, etc.) there may be the need for a BITS clock to provide timing signals to: interconnecting rings; locations with three independent pieces of timing capable digital equipment; and locations with multiple synchronous elements. Contact the AT&T LEC Equipment Engineer when these conditions occur.

2.1.4 All timing capable network elements within a building shall derive timing input signals directly from a BITS/Timing Signal Generator.

2.1.5 Any Network Primary Reference Supply (PRS) shelf must be in the same bay or an adjunct/adjoining bay to the master shelf. When a PRS is installed, the master shelf must be converted to the shelf that meets the master clock definition and NOW be equipped with Stratum 2E oscillators.

2.2. Diversity

2.2.1 Multiple cable routes to/from the BITS shall be provided when/where possible such that redundant timing leads can be routed via two separate cable paths. This is generally accomplished by engineering lineups and/or cross-aisle cable racks on both sides of the BITS frame. The AT&T LEC Equipment Engineer shall be consulted regarding the addition of new cable racks in existing equipment areas.

2.2.2 Redundant BITS input/output timing signals leads may be routed on a common cable rack when multiple cable rack paths are not possible as follows:

- a) Redundant leads shall be placed on opposite sides of the rack to the point separate cable paths can be taken.
- b) One pair/set of redundant leads associated with CCS7 equipment and Composite Clock/DS-Zero feeders between the master BITS and remote master BITS shelves shall be placed in innerduct for the distance the leads are run parallel on the same rack (top of bay to top of bay), and
- c) Innerduct shall be of the solid (un-slit, unless slit is specified) corrugated design having a maximum 1.25-inch diameter and shall be riser rated (minimum). Innerduct application is for critical leads protection rather than identification; as all sync input/output signals leads are 1175A cable runs.

2.2.3 When redundant leads must pass through a common cable hole, their cable routes shall be diverse up to the cable rack entering the hole and as soon as possible after exiting the hole on the other side.

2.2.4 Engineered cable routes shall NOT require redundant leads to cross at any point along their respective routes.

2.3. Engineering Requirements For BITS

- 2.3.1 Operationally, the BITS equipment shall be located in a low traffic area near the majority of Network Elements that it serves.
- 2.3.2 A dedicated bay shall be provided for the BITS equipment.
- 2.3.3 All timing signal leads from a BITS clock OUTPUT ports to network elements shall be run using approved 1175A,, red jacketed, single pair, 22 AWG, foil shielded BITS timing cable. The shield/drain wire shall be DC/hard grounded at the clock end only. The shield/drain wire shall NOT be DC/hard grounded at the Network Element. Connection of the shield/drain wire at the Network Element shall be Manufacturers' equipment specific; optionally left insulated and unterminated or properly AC/capacitive-coupled grounded. When the network element manufactured timing signal cables do not meet this criteria, conforming cables shall be ordered to meet this condition (GR-1244, R3-9).
- 2.3.4 Timing signal leads from the BITS clock OUTPUT ports to network element inputs shall NOT be run through DSX jacks. The only exception being instances when the network element timing input connection must be accessed via a DSX jack. In such cases, the BITS OUTPUT signals must be run to a DSX jack and cross-connected to the network element DSX jack. The network element jack should be as close as possible to the modified sync jack; as overall source-to-termination linear cable distance limitations now make DS-One signals equalization a necessary consideration. The DS-One output of the BITS should be connected on the OUT jack, hardwired side of the DSX jack. Transmit and receive signals equalization require the (IN) jack should be terminated with a 100 ohm resistor. (See Figure 11-5).
- 2.3.5 The sleeve/drain ground wire of the 1175A cable shall be insulated with spaghetti sleeving.
- 2.3.6 All critical network element timing leads shall terminate only on the office master BITS shelf or one of its expansion shelves or a Remote Master Shelf equipped with Remote Track and Hold Cards (RTHC). The AT&T LEC Equipment Engineer shall be notified when this is not possible. This applies to existing installations as well as new ones. Critical network elements are:
- a) All CCS7 related equipment (STPs, LPPs, LIMs, FLIS, IDST, SECURE7, ACCESS7 and D4 bays serving SS7 Links).
 - b) All Remote Master Clock (Slave) Shelves
 - c) Any other equipment specified by the AT&T LEC Equipment Engineer.
- 2.3.7 All timing signal output cards shall be deployed in adjacent mated pairs, odd & even assignments within a DCD shelf, all other TSGs shall use separate card assignments. Outputs shall be equally assigned in matched set of cards such that both cardsets will exhaust at the same time period. Output timing signals feeds shall be routed from alternate sides of the BITS shelf. Since all timing cards are mated pairs, odd numbered DS-Zero and DS-One outputs shall be run from the right side of the BITS shelf and even numbered DS-Zero and DS-One outputs shall be run from the left side, as viewed from the rear or wire-wrap output field of the BITS shelf. The DESP shall not change existing wiring arrangements of the BITS shelf without approval of the AT&T LEC Equipment Engineer.

- 2.3.8 The DESP shall provide the sync assignment record book, record book holder and assure all assignments accurately match in TAB/dB with initially provided BITS Master shelf.
- 2.3.9 The DESP shall specify that the alarm and alarm return leads be run as a pair and terminated per ATT 801-601-900 and ATT-TP-76450.

2.4. Timing Reference Inputs

- 2.4.1 The AT&T LEC Equipment Engineer will provide for timing reference input signals. Appropriate schematic figures for these references are shown in Figures 11-2 through 11-4.
- 2.4.2 Timing reference signals to the BITS shall be diversely routed from points of origin to the BITS shelf inputs points of termination.
- 2.4.3 All sync jacks, if used, shall be equipped with appropriate markers indicating SYNC. These markers should include the modified DSX jack, the originating facility jack and terminating network element jack.
- 2.4.4 The DESP shall provide the appropriate sync DSX jack schematic (see figures). The schematic within the manufacturer's BITS clock documentation should be replaced with the actual schematic utilized.

2.5. Power Requirements

- 2.5.1 A dedicated fuse panel shall be a part of each initial BITS installation. If no existing dedicated panel is available, a new dedicated fuse panel shall be provided. This fuse panel may serve BITS equipment in adjoining/adjunct bay(s) only.
- 2.5.2 Only BITS or associated BITS equipment located in BITS bays shall be fused by the dedicated fuse panel.
- 2.5.3 Battery feeders to the BITS fuse panel shall originate from separate BDFBs when multiple BDFBs are currently provided on the same floor within the office and spare capacity exists.
- 2.5.4 Battery feeders to the BITS fuse panel that originate directly at the Power Plant shall be fused on different rows.
- 2.5.5 Both "A" and "B" battery load and battery return leads from the BDFB to the BITS fuse panel shall have diverse routing in the following order of preference:
 - a) Provide two separate and distinct cable routes from the BDFB to the BITS fuse panel, via existing cable racks;
 - b) Provide one cable route from the BDFB to the BITS fuse panel. The power cables shall be routed on opposite sides of the same cable rack.
- 2.5.6 Battery load and battery return leads from the fuse panel to the BITS equipment shall be routed down opposite sides of the equipment bay.
- 2.5.7 "A" and "B" battery outputs of the fuse panel shall correspond to the "A" and "B" battery inputs of the BITS equipment.

2.5.8 Battery load and battery return connections from the fuse panel to the BITS equipment shall be made with ring terminals at both ends unless the existing fuse panel is designed with mechanical (screw) terminations.

2.6. Grounding Requirements

2.6.1 Clock shelf chassis (frame) ground and logic/signal ground leads shall be individually run and properly terminated.

2.6.2 Timing source signals input leads to a BITS clock from a network element must be shielded and AT&T specification cable. If the lead has a DSX appearance, the shield/drain shall be grounded at the network element and the clock, but left unterminated at the DSX. If the lead does not have a DSX appearance, the shield/drain shall be grounded only at the timing source signal origin.

2.6.3 Where a shield/drain ground connection is required, verify that the ground termination pin is a DC-ground and not grounded through an AC-coupled capacitor at the timing source.

2.7. SONET Network Elements

2.7.1 SONET terminal/ADM equipment configurations requiring BITS timing shall be individually timed from the office BITS. Primary and secondary DS1 reference signals shall be from adjacent DCD DS1 output cards, with odd-even slot assignments per AT&T interconnect drawings; all other TSGs shall be from separate reference cards.

2.7.2 In the event of DS-One output card exhaustion, daisy-chaining to enable cascading of synchronization to all terminals within a bay framework is NOT an AT&T LEC option and shall not be permitted. Arrangements must be made to provide additional BITS outputs.

2.7.3 Each SONET terminal/ADM shall have the "CLOCK IN" connections (PRIMARY and SECONDARY) cabled via 1175A red jacketed, single pair, 22 AWG, foil shielded BITS timing cable to the BITS. Shield lead conductors of all SONET sync signals input cables shall be DC-grounded at the BITS shelf only and left insulated and unterminated at the SONET terminal/ADM connector/terminal strip.

2.7.4 Except when required for office BITS reference, the "CLOCK OUT" from the network element shall not be cabled. Without exception, a wire-wrap adapter or equivalent shall be provided at the network element, if the primary and secondary "CLOCK OUT" leads are contained in the same connector/terminal strip (GR-1244, R3-10).

2.7.5 In limited/controlled applications, if DB9 connectors are required, all 22 AWG "CLOCK IN" shielded cables, terminating on DB9 connectors, shall use right angle connectors. The cable conductors shall be properly crimped or soldered to their associated pins. Wire wrap shall be used to terminate timing leads to a DB9 connector

2.8. Removals

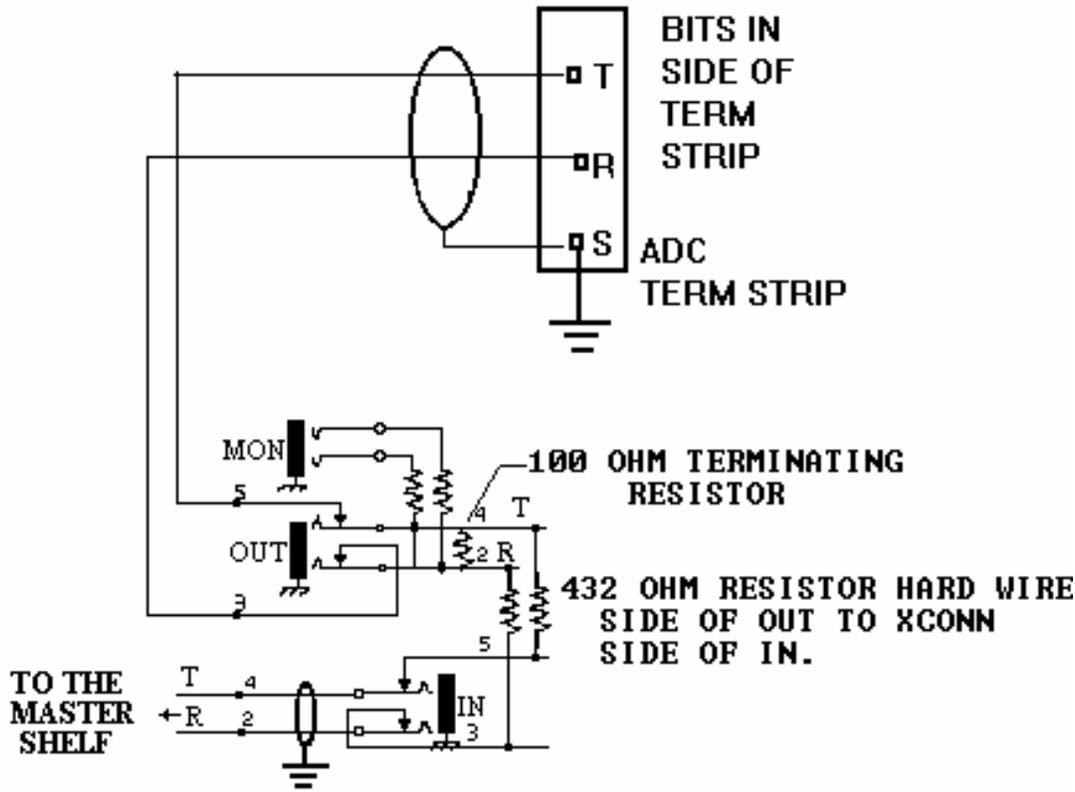
2.8.1 All Network Elements that are removed and have timing leads shall have the timing leads disconnected at the BITS.

2.8.2 Complete all cable removal operations, update sync record assignment book and assure all updates match and are reflected in TAB/db.

TABLE 11-1 – SUMMARY OF CHANGES IN SECTION 11

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

FIGURE 11-2--SCHEMATIC OF SYNCHRONIZATION JACKS USING SONET REFERENCED SIGNAL

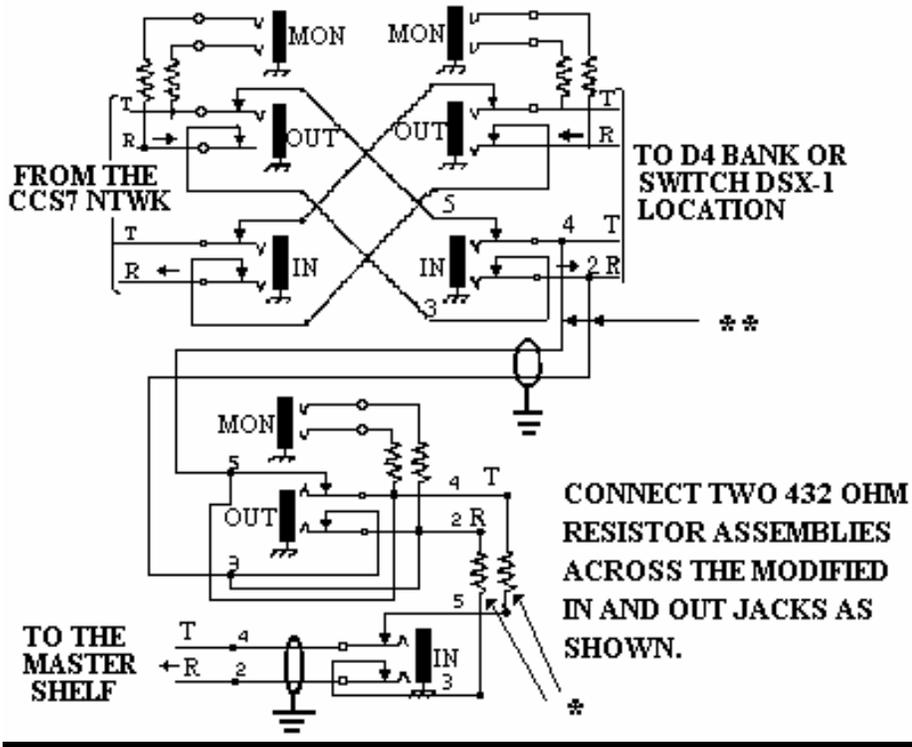


INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

FIGURE 11-3--SCHEMATIC OF SYNCHRONIZATION JACKS USING
 CCS7 REFERENCED SIGNAL OR TRAFFIC BEARING T1 SPAN



* For locations where the DSX line-up is less than 5 bays and the Sync Jack is located in the middle bay. If this condition is not met, these resistors should be replaced with a strap.

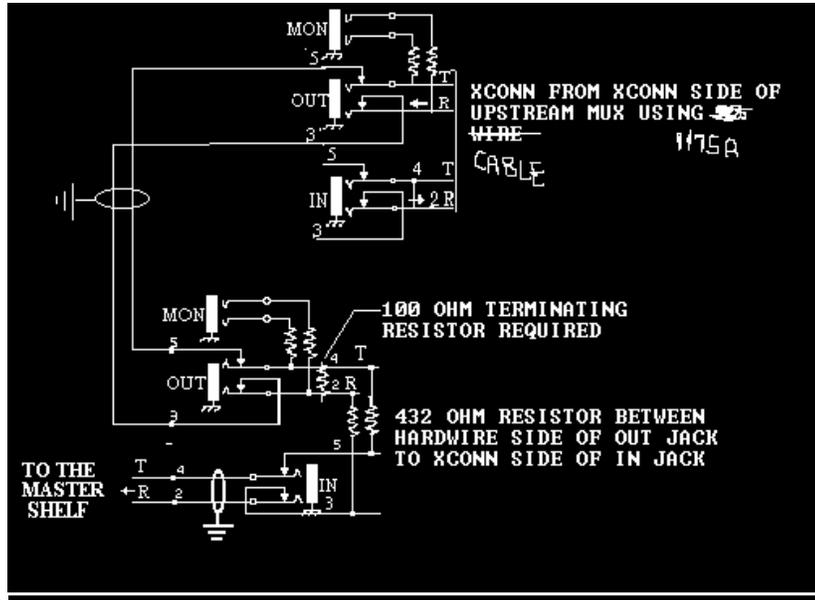
** When the DSX line-up is more than 6 bays or the length of these leads exceed 15 feet, the resistors should be connected between the hardwired side IN jack of the D4 bank jack and the OUT jack of the modified Sync. jack.

INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

FIGURE 11-4--SCHEMATIC OF SYNCHRONIZATION JACKS USING DEDICATED T1 SIGNAL FROM UPSTREAM OFFICE



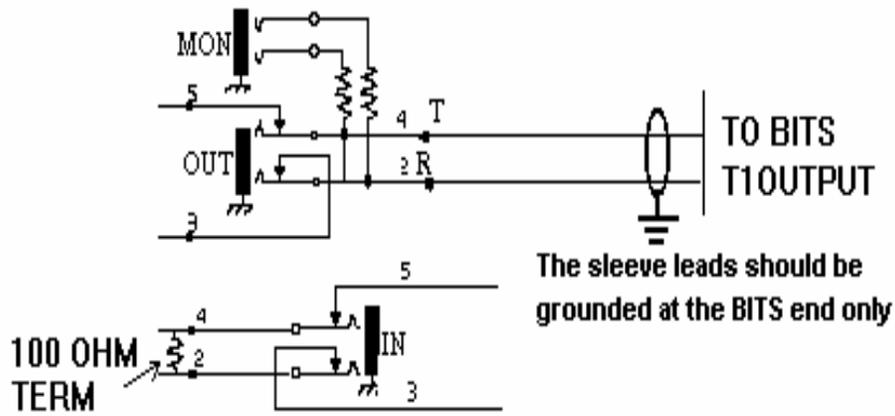
INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

INSTALLER MUST CABLE ORIGINATING OFFICE TIMING LEAD FROM THE BITS CLOCK TO THE FACILITY MUX. LOCAL TECHNICIANS WILL TERMINATE ON THE MUX AND TURN UP THE SPAN.

FIGURE 11-5--SCHEMATIC OF SYNCHRONIZATION JACK
(INPUT TO NETWORK ELEMENT)



[END OF SECTION]

SECTION 12--POWER SYSTEMS

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1. GENERAL

1.1. Introduction

- 1.1.1 This section covers the general requirements for engineering of battery/rectifiers (AC/DC), converters (DC/DC), inverters (DC/AC), Uninterruptible Power Systems (UPS), power systems monitor/controllers, AC/DC power distribution, ring, tone and cadence plants.
- 1.1.2 Changes in this issue of Section 12 are summarized in Table 12-1.
- 1.1.3 The Detail Engineering Service Provider (DESP) shall ensure that the manufacturer's specifications and documentation (i.e., electrical, mechanical, and maintenance documents, drawings, etc.) are provided with power equipment for turnover to local maintenance forces.
- 1.1.4 The DESP shall coordinate with the AT&T LEC Equipment Engineer for the provisioning of the manufacturer's recommended spare parts for each type of power equipment. The AT&T

LEC Engineer will work closely with the LFO in provisioning adequate spare parts based on the geographic response area.

- 1.1.5 The DESP shall provision alarms for all new power equipment in accordance with ATT-TP-76450 or ATT 801-601-900 AT&T Alarm Standards Practice.
- 1.1.6 The DESP shall ensure all floor drains in engine or power rooms are permanently sealed prior to installation of equipment, via a specific installer note in the detail specification.
- 1.1.7 When adding equipment on waterproof floors the DESP shall determine the method of securing equipment frames to the floor in accordance with BSP 800-000-101MP

1.2. Compression Connections for DC Power

- 1.2.1 All connectors, including all approved transitional devices, shall be constructed of tin plated copper. Connectors with inspection holes shall be used in all applications except battery posts and connector plates.
- 1.2.2 Transitional Devices require a UL listed cover and must meet the fire resistance requirements of ATT-TP-76200. Covers shall have an oxygen index of 28% or greater and meet UL 94-V1 or better rating. AQUA-SEAL pads are not approved for use in AT&T LEC.
- 1.2.3 In-line reduction (barrel) taps shall be used in preference to H-taps where possible to reduce cable build-up on the cable racks. The manufacturer provided clear heat shrink shall be installed per the manufacturer's instructions to cover the in-line reduction tap.
- 1.2.4 Lead coated connectors shall be used when connecting directly to posts or battery post termination plates of flooded type lead acid batteries. Lead coated connectors shall not be used for any other applications.
- 1.2.5 Manufacturer inspected and sealed battery connection kits (for non-flooded cells) with heat shrink tubing may be provided. These kits may have inspection holes as long as they are covered with heat shrink tubing.
- 1.2.6 For flooded lead acid batteries, cell post hardware shall be stainless steel, grade 316 and marked 316 accordingly. Washer thickness shall be 1/8 inch and the washer must rest completely on the tongue face of the post/terminal plate connector. Use the battery manufacturer's recommended bolt size for post connections.
- 1.2.7 Valve Regulated Lead Acid batteries shall use connectors other than lead coated.
- 1.2.8 On a going forward basis, NiCad battery connections shall be tin plated copper lugs without inspection holes and nickel plated steel hardware. If inspection holes were previously used, the hole shall be filled with Nox-Rust X-110.
- 1.2.9 The NiCad battery hardware supplied by Saft® shall be used, as standard metric threads are not compatible with the Saft® NiCad battery connections.
- 1.2.10 All connectors shall be the two (2) hole crimp type lugs (#8 stranded and larger) except when connecting to a stud in a power bay or when the equipment specification drawing requires a single hole lug. Single hole lugs require lock washers, except when connected to a fuse stud, in which case two (2) flat washers are required. These washers shall be provided as

specified by the equipment manufacturer. (See AT&T Standard Drawing ATT-P-05100-E on the WoodDuck Web Site, <http://woodduck/> under Standard Drawings – AT&T CO for assembly details.)

- 1.2.11 Connections made to screw type terminal blocks with #10 to #26 wire gauge shall be made using the correct color coded insulated ring-type connector, such as the T&B STA-KON or Burndy VINYLUG. The proper size connector shall be used for the wire size being terminated as detailed in the manufacturer's specifications.
- 1.2.12 New power plant installations with ultimate capacity of 4000 amps and above shall use copper bus bars. Existing plated or unplated aluminum bus bars may be connected to copper bus bars. No new aluminum bars shall be used.
- 1.2.13 Aluminum bus bars and non-hardened copper bus bars shall not be tapped for fastening terminal lugs; through bolts shall be used.
- 1.2.14 For all electrical connections, except for battery post connecting hardware, the DESP shall provide zinc plated SAE J429 Grade 5 or ASTM B99 silicon bronze finished bus bar joint, fastening and support bolts, nuts, washers, etc.. The hardware shall be American National Course with a Class #2 Fit.
- 1.2.15 When fastening bar to bar, bus bar clamps shall be used. A palnut or locknut shall be provided on each bus bar clamp bolt.
- 1.2.16 Ferrous bolts, screws, nuts, washers, bus bar supports and clips shall be zinc or cadmium plated for non-electrical connections.
- 1.2.17 Only American Standard Unified National Course (UNC) threads and hardware shall be used on all external power plant and bus bar connections (internal manufacturer power plant connections may be metric as long as there are no requirements for field installation interaction).
- 1.2.18 Exposed energized bus bar arrangements located outside of the power equipment areas, shall be protected with insulating (e.g., Lexan) covers meeting the oxygen index of 28% or greater. In power rooms or in power board lineups containing power exclusively, insulated covers are not required.

2. BATTERY/RECTIFIER (AC/DC)

2.1. General

- 2.1.1 This unit covers requirements for battery/rectifier systems utilized within regulated telecommunications facilities.

2.2. Rectifier Plants

- 2.2.1 The major components of the power distribution plant and rectifier plant (see Figures 12-1 and 12-2) are:

- a) LOCAL AC POWER DISTRIBUTION - Includes a dedicated Power Distribution Service Cabinet (PDSC) connected to the essential bus, conduit, cabling, fasteners, and protective equipment.
- b) CHARGING EQUIPMENT - Consists of rectifiers and associated equipment to convert AC power to DC power at voltages suitable for AT&T LEC applications.
- c) STORAGE BATTERIES - Provides a source of DC power to the equipment when AC is not available, or until the AC can be restored. They also provide filtering of the rectifier output.
- d) DISTRIBUTION CIRCUITS (Primary, Secondary)
 - 1. Primary Distribution circuits originate at the power plant and terminate at a secondary distribution point or at specific equipment locations (Protected Circuit). It contains a power board that houses the first overcurrent protection devices and the downstream power distribution network that feeds the secondary distribution.
 - 2. Secondary Distribution is an intermediate protection network between the primary and the load equipment. It originates at a distribution point (i.e. BDFB, SPDU, or other similar distribution points) and terminates at a specific equipment location (Protected Circuit).
 - 3. All new Transport and Switching installations require Secondary Distribution and shall include an exclusive fused distribution source (i.e. BDFB, mini BDFB, micro BDFB, or Intermediate PDU) for secondary loads (network elements) if one does not exist.
 - 4. New/updated power plant installations shall include an exclusive fused distribution source (i.e. BDFB, mini BDFB, micro BDFB, or Intermediate PDU) for secondary loads (network elements) if a Secondary Source does not exist.
 - 5. This new Secondary Distribution source shall not be located in the traditional power plant footprint. The secondary distribution network contains a bay or panel that houses the overcurrent protection devices, and the downstream power conductors to the load equipment. Further more, Secondary distribution (i.e. BDFBs, SPDU's) may also feed smaller downstream distribution panels following a branch feed style of architecture (i.e. Fuse panels).

Primary and secondary circuit protection devices shall be coordinated to prevent premature operation of primary fuses caused by faults on secondary circuits. This coordination allows for circuit protection closest to the network element to activate first, in the event of a failure. When calculating individual circuit design, there should be approximately 20% difference in size between one point of circuit protection to the next.

- e) DISTRIBUTION CIRCUIT COMPONENTS

DC distribution systems consist of three basic components:

1. Circuit protection device
 2. Battery and battery return conductors
 3. Terminating hardware at the circuit's origin and equipment end.
- f) CONTROL VOLTAGE - Is the voltage used to operate alarm relays and control circuits in the power plant. The voltage of the primary plant (48 volts, if available) will be the control voltage.
- g) FLOAT VOLTAGE/PLANT VOLTAGE – the plant voltage shall be read at battery string "A" This is the source of the AT&T plant voltage as read at the controller.
- 2.2.2 Rectifier DC power connections from both supply and return shall utilize crimp type copper connections. Aluminum connectors are not acceptable. Power connectors shall be configured as follows:
- a) Within the supplier's equipment, power connections shall be configured to meet the manufacturer's requirements.
 - b) Between the supplier's equipment in the bay and the top of the bay, connections shall be two-hole crimp with the inspection window to verify the connection is fully engaged. Approved connectors can be found on the AT&T Minor Materials list
- 2.2.3 AC feeders to rectifiers shall be enclosed in metallic conduit, raceway or bus duct. Vertical runs of Jacketed Metal Clad (JMC) cable or Liquidtight conduit shall only be used on the last three feet of the connection to the rectifier.
- 2.2.4 Metallic conduit (rigid, intermediate metallic conduit (IMC) and electrical metallic tubing (EMT)) is acceptable if it is not installed on cable racks. If EMT is used, compression couplings and junction boxes shall be used; set screw type couplings are not acceptable.
- 2.2.5 Rectifiers shall be designated G1, G2, G3, G4 ...Gn.

2.3. Batteries

- 2.3.1 Flooded lead acid or Nickel-Cadmium (NiCad) batteries are the AT&T standard for traditional network CO installations. Alternative battery technologies shall require a one-time approval (OTA).
- 2.3.2 The DESP shall provide the intercell connectors and associated hardware recommended by the battery manufacturer.
- 2.3.3 At the direction of the AT&T LEC Power Engineer, the float voltage of the DC plant may be raised from 52.08 V to 52.80 V with the addition or replacement of flooded lead acid battery strings.
- 2.3.4 The NiCad battery strings for Central Office applications contain 38 (1.43V) cells that shall have a string float voltage measured at 54.4V for optimum performance. The float voltage can be reduced to 1.42 volts per cell (54.0 string float) if there is an adjustment issue with high voltage alarms.

- 2.3.5 The higher than normal NiCad 54.4V float voltage requires that a power plant be entirely supported by NiCad batteries. Strings of other battery types and float requirements such as flooded lead acid batteries shall not be mixed with NiCad battery strings in the same power plant.
- 2.3.6 Recommended alarm points for the 54.4 float are: Very High Voltage – 56.0V; High Voltage – 55.5V; Low Voltage – 52.0V; Very Low Voltage – 48.0V.
- 2.3.7 NiCad battery racks shall have sliding shelves, and shall meet the seismic rating for the geographical area.
- 2.3.8 NiCad batteries can release hydrogen gas, and the same safety precautions regarding gassing and explosion hazard apply to NiCad as flooded lead acid battery installations.
- 2.3.9 NiCad batteries contain a corrosive alkaline electrolyte solution that shall be neutralized with a special NiCad spill kit (which is labeled in bright orange). A NiCad spill kit shall be ordered for the first installation of NiCad batteries in an office area. The installation vendor is responsible to provide a NiCad spill kit during their battery installation activity. (Spill kits for flooded lead acid batteries do not contain the correct neutralizing absorbent for NiCad batteries, and the lead acid battery safety equipment shall not be used when cleaning up a NiCad electrolyte spill due to the potential of a dangerous chemical reaction.)
 - a) DESP shall include a Specific Installation Supplier Note to insure spill kits shall be left on-site.
- 2.3.10 NiCad batteries shall use constant voltage charging to maintain float voltage. Temperature compensated voltage control for VRLA application is not recommended.
- 2.3.11 Additional details regarding NiCad batteries can be found in AT&T Standard Power Drawing – ATT-P-05330-E..
- 2.3.12 Plastic battery stands used for round type lead acid cells shall be provided with earthquake rated floor mounted corner details in zone 3 and above.
- 2.3.13 When engineering new battery plants the DESP shall provide approved spill kits.
 - a) DESP shall include a Specific Installation Supplier Note to insure spill kits shall be left on-site.
- 2.3.14 Battery spill containment shall be provided on a site by site basis according to local code mandates and/or direction of the Fire Marshall.
- 2.3.15 When engineering flooded lead acid battery installations, cells of different manufacturers shall not be placed in the same string.
- 2.3.16 Battery strings of the same float voltage (including alternative technologies, e.g. flooded lead acid and lithium) may be placed in parallel.
- 2.3.17 Cells of different battery technologies shall not be placed in the same string.
- 2.3.18 When engineering the replacement of individual cells in a string, the cells provided will have the same ampere-hour capacity, the same number of plates and will be of the same manufacturer.

- 2.3.19 Measured at floor level, a minimum distance of 36 inches shall be maintained between a battery rack, equipment, rigid spill containment, and non-movable obstructions.
- 2.3.20 A single row rack parallel to a wall shall be a minimum of 8 inches from the wall. One end of the battery stands can be placed perpendicular to the wall within 8 inches.
- 2.3.21 The DESP shall provide a thermometer for each battery string installed which may be included in a battery accessory kit.

2.4. Cable And Bus Bars

- 2.4.1 Whether cables or bus bars are used, each type of conductor shall be sized per Table 12-1 taken from ATT 790-100-656, "DC Power Distribution", to prevent heating or exceeding the voltage drop requirement.
- 2.4.2 4/0 flexible type power cable shall be the standard size and type to be used on all flooded lead acid cells through 1800AH on battery tier-to-tier or tier-to-termination bar applications. Size 350kcmil, flexible type power cable, shall be used on 1801AH to 4000AH cells.
- 2.4.3 Size 2AWG flex power cable shall be used to connect 125AH NiCad battery strings shelves to the rack battery and return bus bars (collection bars). The use of the 2AWG flex power cable allows easy movement of the shelves for battery servicing.
- 2.4.4 All bus bars shall be 95% hard drawn copper, bare or tinned.
- 2.4.5 All connections to a bus bar shall be made with a two-hole crimp type connector only. See Drawing ATT-P-05100-E.
- 2.4.6 Cables from the rectifiers to the batteries and from the batteries to the discharge panel shall be on dedicated, non-fused cable racks, that are designated accordingly.
- 2.4.7 AC branch circuits shall be enclosed in non-flexible metallic conduit or raceway. Metallic Armored Clad (MAC) cable may be used only when factory installed within bay end guards, and AC outlet extensions between bays, within the base of the bay.
- 2.4.8 For network equipment applications where rigid conduit connections are not practical, Jacketed Metallic Clad (JMC) conduit enclosed cable may be used as follows:
 - a) All final AC equipment connections, or conduit transitions from walls or columns in Seismic Zones 3 & 4, with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed three feet (including 6" of slack).
 - b) All final AC lighting fixture connections with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed six feet.
 - c) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet only within bay end guards and bases to connect light switches and bay test receptacles. The JMC shall not have excessive slack or be coiled within the bay end guard or base.
- 2.4.9 In remote terminals or remote switching locations where multiple cable racks are not generally available, the following guidelines will be used:

- a) Cable rack "power cable brackets" mounted to the cable rack at nine inch intervals may be used for all fused power cables.
- b) As an alternative, cables can be run on the same cable racks as switchboard cables, if segregated.

3. CONVERTERS (DC/DC)

3.1. Introduction

- 3.1.1 This unit covers DC/DC converters, which transform the DC output of a battery plant to other DC voltages. The converter output voltage may be higher, lower, or at a different polarity than the input voltage. In some special cases, where ground or transient isolation is required, the output voltage may be the same as the input.
- 3.1.2 DC/DC converters that are placed for equipment isolation should be physically located in close proximity to the served equipment.

3.2. Requirements

- 3.2.1 Individual and total fusing capacity shall be limited so the converter plant will be capable of operating any discharge fuse when required. This requirement shall be met without the redundant or working spare converter in service. It is also acceptable to use a capacitor bank, which is designed to provide additional short-term capacity to operate discharge fuses.
- 3.2.2 Individual battery returns shall be run for battery discharge circuits.

4. INVERTERS (DC/AC) AND UNINTERRUPTABLE POWER SYSTEMS

4.1. General

- 4.1.1 If the AC load is identified as "protected", it shall be fed from an inverter plant or Uninterruptible Power System (UPS), as determined by the AT&T Equipment Engineer. The use of inverters should be considered as first choice.
- 4.1.2 An AC maintenance bypass switch from a separate commercial AC power source to the inverter/UPS output PDSC shall be provided to allow maintenance or removal of the protected AC element on UPS and inverter systems larger than 10KVA

4.2. UPS Apparatus Considerations

- 4.2.1 AC wiring shall be sized to meet manufacturer's specifications or NEC specifications, whichever is more stringent.
- 4.2.2 Rigid metallic conduit shall be used in areas where activity could jeopardize the integrity of the system.
- 4.2.3 Circuit breakers shall be sized and coordinated with system components to ensure proper isolation of feeders due to faults or overloads. Breakers shall be sized to allow all charge units to operate at full output during battery recharge.

- 4.2.4 DC wiring shall be sized to meet manufacturers' specifications for ampacity and loop loss between the battery and the charger or inverter.
- a) These leads shall be run on open cable racks or trays. Conduit may be used if both the positive and negative leads are run in the same conduit. Conduit should be used only if other means are not available due to space requirements.
- 4.2.5 Computer systems shall have electrically operated remote disconnection devices as detailed in Section 14 of ATT-TP76400. They shall be located in the computer room and not in the UPS area.
- 4.2.6 Grounding of the UPS shall be in accordance with the manufacturer's specifications and Section 13 of ATT-TP-76400.

5. RING, TONE AND CADENCE PLANTS

5.1. General

- 5.1.1 This section provides general information regarding:
- a) Ringing systems currently in use in switching and transmission systems;
- b) The various call progress tones furnished by ringing plants;
- c) General information on ring plant sizing.
- 5.1.2 Going forward, ring cadence and voltage of any type should be generated within the equipment
- 5.1.3 In Stored Program Control System (SPCS) offices, ringing, call progression tones, precision tones, Dual Tone Multi-Frequency (DTMF), dial tone, audible ringing tone, high tone and low tone, are provided by the switch. A separate ringing plant shall be provided for all non-switched services such as Foreign Exchange (FX), ring down, Interexchange Carrier (IC) special ringing requirement, metallic facility, etc.

5.2. Ringing Systems

- 5.2.1 Some non-switched circuits will require a ringing supply. Generally, non-switched circuits only require 20 Hz, AC/DC Superimposed ringing. Ringing supplies for non-switched circuit shall be separate from the ringing supply for the SPCS equipment.
- 5.2.2 The major ringing and tone components of the plant shall be provided with a redundant configuration.

5.3. Residual Ringing Plant - Ringing and Tone Distribution

- 5.3.1 The signals generated by a ringing plant are fed from fuses mounted on the main ringing power board. These main fuses in turn feed other distribution bays or equipment fuse panels. The downstream fuse shall in all cases be smaller than the upstream fuse. The DESP shall verify with the AT&T LEC Equipment Engineer that distribution fusing does not exceed the maximum output current of the ringing supplies.

- 5.3.2 The DESP shall verify with the AT&T LEC Equipment Engineer that adequate fusing is provided on each ringing supply path when adding new equipment fed by the ringing supply.
- 5.3.3 Ringing plant distribution fuses shall not be multiplied to more than one fuse bay.

6. DC POWER DISTRIBUTION

6.1. Power Distribution Sources

- 6.1.1 Fuses are preferred for primary distribution equipment. Circuit breakers may be used for circuits with design requirements less than 226 amps. Fuses are required for circuits with design requirements of 226 amps or larger. Fuses are considered the preferred method of circuit protection.
- 6.1.2 Equipment being engineered with multiple loads (i.e. "A", "B", "C", etc.):
 - a) shall be assigned to different load supplies on the BDFB.
 - b) shall maintain separate primary fuse integrity throughout the circuit
- 6.1.3 Primary battery and battery return leads shall be run on unpanned dedicated power cable rack. Secondary power leads shall be run on existing, dedicated secondary power cable racks, whenever possible. If dedicated cable rack is not available, secondary power leads shall be run on existing non-dedicated cable rack.
- 6.1.4 A separate battery return lead shall be paired with each distribution or source lead. A and B battery return leads may be connected to the same battery return bus bar position.
- 6.1.5 The DESP shall provide 145P (tag) or approved equivalent tags for both ends of every battery and battery return lead, except secondary power leads internal to a rack or voice switching system.
- 6.1.6 Preferred fuse panels for BDFBs are telecommunications power-style (e.g. TELPOWER®), which accommodate fuse sizes from 1 to 150 amps.
- 6.1.7 The maximum fusing for a supply to a single or multiple bay BDFB shall be sized to the bus distribution, not to exceed 800 amps per load, unless prohibited by the state commission.
- 6.1.8 On a going forward basis, the DESP shall provide a work item to designate the manufacturer's maximum BDFB shunt capacity on the front of the BDFB.
- 6.1.9 The largest fuse to be used in a BDFB shall be 150 amps.
- 6.1.10 In a BDFB, a single panel shall not have multiple feeds connected to it.
- 6.1.11 Only factory manufactured 45 or 90 degree lugs shall be used to minimize cable congestion within the BDFB.
- 6.1.12 Any secondary distribution equipment located on one floor shall not be used to supply equipment located on another floor, except in those cases where requirements state that equipment units must be supplied from the same secondary distribution equipment and the equipment units are located on different floors.

- 6.1.13 For new BDFBs configured with external battery return bus bars, the bars shall be mounted as close as possible to the BDFB without impeding the access to the BDFB or associated cable racks. The preferred placement for the external return bar is at the rear of the BDFB at the cable rack level or higher; however, it can also be placed to the side of the BDFB, at the cable rack level or higher, based on space availability. (see figure 12-3 in this section for BDFB external battery return bar placement, and Section 8 figures for common systems cabling and rack details.)
- 6.1.14 SPDUs (Secondary Power Distribution Units) are designed to provide a centralized location for other equipment to obtain power of small amperages. SPDUs are provided with power from a BDFB or Power Board.
- 6.1.15 The use of legacy miscellaneous fuse bays shall be discontinued as bay mounted fuse panels shall be the source of secondary distribution.
- 6.1.16 SPDUs shall be fused at their source (BDFB, Power Board) with a fuse size not to exceed the maximum rating of the fuse panel.
- 6.1.17 Every SPDU shall be fed individually from the power source (either from a BDFB, distribution panel or intermediate PDU) using a single fuse and set of power cables per load. Fuse panels shall not be "daisy chained" to the same source (sharing the same cable or fuse).
- 6.1.18 SPDUs may serve network elements outside the bay in which the fuse panel resides as long as it is within a close proximity of the fuse panel, and does not exceed the engineered limitation of the largest output cable the panel can accommodate. Exact distances will vary from panel to panel and overall shall not be outside of line-of-sight. Distances shall be calculated by determining the largest conductor physically attachable to the panel (tapping a larger cable to increase the distance is not acceptable), appropriate voltage drop, and List 2 DC amperage value to be used per fuse position.

6.2. Telecommunications Equipment Loads

- 6.2.1 The nominal voltage levels for standard telecommunications equipment are -48V. Although nominal voltages are standardized, the limits permitted on individual equipment assemblies are more variable. Voltage requirements are:
 - a) HIGH VOLTAGE LIMIT - Above this supply voltage, equipment damage may occur.
 - b) LOW VOLTAGE LIMIT - Below this supply voltage, equipment does not operate properly.
 - c) ELECTRONIC NOISE IMMUNITY - The power supply shall not exceed manufacturer's requirements and in no case exceed 35 dBmC.
- 6.2.2 The maximum allowable one way voltage drop from batteries to the served equipment via a BDFB/SPDU shall be 1.0 volt per reference drawing ATT-P-05410-E .
- 6.2.3 The DESP shall assure that the maximum allowable voltage drop from the battery to the served equipment is not exceeded. This voltage drop is an engineered value, based on the minimum volts per cell (MVPC) used in calculating battery requirements. Refer to the BDFB/SPDU CO records in TAB/db for the engineered voltage drop values of each

BDFB/SPDU that is determined by the following not to exceed .5V 1-Way from the power board to the BDFB:

- a) The primary cable length can either be the measured average length of the supply and return cables installed, or based on an average estimate from the top of the Power Board Distribution Bay to the top of the new BDFB/SPDU location taking into account any rack elevation transitions with up to a 10 ft. total allowance for cable drops on each cable. This length will correspond to the Cable Run List on the Job Specification.
- b) If the DESP Power Installer finds the actual (average) installed power cable length is not within 10% of the cable run list; they will be responsible to notify the DESP Engineer via a JIM to issue a Job Specification Addendum correction.

The following formula applies for the calculation of primary power cable voltage drop to the BDFB/SPDU:

$$V = (11.1 \times L \times \text{Feet}) / \text{CM}$$

Where:

V = Allowable voltage drop one way

L = 2/3 of Power Board Supply Fuse Size (largest fuse size to be installed for the BDFB/SPDU

as some local areas increase fuse size based on load increments)

Feet = One-way length of cable in feet

CM = Circular Mil area of the cable(s) supply or return 1-Way

See reference drawing ATT-P-05410-E.

6.3. Protector And Cable Sizing

6.3.1 Overcurrent protection (fuses or circuit breakers) and secondary distribution cables are sized using List 2 current drain. List 2 current drain represents the peak current for a circuit under worst-case operating conditions. Worst case could be a constant power load requiring maximum current at minimum operating voltage.

6.3.2 The DESP shall determine the cable path and length, and then size the cable for the load at the maximum allowable voltage drop. The following formula applies:

$$\text{CM} = (11.1 \times L \times \text{Feet}) / V$$

Where:

CM = Circular Mil area of the cable

L = List 2 Drain

Feet = One-way length of cable in feet

V = Allowable voltage drop one way

See reference drawing ATT-P-05410-E.

- 6.3.3 The preferred engineering method of power connection is to use a non-interrupted conductor with connecting lugs at each end. Transitional devices shall only be used when no other solutions (such as narrow tongue lugs) are applicable.
- 6.3.4 The DESP shall engineer wiring connections to BDFB fuse posts up to the maximum power cable size (based on circuit ampacity and voltage drop requirements) allowed by the Fuse Disconnect/BDFB Manufacturer.
- a) Power cabling to a 1/4-20 connection stud on a 15800 (TPS) or other type Fuse Disconnect shall be up to (\leq) #2AWG.
 - b) Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect shall be up to (\leq) 2/0AWG.
- 6.3.5 Secondary power distribution cables larger than 2/0AWG shall not be engineered into the interior of the BDFB or secondary power distribution frames.
- a) For external return bar BDFBs, the return lead shall be engineered to be terminated without a reduction.
 - b) Where cable congestion on legacy BDFBs with internal return bars is not an issue; the return lead shall also be engineered to be terminated without a reduction.
- 6.3.6 Fuse size shall be larger than the load on the cable. Multiply the List 2 load by 1.25 (125%) to determine the correct protector size. **Caution:** This does not apply to protectors at BDFB or Power Board which supply miscellaneous fuse panels as described previously under Power Distribution Sources. Once the protector is sized, assure the ampacity of the cable exceeds the rating of the protector. The cable size may be increased as necessary to meet the requirements for ampacity. The current capacity of the cable is usually only an issue with very short runs, since cables are sized first on voltage drop, then current capacity.
- 6.3.7 When adding circuit breakers to an existing PDU, the circuit breaker shall be, thermal-magnetic and 100% DC rated, UL listed, and the trip-free type. Contacts shall not be able to be held closed during an over-current condition, by holding the lever in the closed position.
- 6.3.8 A circuit breaker with a 100% rating can be loaded to the List 2 drain.
- 6.3.9 Circuit breakers not rated at 100% shall be larger than the load on the cable. Multiply the List 2 load by 1.25 (125%) to determine the minimum protector size.
- 6.3.10 Primary and secondary circuit protection devices shall be coordinated to prevent premature operation of primary fuses caused by faults on secondary circuits. The differential shall be approximately 20% per protection level.
- 6.3.11 Circuit breakers shall not be protected by fuses as circuit breakers typically have slower interrupt ratings. The exceptions are:
- a) If the network element rack comes pre-assembled;
 - b) Where the circuit breaker is used as an on/off switch at the equipment

- 6.3.12 If paralleling of conductors or reinforcement of existing, overloaded conductors is required, they shall be electrically joined at both ends to form a single conductor. Paralleled conductors shall meet the following:
- a) Be the same length;
 - b) Have the same conductor material;
 - c) Be the same size in circular mils area;
 - d) Have the same insulation type;
 - e) Be terminated in the same manner and area;
 - f) Follow the same path.
- 6.3.13 All cartridge type fuses shall be DC rated, telecommunications power-style (e.g. TELPOWER®) for new installations and replacements, unless another type of fuse is specified in the applicable AT&T Equipment or Power Drawing. Approved telecommunications power-style fuses are listed on the Minor Materials List and shall be used
- 6.3.14 All non-cartridge type fuses and circuit breakers shall be AC rated for AC circuits and DC rated for DC circuits.
- 6.3.15 Renewable link and H type fuses shall not be used.
- 6.3.16 Alarm pilot fuse applications other than the 0.18 amp GMT for Telpower fuse Blocks shall be 1/2 amp. (35 or 70 type).
- 6.3.17 All DC fuses shall be provided with a blown fuse indicator connected to an alarm circuit and indicating lamp within the bay.
- 6.3.18 All telecommunications power-style (e.g. TELPOWER®) fuse blocks equipped with a GMT alarm fuse circuit shall be equipped with a 0.18 amp fuse.
- 6.3.19 Dummy fuses shall be provided at all exposed, vacant fuse positions. (This includes GMT type and 70 type). It is not necessary to provide dummy fuses for enclosed cartridge type fuse blocks.
- 6.3.20 The DESP shall ensure that the correct type and quantity of fuse designation pins are provided for those fuse panels designed to accommodate fuse designation pins.
- 6.3.21 The DESP shall provide 10% spare fuses (minimum 1) of each size and type ordered up to 100 amps, and 25% spare fuses (minimum 1) of each size and type from 100 to 600 amps.
- 6.3.22 Only manufacturer approved fuse reducers may be used for exposed face fuse positions. In all other cases fuse reducers shall not be used.

TABLE 12-1 – SUMMARY OF CHANGES IN SECTION 12

Change	Item in 3/26/07 Issue	Item in This Issue
Revised	2.4.8 6.2.3 6.3.4 6.3.5	2.4.8 6.2.3 6.3.4 6.3.5
Deleted		
Added		

FIGURE 12-1--POWER SYSTEM

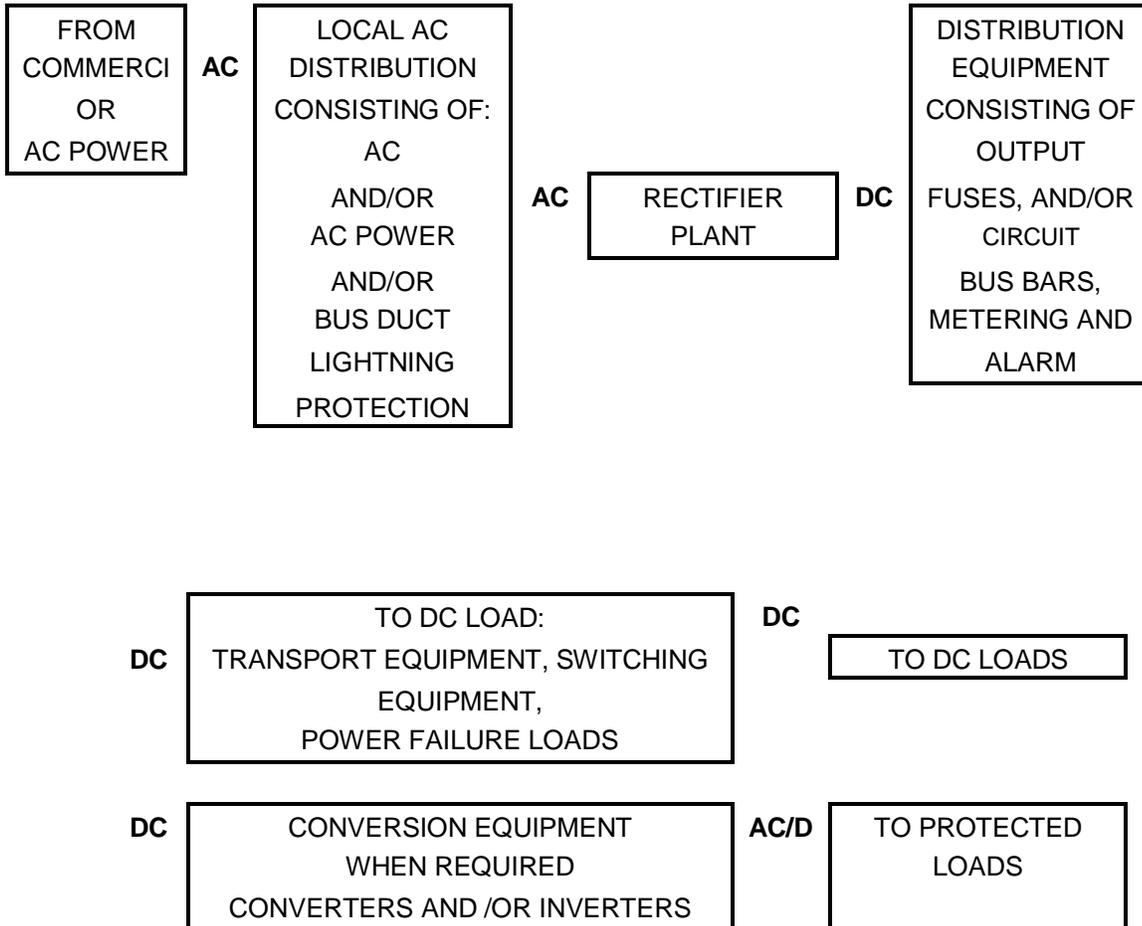


FIGURE 12-2--RECTIFIER PLANT

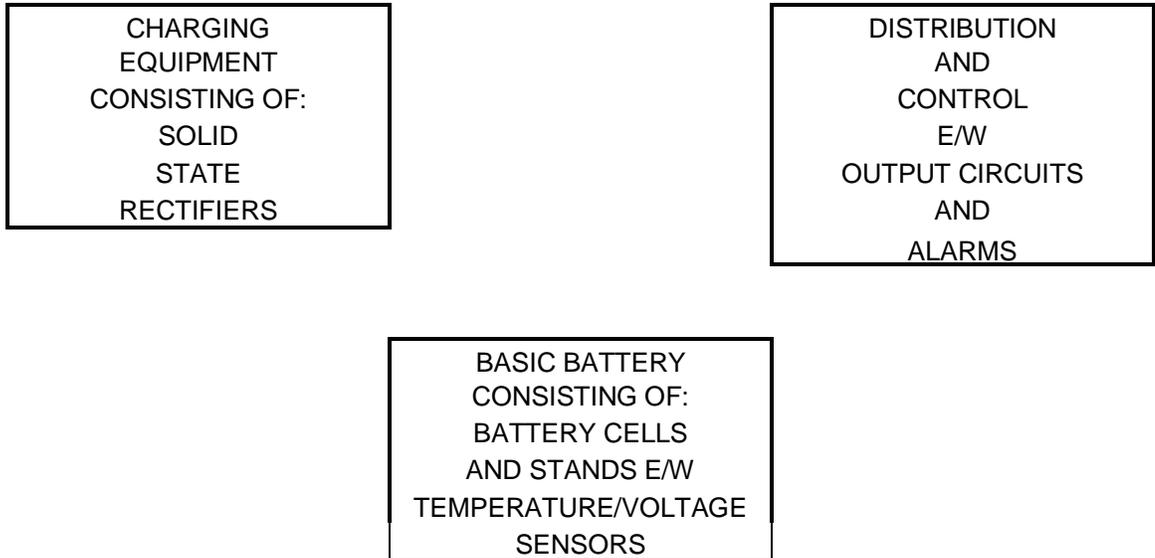
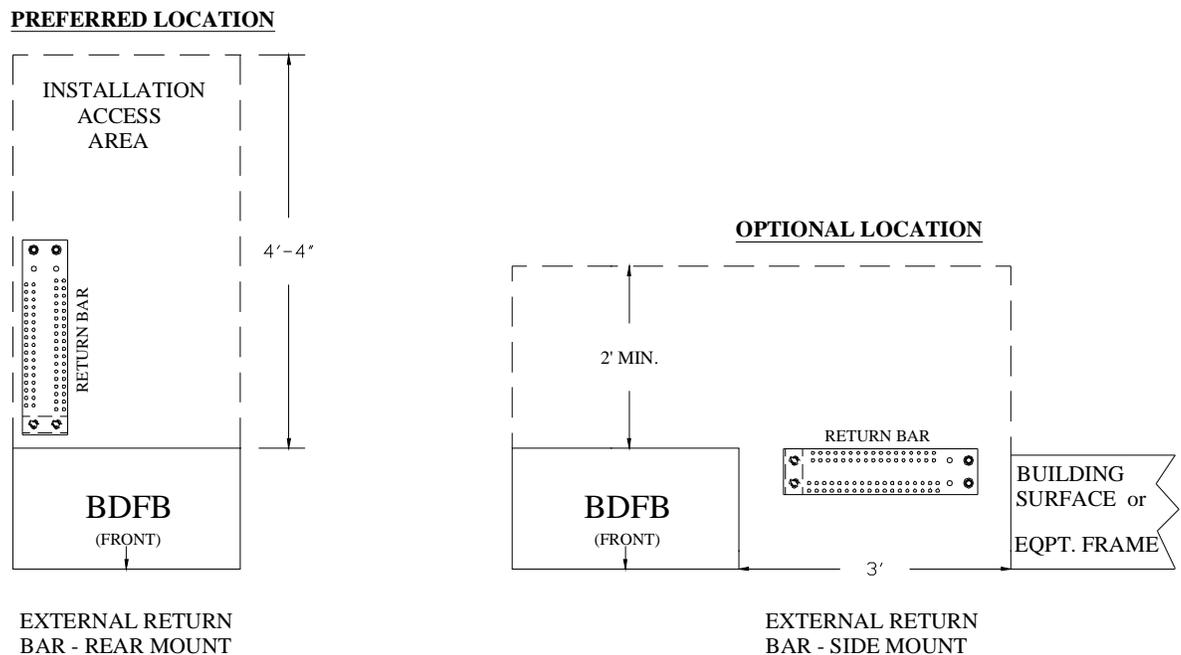


FIGURE 12-3 – BDFB EXTERNAL BATTERY RETURN BAR PLACEMENT (TOP VIEWS)



[END OF SECTION]

SECTION 13--GROUNDING AND BONDING

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1. GENERAL

1.1. Introduction

- 1.1.1 This section identifies the requirements for the grounding and bonding of network equipment engineered for the AT&T LEC.
- 1.1.2 Changes in this issue of Section 13 are summarized in Table 13-1.
- 1.1.3 Proper engineering and installation of grounding and bonding infrastructure are critically important to the safety of installation and operations personnel, the protection of equipment and the provision of reliable services.

2. REQUIREMENTS

2.1. ATT-TP-76416 and ATT-TP-76416-001

- 2.1.1 Instructions for ordering a copy of ATT-TP-76416 and ATT-TP-76416-001 are in Section 1, of ATT-TP-76400.
- 2.1.2 The DESP shall engineer to the applicable bonding and grounding requirements of ATT-TP-76416, Grounding and Bonding Requirements for Network Facilities. For convenience, the sub sections of ATT-TP-76416 are outlined below:

AT&T Sub Section

- 1 Definitions, General and Material Requirements
- 2 Office Ground Electrodes, Vertical and Horizontal Equalizers, AC Service and Distribution System
- 3 Power Plants and Equipment, Transport and Miscellaneous Equipment
- 4 Isolated Bonding Networks for Network Equipment Systems, Data Processing/Operational Support Systems Equipment
- 5 Electronic Equipment Enclosures, Attended Position Equipment, Equipment Trailers, Customer Premises Equipment

- 6 Radio Sites and Equipment
 - Annex A – Reference Documents and Information
 - Annex B – Revisions to Text and Information
 - Annex C – Index to Figures and Tables

2.2. Specification Notes

- 2.2.1 The building DESP shall provide specification notes requiring the building installation supplier to provide documentation of placement and composition of an earth electrode system.
- 2.2.2 When an earth electrode system is provided, the building DESP shall provide specification notes requiring the building installation supplier to provide advance notification to the AT&T LEC for inspection and testing prior to back fill.
- 2.2.3 The DESP shall provide a specification note requiring the existing grounding convention be followed.

TABLE 13-1 – SUMMARY OF CHANGES IN SECTION 13

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

[END OF SECTION]

SECTION 14--OPERATIONS SUPPORT SYSTEMS

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1.4. Power Requirements	14-2
1.5. Alarms.....	14-3

1. GENERAL

1.1. Introduction

- 1.1.1 This section covers requirements for the engineering of Operations Support Systems (OSS).
- 1.1.2 Changes in this issue of Section 14 are summarized in Table 14-1.
- 1.1.3 All new OSS shall adhere to ATT-TP-76400. Modifications to existing OSS should be engineered to incorporate these requirements.
- 1.1.4 Due to the large variety of OSS, only general information is included in this section. Where manufacturer's documentation provides the necessary requirements for a specific OSS, that documentation shall take precedence over ATT-TP-76400.

1.2. Location and Layout

- 1.2.1 In general, the weights of OSS components are well within the range of normal floor loading specifications. The AT&T LEC will determine floor loading based upon equipment weight information and system configuration from the computer manufacturer's specifications.
- 1.2.2 Many OSS require the use of a raised floor. A notation that raised floors are being utilized will be made in the TEO. Raised floors may be provided for system cable control or for under-floor cooling requirements.
- 1.2.3 When raised flooring is used as an air plenum, the cabling requirements shall be as follows:
 - a) Data processing interconnecting cables and connecting cables do not require a plenum rating if the plenum meets the criteria of the National Fire Protection Association (NFPA) 70-465, and the plenum has a smoke detection system.
 - b) Communication cables, as defined in the NFPA 70-800-51, shall meet the listing requirements of types CMP, MP or MPR for use in ducts, plenums, and other space used for environmental air.
 - c) Plenum rated interconnecting cables and connecting cables meeting the requirements of type CMP, MP, or MPR, shall be used in a plenum space.
 - d) These are the minimum requirements: local codes may be more stringent. Therefore, before beginning any large scale data processing cabling project, the DESP shall refer to the relevant codes.

- 1.2.4 Raised floor designs shall provide an insulating floor surface. The raised floor grid is utilized as a signal reference plane and shall be a part of the common bonding system.
- 1.2.5 Metallic hardware that penetrates the floor and contacts the metal undersurface or support structure shall not be used. Nonmetallic fasteners shall be used.
- 1.2.6 Within the central office environment, metal hold down bolts for OSS framework that penetrates a floor shall be furnished with nylon bushings or other suitable nonconductive hardware. This prevents electrical continuity through the bolting material. Computer hardware shall not be bolted through the floor.

1.3. Environmental Controls

- 1.3.1 Temperature and humidity alarms shall be set to alarm as specified by the equipment manufacturer.
- 1.3.2 When the OSS are clustered in one location, the system with the most stringent temperature and humidity requirements shall be used for the environmental provisioning.
- 1.3.3 OSS equipment is sensitive to excessive variation and shock. Isolation from the source of the vibration and shock shall be provided.

1.4. Power Requirements

- 1.4.1 A master disconnect switch shall be provided and controlled from a location near the main AC control panel and the exit doors. This disconnect switch shall discontinue the flow of power to all equipment in the OSS area.
- 1.4.2 The requirements for grounding an OSS are contained in Section 13 of ATT-TP-76400.
- 1.4.3 To clarify interrelationships, the various sources and combinations of AC supplies that can be used to power OSS installations are summarized as follows:
 - a) Unconditioned commercial AC power is the least expensive form of power supply suitable for OSS installation. This supply is not adequate for most OSS installations. Commercial power sources are subject to interruptions, spikes, sags, surges, and other transients generated on the incoming lines. Computers served by unconditioned commercial power may experience processing interruptions and occasional damage to components.
 - b) Standby power from an engine generator is generally available in COs to provide power to units classified as essential loads. Essential loads are defined as loads that are capable of tolerating power interruptions of more than five seconds without damage. This scenario is not an acceptable alternative in the computer data centers.
 - c) Standby inverter plants operated from the CO battery supply switch standby AC power during a commercial power failure to loads classified as protected. Such loads are those that can tolerate interruptions from a few milliseconds up to five seconds without interfering with operations.
 - d) Continuous operation inverters operated from a DC power plant (i.e., CO battery) are employed to supply interruption proof AC power when the OSS cannot tolerate

processing interruptions. The AC output is not affected by noise that may be present on the commercial AC supply.

- e) Uninterruptible Power Supply (UPS) is utilized in cases where interruptions are too great for OSS that require no-break power. UPS typically provides coverage for interruptions of short duration.
- 1.4.4 Autotransformers do not interrupt the AC neutral. Certain UPS employ an autotransformer that allows the neutral to be continuous from the main AC switchboard to the OSS. Units that maintain neutral continuity from feeders to downstream distribution circuits shall not provide local ground to the distribution grounded (neutral) conductor.
- 1.4.5 When commercial AC supply does not allow satisfactory operation of OSS, the supply shall be conditioned. Available devices for treating the commercial power include Line Voltage Regulators (LVR), isolating transformers, motor-alternators, inverters, and UPS. Logical combinations are acceptable. An LVR or nonregulating transformers may be interposed between the power source and the load to regulate sags, surges, and to block spurious line transients. Conditioning devices may be used to establish a separately derived system.
- 1.4.6 Certain conditioning units isolate the grounded (neutral) conductors of the distribution circuits from the neutral of the feeder circuit, if a feeder neutral is provided.
- 1.4.7 An LVR may be interposed between the power source and the panel board serving the OSS, to address voltage sags. Unless an autotransformer is used, the LVR establishes a separately derived system.
- 1.4.8 Isolating transformers provide isolation from transient and high frequency common-mode noise. Isolating transformers always create a separately derived system. Isolating transformers are used:
- a) When other equipment attached to the building AC imposes excessive noise on the feeder serving the OSS;
 - b) In place of LVR when voltage sags are not a problem;
 - c) As part of some power distribution units.
- 1.4.9 An inverter is customarily connected to a panelboard on a one-to-one basis; however, when the load is restricted to the capacity of one inverter, a pair of inverters may be connected to one panelboard to protect the system if an inverter fails.

1.5. Alarms

- 1.5.1 At a minimum, alarm systems shall be provided for the OSS which include the following:
- a) Computer sanity alert (such as a watchdog or sanity check circuit)
 - b) Loss of power to the OSS
 - c) Fire alarm
 - d) High temperature
 - e) High and low humidity

- f) Water alarms
 - g) Loss of commercial power.
- 1.5.2 The OSS shall be alarm compatible with external maintenance and monitoring systems. The AT&T LEC Equipment Engineer will specify interconnection requirements for external maintenance and monitoring.
- 1.5.3 The alarm system shall function whether using normal or emergency power.

TABLE 14-1 – SUMMARY OF CHANGES IN SECTION 14

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

[END OF SECTION]

SECTION 15--CABLE ENTRANCE FACILITY

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1. GENERAL

1.1. Introduction

- 1.1.1 This section covers the grounding requirements in the cable vault and Cable Entrance Facility (CEF).
- 1.1.2 Changes in this issue of Section 15 are summarized in Table 15-1.
- 1.1.3 The CEF is the interface linking the outside plant cables to the main distributing frame(s) in the central office. These outside plant cables are feeder and trunk cables that may be paired-conductor, coaxial, or optical. The paired cables that leave the CEF and attach to the connectors on the Main Distributing Frame (MDF) are known as tip cables or stub cables.
- 1.1.4 A below ground CEF is sometimes called a cable vault.

1.2. Requirements – All CEFs

- 1.2.1 The protection measures should be applied to the cables in a designated area of the CEF that promotes uniform methods and facilitates inspections; this area is identified as the cable protection area. It is located between the entrance conduit and the splice frame in a horizontal-entry CEF; it traverses the entire CEF in a vertical-entry system.
- 1.2.2 All of the ground bars located in the cable vault shall be bonded to the 1/0 AWG conductor connected to the CO ground system, via the OPGP or CO ground bar. The bonding conductor shall be run on the top horizontal and secured every 18 inches with cable ties or sewing twine.
- 1.2.3 A 1/0 AWG conductor is required between the CEF and the ACEG
- 1.2.4 Multiple CEFs may be provided in a single building. When this condition occurs, a 1/0 AWG conductor shall be installed to bond all bars together.
- 1.2.5 Each lineup of cable rack in the cable vault shall be equipped with an insulated ground bar near each CEF. (See Figure 15-1)
- 1.2.6 The insulated ground bar shall normally be mounted above the top horizontal support arms between verticals 2 and 3. As an alternate location, in cable vaults with a single line-up, the insulated ground bar may be mounted on the wall.

1.2.7 Each lineup of cable rack in the cable vault shall be bonded to the cable vault ground bar with a #6 AWG bonding conductor using a two (2) hole crimp type connector.

1.3. Requirements – Non-Insulating Joint CEFs

1.3.1 Each ST 21 Peth (polyethylene) sheath entrance cable shall be bonded to the ground bar nearest its CEF. Stacking ground connectors is not acceptable. The bonding conductor shall be a #6 AWG conductor equipped with a single hole crimp type lug for connection to the cable splicing case. Lockwashers are required to ensure a secure connection.

1.3.2 Each new or rearranged cable with lead sheath shall be bonded to the ground bar nearest its CEF. The #6 AWG bonding conductor shall be attached to the lead sheath using a B or D bond clip. The bonding clip is normally located between the 2nd and 4th verticals. Connecting a grounding conductor to a lead sheath by soldering on existing cable is not acceptable.

1.3.3 Foil-lined or metallic air pipes shall also be bonded to the nearest CEF ground bar using #6 AWG bonding conductors. Air pipefittings are available for this purpose.

1.3.4 Connections to the cable vault ground bar shall be made using two (2) hole crimp type connectors.

1.3.5 In a CO or remote hut location without a cable vault, an insulated ground bar shall be mounted near the CEF.

1.3.6 If Cable Rearrangement Facility (CRF) cabinets are in the CEFs, a 1/0 AWG dedicated conductor shall be run from the CRF cabinet/panel to the COG bar.

1.3.7 Tip cables (or stub cables) extend from the cable entrance facility to the MDF. The metallic sheaths of these cables are bonded to the OSP cable sheaths and to the MDF ground bar using a #6 AWG

1.4. Requirements – Insulating Joint CEFS

1.4.1 Central offices may be located in areas where stray DC currents are present in the earth from external sources such as dc powered public transportation systems, cathodic protection rectifiers or large welding establishments. The low earthing resistance of the central office grounding electrode system picks up a portion of these stray currents from the earth and conducts it to the CEF, where it exists on the metallic shields of outside plant cables. At a location outside the central office, where bare metallic components of the outside plant are in direct contact with the earth, the stray DC current leaves the plant and re-enters the earth, returning to its source. This discharge of DC current causes corrosion of outside plant components at that remote location.

1.4.2 Conduction of stray DC currents to the outside plant cable shields can be prevented by installing insulating joints in all cable shields and other metallic components entering the CEF. An insulating joint is an opening in the outside plant cable or air pipe that breaks the continuity of the sheath, shield, metallic strength member and moisture barriers, which interrupts the flow of DC currents that may cause corrosion.

- 1.4.3 Cable corrosion protection in the CEF shall be provided by creating a minimum $\frac{3}{4}$ inch air gap in the lead sheath of a cable or in the metallic shields of composite-sheath cable, the metallic components of an optical fiber cable and the metallic components of air pipes.
- 1.4.4 The metallic cable shield and other metallic components on the field side of the insulating joint shall be connected to a #6 AWG copper conductor insulated from the framing structure. This conductor shall be joined to a common # 6 AWG minimum isolation bonding conductor which is also insulated from the framing structure. This conductor shall terminate on an insulated bus bar located at the top of the cable rack. See Figure 15-2.
- 1.4.5 Outside plant entry cables shall be isolated from the CEF framing structure by either hardwood insulating members placed between the cable racks and framing structure or by insulators placed between the cables and cable hooks or cable support arms.
- 1.4.6 The metallic cable shield on the central office side of the insulating joint shall be connected to the central office grounding system following the requirements for a Non-Insulating Joint CEF except no bond is made between the OSP cable sheath and the tip cable sheath. See drawing 15-2.
- 1.4.7 To maintain a path to ground for lightning and ac voltages, the insulating joint shall be bridged with a bridging capacitor.

1.5. Interbonding

For Cable Entrance Facility requirements see ATT-TP-47616

1.6 Fiber Optic Cable

Any Fiber Optic cable containing a metallic shield shall be bonded to the CEF.

TABLE 15-1 – SUMMARY OF CHANGES IN SECTION 15

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

FIGURE 15-1 -- CABLE VAULT GROUNDING

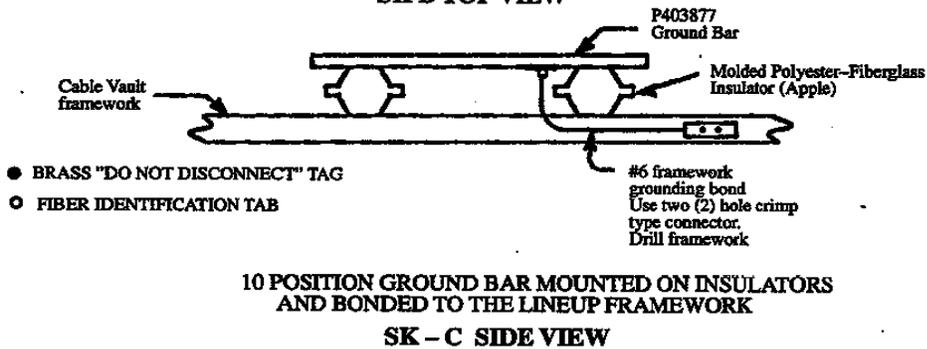
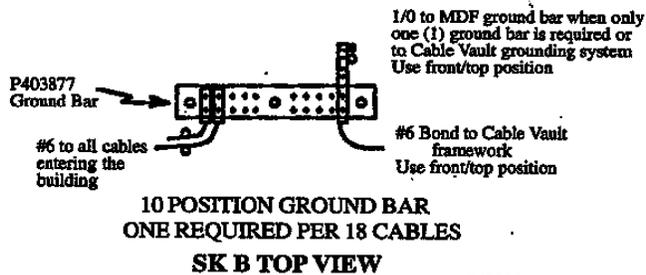
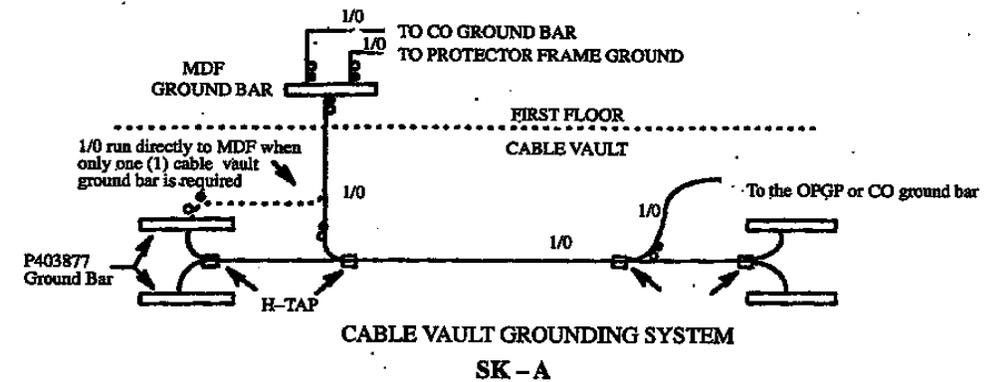
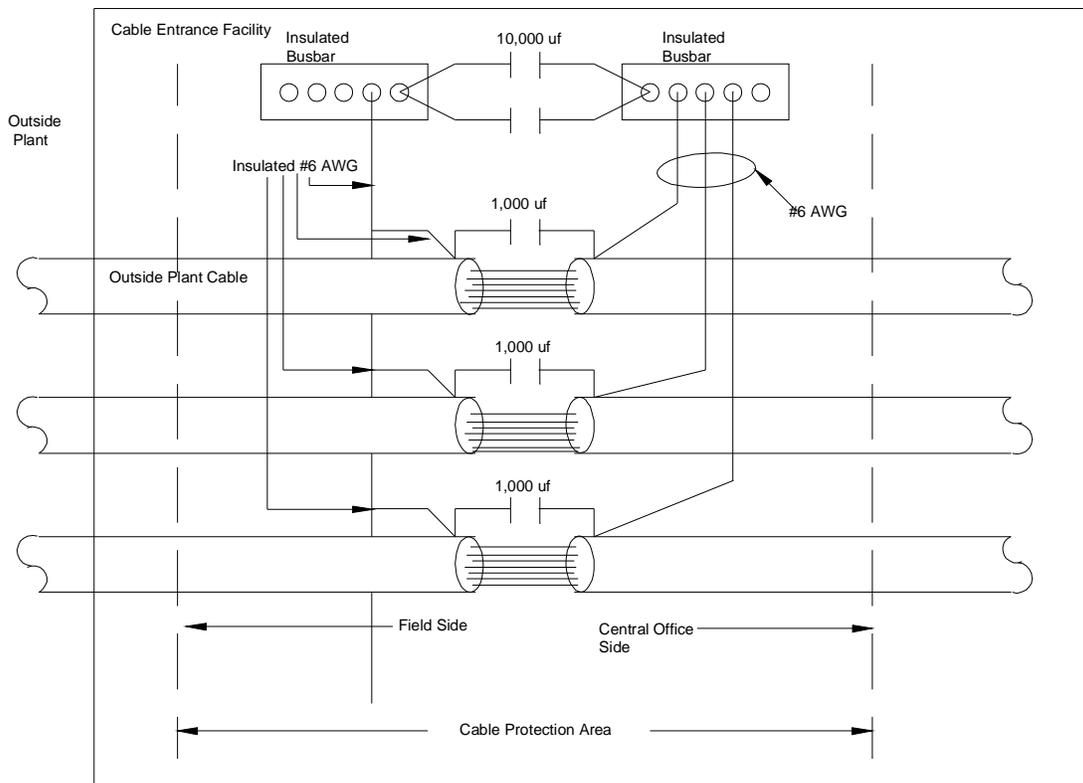


FIGURE 15-2 -- INSULATING JOINT CEF



[END OF SECTION]

SECTION 16 -- STANDBY ENGINE/ALTERNATORS

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1. GENERAL

1.1. Introduction

- 1.1.1 This section covers the engineering requirements for standby engine/alternators.
- 1.1.2 Changes in this issue of this section are summarized in Table 16-1.

2. REQUIREMENTS

2.1. General

- 2.1.1 This document contains Standard Specification for Engine Alternator Sets and requirements for all standby AC systems and equipment including engine/alternators with automatic transfer equipment.
- 2.1.2 Terminology commonly used for AC power plants is defined in ATT-790-100-659.

2.2. Engine Requirements

- 2.2.1 The AT&T LEC Equipment Engineer will select the standby engine to be used.
- 2.2.2 Engine critical building interface systems (intake louvers, fuel transfers, etc.) shall be sourced either directly on the engine or on the standby bus (as directed by the AT&T LEC Equipment Engineer) and shall not be controlled by any building environmental control system. These

systems shall be under the exclusive control of the engine alternator. The determination of relevance of any area subject to dispute in the above requirements shall be made by the AT&T LEC Equipment Engineer.

- 2.2.3 Load shedding controllers shall only control building load shedding, not network load (see Section 2.9) House service control panels or other controls will not override generator OEM operation controls (fuel, air intake, air exhaust, network load, etc.).

2.3. Fuel Systems

- 2.3.1 The rate of fuel supply to the engine's injection system shall be as required to prevent stalling, over-speed, or over temperature under any steady state or transient loading conditions. This shall be true when the engine/alternator set operates within its rating and proper environmental limits (temperature, altitude, and humidity) as stated in ATT-TP- 76200. The fuel system shall be designed so that the engine/alternator set draws necessary fuel. Fuel shall not be fed to the set.

- 2.3.2 Petroleum storage tanks shall be installed in accordance with Environmental Protection Agency (EPA), NFPA, UFC, state and local laws and regulations.

- 2.3.3 There are two basic types of petroleum storage tanks used by AT&T

- a) Underground Storage Tank – shall be doublewall with annular space monitoring and all bungs (openings) into the tank shall have a watertight collar and sump around them. Tanks shall be UL approved composite construction. Composite tanks shall be used in high seismic zones.
- b) Aboveground Storage Tank – shall be doublewall. All tanks shall have annular space monitoring, overfill protection and spill bucket. Tanks greater than 660 gallons or an accumulated value of more than 1320 gallons shall have a Spill Prevention Control and Countermeasures (SPCC) Plan. Tanks installed outside the building shall be UL 2085 approved. Sub base tanks (belly tanks) and other tanks installed inside a structure shall be double walled UL 142 approved. Day tanks shall be equipped with a Rupture Basin.

- 2.3.4 Tanks are to be installed in a location as near as possible to the engine alternator, to minimize piping runs in accordance with local code restrictions. Variance from local codes should be obtained in special circumstances.

- 2.3.5 All new petroleum storage tanks shall be equipped with release detection with a continuous monitoring system.

- 2.3.6 All return fuel shall be pumped back to the main petroleum storage tank unless otherwise specified by the AT&T LEC Equipment Engineer.

- 2.3.7 Return fuel line capacity shall be greater than the supply line capacity.

- 2.3.8 A leak detection sensor shall be installed in the rupture basin of the day tank, when present, and installed near the engine when no day tank is present.

- 2.3.9 Double solenoid shut off devices shall be installed before the day tank or main petroleum storage tank to prevent catastrophic fuel spills in the following situations:

- a) When any petroleum storage tank (day tank or main tank) is installed at a higher elevation than the engine/alternator;
 - b) Any piping system under pressure greater than atmospheric pressure.
- 2.3.10 All fuel storage tank and VeederRoot monitoring system equipment is to have specifications that meet federal, state and local regulatory requirements. Environmental Management maintains specification documentation to meet these requirements. All installation, upgrade or repair projects that impact any portion of the fuel storage, delivery or monitoring system are to be reviewed with Environmental Management at time of planning and design to ensure current technical design criteria are incorporated. Contact Cheryal Allen at 214-464-1917..
- 2.3.11 Copper or galvanized steel pipe shall not be used for fuel lines.
- 2.3.12 Fuel level indicators on the day tank shall be provided.
- 2.3.13 Exhaust pipes shall comply with applicable codes. The minimum requirements are as follows:
- a) Pipes shall be wrought iron or steel and strong enough to withstand the service. All externally exposed pipes shall be stainless steel.
 - b) Pipes shall not be supported by engine or silencer;
 - c) Exhaust plumbing shall have a stainless steel flexible bellow type section installed within 12 inches of the engine manifold;
 - d) Pipes shall have a clearance of at least 9 inches from combustible materials and terminate outside the building;
 - e) Pipes shall be guarded and/or insulated to prevent burn injuries to personnel and excessive heat in the engine room;
 - f) All connections shall be bolted flange (with gaskets) or welded. No automotive type exhaust pipe clamps are permitted;
 - g) The surface temperature of the muffler and all indoor exhaust piping shall not exceed 130° F. The insulation shall be installed so that it does not cover or interfere with the functioning of the flexible exhaust fitting. A protective shield shall be provided around the flexible section;
 - h) Exhaust piping shall be of sufficient length to allow for proper exhaust flow and configured to meet manufacturer EPA requirements.
- 2.3.14 A Critical Grade exhaust silencer(s), sized in accordance with the manufacturer's recommendations, shall be provided for each engine. Silencer(s) shall comply with the acoustic requirements of Section 6 of ATT-TP-76400.
- 2.4. Starting Systems**
- 2.4.1 The engine starting battery shall be sized per AT&T drawing ATT-P-05332-E or in accordance with the engine manufacturer's requirements.

- 2.4.2 The engine start batteries shall be located so the cells will not be exposed to excessive engine heat.
- 2.4.3 The start and control batteries shall be AT&T LEC approved Lead Acid or NiCad type.
- 2.4.4 A start battery rectifier shall be mounted either in the control cabinet or mounted on a wall near the start battery stand. Engine driven alternators shall not be used.
- 2.4.5 The starting battery rectifier shall be a regulated type and capable of recharging the start battery to a serviceable condition within 30 minutes after a drain of three successive starts. The rectifier output capacity shall be a minimum of 5 amperes, and the rectifier shall have an output voltmeter and ammeter. The battery rectifier shall be compatible with the battery application.
- 2.4.6 The starting battery rectifier shall be powered from the standby AC bus.

2.5. Cold Starting Aids

- 2.5.1 All water-cooled diesel engine alternator sets shall be provided with thermostatically-controlled heaters, designed to maintain jacket water temperatures not lower than 90° F and not higher than 120° F.
- 2.5.2 For all engine alternator sets to be installed where ambient temperatures will fall below 40° F, optional arrangements shall be provided for maintaining the start and control battery between 50° F and 80° F in low ambient temperatures.

2.6. Acoustic Noise

- 2.6.1 Sound levels within the building housing the standby plant and outdoor sound levels resulting from operation of this equipment shall meet the requirements specified in ATT-TP-76200 or local codes, whichever is more stringent.
- 2.6.2 Where the engine alternator set is equipped with a sound attenuating enclosure, the enclosure shall be designed to allow adequate cooling of the engine alternator set. The enclosure shall be designed to allow adequate intake and exhaust airflow per the genset manufacturer.
- 2.6.3 Sound-attenuating enclosures, where employed, shall provide hinged doors or latched panels to allow access for normal maintenance and repair operations, including:
 - a) Removal and replacement of fuel and lubricating filters;
 - b) Replacement or cleaning of air filters; and
 - c) Performance of all other normal maintenance operations specified by the manufacturer.
- 2.6.4 Where the engine alternator set is equipped with a sound-attenuating enclosure, the enclosure cooling requirements shall be met without booster fans or other accessory devices.
- 2.6.5 Acoustical materials, such as acoustically absorbent liners, shall be non-capillary, non-hygroscopic and free from perceptible odors. They shall maintain their acoustic attenuating properties under the conditions of temperature, mechanical vibration, and exposure to petroleum products to which they may be subjected under normal operation. Elastomeric

material used in sealing the acoustic enclosure shall remain flexible and resist cracking in the environment to which they are exposed in normal use.

2.7. Cooling System

2.7.1 Some installations require the radiator and fan to be mounted separately from the engine alternator. If so, the following requirements shall be met:

- a) When the engine driven water pump produces water flow, total piping pressure drop shall not exceed the engine manufacturer's recommendation. If an auxiliary pump assists water flow, piping pressure drop shall be matched to pump capacity at desired water flow, as determined by the manufacturer;
- b) Remote radiators are designed for installations where no external airflow restrictions occur. If the remote radiator ventilates a room, has any ducting, or its airflow is opposed by prevailing winds, the cooling capacity is reduced;
- c) A remote radiator fan requires an electric motor compatible with the standby power source. The voltage, frequency and horsepower of the required motor shall be specified on its rating tag. The fan can be direct or belt drive. If belts are used, multiple belts shall be employed to ensure reliability. An indicator lamp shall be on the engine control panel, indicating proper operation of the fan and an alarm to indicate fan failure;
- d) Heat exchangers shall be utilized when the engine manufacturer's specified maximum head pressure is exceeded. If a heat exchanger is required, an auxiliary pump shall be used in the system;
- e) For external engine cooling, a remotely mounted radiator or an engine based-mounted heat exchanger and an expansion tank, of a type and capacity recommended by the engine manufacturer for the application, shall be provided. Two manual shutoff valves shall be furnished and installed. The valves shall be mounted on the cooling water supply and return sides. In addition, a remote shutdown switch shall be provided for the engine-cooling fan. Flexible water line connectors shall be supplied for heat exchanger inlet and outlet ports;
- f) The engine cooling system shall be pre-treated by the engine supplier for the inhibition of internal corrosion.

2.7.2 The engine radiator exhaust duct shall be equipped with a re-circulation inspection door.

2.7.3 Combustion and cooling air louvers shall open upon loss of commercial AC power. These louvers shall be spring loaded to open mechanically (electrically held closed).

2.8. Alternator Technical Requirements

2.8.1 Alternators shall meet the following requirements:

- a) Lead Termination - The alternator leads shall terminate on the line side of the circuit breaker. Suitable connectors shall be used to terminate the alternator's leads. A means will be provided to prevent connectors from turning when mounted on breaker studs;

b) Vibration Isolation - Each engine alternator set shall be mounted on vibration isolators, either internal or external to the skid base of the set.

2.8.2 To minimize potential loose connections or trouble spots in the control circuitry, all interconnections of control circuitry wiring shall be terminated with ring terminals securely fastened to terminating points with a machine screw. Only one termination shall be provided per screw.

2.8.3 All connections between the remote control cabinet and the set cabinet shall be run in conduit. These leads may be run along with the alarm leads.

2.8.4 Connect the neutral of the set to the neutral of the commercial power at the house service entrance.

2.9. Load Prioritization

2.9.1 Genset loads shall include all self sustaining equipment. For instance, fuel pumps, air control servos, and battery chargers shall be electrically supported by the specific generator served, co-dependency is not allowed.

2.9.2 Generator control systems may include load prioritization. In those cases, network and network supporting loads shall never be staged and shall be the first loads(s) to transfer to the generator.

2.9.3 Building control systems may be employed to load and shed only non-network (administrative) supported loads. These type loads shall be the last loads added to the generator and the first loads to be removed.

2.10. Automatic Transfer Switch Systems

2.10.1 Each Automatic Transfer Switch (ATS) shall be mechanically held on both the standby and normal side, and be rated for continuous duty in an unventilated enclosure. The ATS shall have three possible positions:

- a) Closed to Commercial, Open to Engine;
- b) Closed to Engine, Open to Commercial;
- c) Open to Engine and Open to Commercial.

2.10.2 An ATS shall have a minimum open time of six to ten seconds depending on the load configuration. The mechanical components of the transfer system can be either circuit breakers or a switch. There shall be no provision to unload the engine automatically (load shedding), except in the very large offices where multiple transfer points are available.

2.10.3 Each ATS shall be a solenoid operated mechanism, momentarily energized from the source to which the load is being transferred. The open circuit interval during transfer shall be long enough to allow stored energy in the powered equipment to decay, thus preventing a possible phase mismatch and power overload during the switch transition.

- 2.10.4 Each ATS used shall meet UL 1008 requirements. All main contacts and control assemblies shall provide repetitive load transfer service. Inspection and replacement of all main and arcing contacts shall be possible from the front of the ATS enclosure without disassembly of operating linkage or disconnection of power conductors.
- 2.10.5 Each ATS shall include a separate control panel. The switch shall be mounted on the inside surface of the enclosure door. The ATS shall be in a secured area. For large or high voltage (over 400v) systems, the switch may be outside the engine/alternator room. A protective cover shall be provided. The capability to manually bypass the ATS shall be provided. If a wiring harness plug is used, it shall be secured with machine screws to prevent accidental disconnection. The following shall also be provided:
- a) Engine starting contacts to provide for engine/alternator starting of each unit, independent of the other;
 - b) Three-phase relays shall be field adjustable, close differential type with 92-95 percent pick-up and 82-85 percent dropout. Relays are to be connected across live lines;
 - c) Test switch to simulate normal source failure;
 - d) Independent voltage and frequency sensing of the emergency source, factory preset to pick up at 90 percent voltage and 58 Hz;
 - e) Adjustable time delays for start, transfer, retransfer and engine cool-off;
 - f) Two auxiliary contacts rated at 10 amperes, 480v AC, one closed on normal, one closed on emergency;
 - g) Pilot light(s) to indicate switch position;
 - h) The ATS shall have a manual operation option.
- 2.10.6 Transfer system enclosures are usually NEMA 1 type as a manufacturing standard. However, job conditions may dictate a choice of the following:
- NEMA 1A, Dust Tight, Indoor
 - NEMA 3, Dust Tight/Rain - Sleet Resistant
 - NEMA 3R, Rain Proof/Sleet Resistant
 - NEMA 4, Water Tight or Dust Tight
 - NEMA 12, Industrial Oil Tight, Indoor
- 2.10.7 The transfer system shall be arranged to use DC trip to open and AC closure. The DC trip signal shall be supplied from an external source. This arrangement will provide the protection necessary in the event of any unacceptable commercial power source conditions such as complete power failure, high or low voltage, high or low frequency and single phasing. The AC closure shall be obtained from the power source that will be active after the transfer.
- 2.10.8 The manufacturer shall supply interconnection information for connecting the engine alternator with an Automatic Transfer System.
- 2.10.9 For automatic transfer, the system shall be capable of the following:
- a) Recognizing the occurrence of a power failure;

- b) Opening the commercial power source;
- c) Starting the engine alternator set;
- d) Closing the alternator circuit breaker;
- e) Automatically controlling the loading of the standby bus;
- f) Recognizing the return of commercial power;
- g) Transferring all loads from the standby power source to the commercial power source;
- h) Engine cool down and shutting down the engine alternator.

2.10.10 For automatic paralleling of multiple engines, the system shall be capable of performing the following operations:

- a) Recognize the occurrence of a power failure;
- b) Open the commercial power source;
- c) Initiate the Start signal to all engines simultaneously;
- d) The first engine to reach proper voltage and frequency closes its on-set breaker initiating closure of the engine transfer breaker powering the static loads;
- e) As additional engine alternators are paralleled to the essential bus, the Load Management Controller shall connect these loads on a priority basis;
- f) Recognize the return of commercial power;
- g) Transfer all loads from the standby power source to the commercial power source after the Holdover Timer has operated;
- h) Engine cool down and shut down of the engine alternator(s).

2.11. Outdoor Enclosures

2.11.1 When the engine/alternator is to be enclosed, it will be necessary to provide access for maintenance purposes. The enclosure shall be designed to allow sufficient air flow for combustion and cooling of the engine/alternator set, during normal operation, and any negative air pressure shall not hamper easy opening and closing of the enclosure door. Any acoustical material or thermal insulation shall be non-capillary, non-hygroscopic, free from perceptible odors, fire retardant, and capable of holding its acoustical characteristics without deterioration. Exhaust piping shall be of sufficient length to allow for proper exhaust flow.

2.12. Safety

2.12.1 The engine alternator set shall be designed and constructed so that personnel hazards are minimized. Component parts shall be suitably arranged and/or guards shall be employed to minimize the possibility of accidental contact with hazardous voltages, rotating parts, excessively sharp edges, and/or high temperature surfaces.

- 2.12.2 Exposed surfaces with temperatures greater than 115°F shall be marked with warning labels. Surfaces with temperatures greater than 130° F shall be guarded as well as marked with warning labels.
- 2.12.3 Insulation and/or ventilated guards shall be provided to protect the operator from coming in accidental contact with the high-temperature external surfaces of diesel engine exhaust system parts and piping and any other components with surface temperatures higher than 130° F.
- 2.12.4 Suitable guards shall be provided for all fans, blowers, rotating parts of alternators, and any other rotating parts associated with the engine alternator plant to which the operator might otherwise be exposed.
- a) Guards shall be of substantial construction, removable but securely fastened in place, and of such design and arrangement that any part of the operator's body cannot project through, over, around or underneath the guard.
 - b) All set screws, projecting bolts, keys, and key ways shall either be suitably guarded or of a safety type without hazardous projections or sharp edges.
 - c) All in-running gears and sprockets otherwise exposed to personnel contact shall be completely enclosed or be provided with band guards around the face of the gear or sprocket. Side flanges on the band guard shall extend inward beyond the root of gear teeth.
- 2.12.5 The DESP shall ensure that suitable warning labels for automatic start are provided.

2.13. Hazardous Voltages

- 2.13.1 Energized components with voltages at or above 150 Volts DC or 50 Volts rms AC shall be enclosed or covered. Warning labels shall also be provided and conspicuously displayed with guards either in place or removed.

3. MAIN LINE AC CIRCUIT BREAKERS

3.1. General

- 3.1.1 When the AC transfer system is a circuit breaker type, and the circuit breaker is located within 25 feet of the standby engine/alternator, a separate main line AC circuit breaker is not required. Otherwise, a second AC circuit breaker shall be placed within 25 feet of the standby engine/alternator and sized to the output of the alternator as a load circuit interrupting and protection device. It shall operate both manually for normal switching functions and automatically during overload and short circuit conditions.
- 3.1.2 The trip unit for each post shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection.
- 3.1.3 The AC circuit breaker shall have a battery voltage operated shunt, trip wired to the safety shut down to open the breaker in the event of engine failure. This AC circuit breaker shall have a dry alarm contact.

- 3.1.4 An emergency shutdown switch for the engine shall be provided, designated, and covered to prevent accidental activation.

TABLE 16-1 – SUMMARY OF CHANGES IN SECTION 16

Change	Item in 11/1/05 Issue	Item in This Issue
Revised		
Deleted		
Added		

[END OF SECTION]