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SECTION 1 – INTRODUCTION

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TABLE 1-1 – SUMMARY OF CHANGES IN SECTION 1

Change	Item in 09/08Issue	Item in this Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 ATT-TP-76401, Detail Engineering Requirements, delineates the requirements for providing detail engineering services to AT&TIS

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

1.1.3 AT&TIS assumes no responsibility for any costs incurred by a given manufacturer or supplier in conforming to the requirements of ATT-TP-76401. 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 AT&TIS.

1.1.4 AT&TIS reserves the right, without prior notice, to revise ATT-TP-76401 for any reason.

1.1.5 In Alaska (Alascom) the Local Engineer serves the roll of both the DESP and the AT&T Equipment Engineer. In this capacity the Local Engineer has the authority to vary from ATT TP76400 process requirements and substitute locally established Method & Procedures in completion of the Job Specification as they relate to the defined handoffs between the AT&T Equipment Engineer and the DESP.

1.2. Purpose

1.2.1 The purpose of ATT-TP-76401 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&TIS Equipment Engineer;

c) Provide guidelines for the expected output of the DESP;

d) Provide guidance on the required methodology used in constructing or correcting AT&TIS records;

e) Promote engineering compatibility with ATT-TP-76301, AT&TIS Installation Requirements.

1.3. Application

1.3.1 ATT-TP-76401 applies to all detail engineering services provided to AT&TIS and supersedes all detail engineering requirements documents previously issued by AT&TIS.

1.3.2 ATT-TP-76401 is applicable to all types of new and reused Information Services equipment.

1.3.3 ATT-TP-76401 is applicable to IS sites, antennas, 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 “IS Sites”. .

1.3.4 ATT-TP-76401 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-76401 also applies to AT&TIS personnel who perform equipment detail engineering, as well as to AT&TIS 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-76401 are as follows:

a) **AT&T CRE (Corporate Real Estate Management Representative)** - The AT&T real estate management representative (Design and Construction) who is directly responsible for the engineering and installation of the environmental and infrastructure job and who has overall responsibility for job completion.

b) **AT&TIS Equipment Engineer** - the AT&TIS equipment engineering representative who is directly responsible for the installation in progress and who has overall responsibility for ensuring job completion and acceptance.

c) **Automated Equipment Order (AEO)** – The AT&TIS document to the DESP to authorize engineering services.

d) **AT&TIS Operations Engineer** – The Operations manager accountable for site integrity, JSA, MOP sign off, daily coordination with the installation suppliers, and sign off on the JCR.

e) **Detail Engineering Service Provider (DESP)** - The provider of detail engineering services, including Information Services equipment and building engineering service providers, as well as AT&TIS personnel who perform detail engineering.

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) **Space & Power Request Form** – The document the AT&TIS Planner will use to request site specific space and power assignments from the Capacity Manager.

i) **Vendor Response Form (VRF)** – The document the DESP uses to confirm the acceptance of the job from AT&TIS.

j) **Power DESP**: The provider of power detail engineering services, including DC power plant, UPS, standby generator engineering service providers.

k) **Listed:** Per the National Electrical Code "Listed" refers to equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose.

l) **FPN**: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. Use of the system employed by the listing organization allows the authority having jurisdiction to identify a listed product.

1.5. General Requirements

1.5.1 The current issue of each section of ATT-TP-76401 as of receipt of the AEO 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-76401 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-76401, 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-76401 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 AT&TIS. The DESP shall notify the AT&TIS Equipment Engineer for resolution of any discrepancy between the manufacturer's engineering information and ATT-TP-76401.

1.5.4 The DESP shall utilize only AT&T approved products.

1.5.5 Some requirements in ATT-TP-76401 are delineated by reference to other AT&TIS standards such as ATT-TP-76301 and industry standards. These standards are summarized in Table 1-2 and shall be considered part of ATT-TP-76401.

1.5.6 The DESP is responsible for:

a) Providing a completed VRF to the AT&TIS 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&TIS 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 AT&TIS's practices or requirements;

g) Developing and providing the detail specification(s) per ATT-TP-76401;

h) Request or provide office assignments via the ARF;

i) Creating and updating AT&TIS records as required by Section 4, ATT-TP-76401;

j) Ensuring that the job, as detail engineered, can be installed in accordance with ATT-TP-76301;

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&TIS Equipment Engineer to request a variance from any ATT-TP-76401 requirement and any approval of a variance shall be in writing. The DESP shall not request from the AT&TIS Equipment Engineer any variances from the requirements outlined in this document related to fire stopping and safety issues and/or code issues.

1.5.8 AT&TIS reserves the right to audit any job for compliance to ATT-TP-76401. 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-76401 are available to contracted Suppliers through signed nondisclosure agreements or as detailed in current contracts between AT&TIS and the Supplier.

1.7. Ordering Information

1.7.1 Extranet access is available to approved suppliers for downloading electronic copies of ATT-TP-76401 and other non-proprietary AT&TIS 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&TIS publications referenced herein should be obtained from the originator of the publication.

1.7.3 AT&TIS personnel may access the ATT-TP-76401 from the Common Systems web site at:

http://ebiz.sbc.com/commonsystems/

1.8. Comments On ATT-TP-76401

1.8.1 Comments on ATT-TP-76401 should be submitted by e-mail or in writing to:

Lawrence Lyles
Lead Network Engineering Manager
675 W Peachtree St NW
Atlanta, GA 30375
ll4546@att.com

TABLE 1-2 – REFERENCES IN ATT-TP-76401

Reference	Title
ATT-TP-76200	Network Equipment Power, Grounding, Environmental, and Physical Design Requirements
ATT-TP-76301	AT&TIS Installation Requirements
ATT-TP-76900	AT&T Installation Testing Requirements
ATT-TP-76911	Common Systems Considerations For Determining The Affects On Floor Loading Of Superstructure Suspended From CeilingsAT&T E911 Requirements
ATT-790-100-656	DC Power Distribution
ATT-TP76402	Internet Service Equipment on Access Flooring Engineering & Installation Requirements
ATT-TP76403	Grounding and Bonding Requirements for Internet Facilities
ATT-TP76408	Common Systems Network Facility Auxiliary Framing and Bracing Requirements
ATT-TP76409	Common Systems Network Facility Cable Rack Requirements
BSP 790-100-658MP	Standard Specification and Performance Requirements for Engine Alternator Sets
ATT-790-100-659	Standby AC Plants
ATT-TP-76201	Hardware Products and Materials Specifications
BSP 800-000-101MP	Network Equipment Anchoring Requirements
BSP 800-000-102MP	Central Office Equipment Framework Design Requirements

Reference	Title
BSP 800-000-104MP	Bracing Requirements For Network and Data Equipment On Raised Floor System
ATT-812-000-032	Common Systems Through-Penetration Firestopping Requirements
BSP 800-006-152MP	Floor Stanchion Supported Cable Rack System Requirement
BSP 800-068-150MP	Central Office Equipment Framework Support Requirements
BR 751-410-101 (Telcordia Technologies)	Common Language Standard Abbreviation List
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
SBC Minor Material List (3/2/06)	
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-- AUTOMATED EQUIPMENT ORDERS (AEOs)

CONTENTS PAGE

TABLE 2-1 – SUMMARY OF CHANGES IN SECTION 2

Change	Item in 09/08 Issue	Item in this Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 This section describes the information that shall be provided to a Supplier and/or the Detail Engineering Service Provider (DESP) by means of the Automated Equipment Order (AEO).

1.1.2 Changes in this issue of Section 2 of ATT-TP-76401 are summarized in Table 2-1.

2. INFORMATION PROVIDED BY THE AT&TIS EQUIPMENT ENGINEER

2.1. General

2.1.1 The AT&TIS Equipment Engineer shall provide an AEO for every job issued (electronic if available) to the DESP to identify relative billing information, work effort and job schedules. The DESP shall receive an AEO and Purchase Order before issuing the detail specification.

2.1.2 The AT&TIS Equipment Engineer shall provide an appendix AEO when the job scope changes (i.e. additional services, assignment updates, date changes).

2.2. AEO Facesheet

2.2.1 The AEO Facesheet (iNEWT) shall contain, at a minimum:

a) **Job address (Install at)**

b) **P/A Oracle Number**

c) **Automated Equipment Order (AEO) Number.**

d) **CLLI Code.** Common Language Location Identifier code

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

e) **FRC/Account Code.** Field Reporting Code or Account Code or Technology Code

f) **LOC or GEO/PAR/GLC.** AT&TIS Location Accounting Code

g) **Appendix No.** Appendix number of the AEO. The original AEO will carry no Appendix No. Subsequent appendices follow the pattern: 001, 002, 003, etc.

h) **On Job Want Date.** Date major material is to be delivered from the material supplier

i) **Requested Engineering Start Date.** Date engineering is scheduled to start including detailed drawings.

j) **Requested Engineering Complete Date.** Date engineering is scheduled to complete.

k) **Requested Install Start Date.** Date installation is scheduled to start

l) **Requested Install Complete Date.** Date supplier is scheduled to complete.

m) **Ready for Service (RFS) Date.** Date equipment is in office and can be provisioned to provide service.

n) **Final Destination**. "Final Ship To" location for material required for the job

Note: The AT&TIS Equipment Engineer shall include address and zip code.

o) **Description.** A summary of the scope of work including; Activity, Equipment Type(s) and Quantity, and Circuit quantity

p) **AT&T**IS **Equipment Engineer.** Name of the AT&TIS Equipment Engineer responsible for the job

q) **Engineering Issue Date.** Date AT&TIS Equipment Engineer issues the AEO

r) **Requested T&A Start Date**.

s) **Requested T&A Complete Date**.

t) **Phone Number and EMAIL.** Telephone number and e-mail address of AT&TIS Equipment Engineer

u) **Responsibility Code Originating.** RCO of the AT&TIS Equipment Engineer.

2.3. Other AEO Information Including Attachments (AEO as defined in definitions Section 1)

2.3.1 The following information shall be included in the AEO as applicable per the scope of the job:

a) A listing of AT&TIS provided equipment (a.k.a. “Information Services Equipment”)

b) Equipment model number

c) Disposition of any removed equipment; i.e. junk, send to reuse, redeploy to another location, Retired in Place (RIP)

d) Specify whether cable mining is to be performed and to what extent cable mining is to be performed (a to z location)

e) Name and telephone number of the AT&TIS Representative

f) For new bays and equipment being added or removed, provide the relay rack location via Space & Power Request Form (S&P)

g) Applicable specific installer notes to be included in the detail specification

h) Fuse panel assignments and other specific power source requirements, or instructions for obtaining this information

i) Unique, supplier specific numbering schemes for bays, shelves and circuits or instructions for obtaining this information

j) Any other office-specific information necessary to engineer the job

k) The Power Engineer’s name and telephone number for Power Assignment Log requirements

l) **Material Ship To**. “Ship To” location for material required for the job

m) **Mail Installers Papers To.** The “Ship To” for Installer’s Papers. Required for jobs when DESP is not the installation supplier

[END OF SECTION]

SECTION 3 -- DETAIL ENGINEERING SPECIFICATION REQUIREMENTS

CONTENTS PAGE

TABLE 3-1 – SUMMARY OF CHANGES IN SECTION 3

Change	Item in9/08 Issue	Item in this Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

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 Firm Price Quote (FPQ) upon request of IS work from the AT&TIS Equipment Engineer.

1.2.2 Upon receipt of the AEO/PO the DESP shall provide a final detailed specification Detailed Specification for all items requested to the AT&TIS Equipment Engineer. The DESP shall not request a variance of this requirement from the AT&TIS Equipment Engineer.

1.2.3 The AT&TIS Equipment Engineer shall provide a final detailed specification to the installation supplier when the DESP is not the installation supplier.

1.2.4 Along with the Detailed Specification, the DESP shall provide a copy of the AEO (including all attachments) to the installer.

1.2.5 The DESP shall obtain from AT&T written approvals for variations from ATT-TP-76401 and include this correspondence with the Detailed Specification.

1.2.6 Established patterns within the IS site should be considered by the DESP. (i.e. distributing frame blocks wiring patterns). The DESP shall obtain from AT&T written approvals for variations.

1.2.7 The DESP shall insure that the correct P/A Oracle number is identified on the Spec for marking the material being shipped to the job site.

1.2.8 Any known discrepancies in the information provided by the AEO/PO shall be resolved with the AT&TIS Equipment Engineer prior to issuing the final Detailed Specification.

1.3. Contents of Detailed Specification

1.3.1 The completed output constitutes the Detailed Specification. The Detailed 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 Detailed 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. IS site Drawing Records List
8. AT&TIS Equipment and Interconnect Drawing List (If Applicable)
9. Reference Drawings List
10. Cable Running List

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 Detailed Specification shall be followed for all jobs. The contents of the Detailed Specification, as delineated herein, shall apply to all jobs. Appendix 3-A of this section provides a template for the Detailed Specification. The DESP may utilize this template for the Detailed Specification. Appendix 3-B provides an illustration of completed Detailed Specification forms.

1.3.3 The DESP shall provide the completed specification forms (worksheets) in a single package.

1.3.4 The DESP shall provide an electronic file of the Detailed Specification to the AT&TIS Equipment Engineer.

1.3.5 This electronic file shall be compatible with the Microsoft Excel® release designated by the AT&TIS Equipment Engineer or made available upon request electronically.

1.3.6 The DESP shall ensure that distributed paper copies of the Detailed 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 Detailed Specification form:

AT&T Proprietary

Not for use or disclosure outside of the AT&T Internet Services companies except under written agreement.

The proprietary statement on the completed forms of Appendix 3-B of ATTIS-TP-76401 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 AEO/PO 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 AEO/PO Facesheet and add the following information:

a) P/A Oracle Number

b) Requisition Number

c) Supplier Order Number

d) SPEC Appendix No. The original Detailed Specification shall carry Appendix Number 0, or 00. Subsequent appendices shall follow the pattern: i.e. 1, 2, 3 or 01, 02, 03, etc.

e) Date DESP received AEO/PO

f) List of AT&TIS AEO/POs and appendices if included in this specification

g) Table of Contents

h) DESP's Full Name (primary DESP – not subcontractor)

i) DESP's Contact and Telephone Number

j) Instruction to mark packages with AEO/PO Job Number

3. SPECIFICATION FORMS

3.1. General

3.1.1 If the Detailed 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) AEO Number

c) Page X of Y (consecutively)

d) CLLI

e) Supplier Order Number

f) Appendix Number of Detailed 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&TIS approved variances from ATTIS-TP-76401

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. The entire installation shall be in compliance with ATTIS-TP-76301.
2. The installer shall make equipment acceptance tests in accordance with ATT-TP-76900 and all applicable practices. Installer shall refer to ATT-TP-76900 during testing.
3. The installer shall send an MDR, per ATT-IS-TP-76301, indicating any installer corrected drawing activity and route corrected drawings to [The DESP shall provide the address].
4. The installer shall refer engineering questions pertaining to this specification to the detail engineer listed on the Cover Sheet.
5. The Installation Supplier shall record power load readings on the Power Assignment Log, and forward the worksheet to the AT&TIS Equipment Engineer (Implementation Engineer) and AT&TIS Capacity Engineer on all jobs that add a power load to the IS site. The AT&TIS Capacity Engineer's approval is required prior to adding or terminating to circuit fuse/breakers. Instructions and worksheets are available on the extranet. This includes jobs that add load to the BDFB or FDC via an existing bay fuse panel and/or circuit additions to the BDFB or FDC. Approval is required prior to adding new circuit fuse positions at the BDFB or FDC.
6. 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 fire stop covers. BDFB Power Boards and cable hole fire stop 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 ATTIS-TP-76301, 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 Information Services 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.

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, 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 multipled (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 ordered. 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 non-circuit 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 AEO, 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 re-stamping, re-stenciling, 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&TIS 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 Note 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 terminal strips or patch panels 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&TIS Equipment Engineer in the AEO.

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 HECI 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-76301.

T - Material designated "T" will be furnished by AT&TIS to the installer in accordance with ----------(indicate letter, (date), or AEO number).

NOTE: Use this note for material which is to be furnished by AT&TIS to the installer, from its own stock, from another IS site, from the holding account, from surplus, or from any other order. Show materials exactly as furnished by the AT&TIS 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&TIS purchasing organization or AT&TIS Equipment Engineer in accordance with AEO_____.

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&TIS 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 purchasing organization upon request. The material listed against this note shall meet AT&T 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/Action - 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").

3.9. AT&TIS Records

3.9.1 The DESP shall list on the AT&TIS Records page the IS Site 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&TIS Equipment and Interconnect Drawings page the following drawing(s), with issue numbers, used in engineering the job:

a) Manufacturer's (equipment) drawings

b) Circuit or interconnect drawings

3.11. Reference Drawings

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

Note: Reference Drawings listed here are <u>not</u> 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.

4. APPENDICES TO SPECIFICATIONS

4.1. Purpose

4.1.1 The DESP shall provide an appendix Detailed 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/Action" column.

b) The only valid designations for action/operations are shown below with their single letter abbreviations, to be used in the action/operation column throughout the appendix.

DESIGNATION	ABBREVIATION
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 Detailed Specifications and appendices. A copy of the final Detailed Specification and appendices shall be sent to the AT&TIS Equipment Engineer or made available upon request electronically by 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&TIS Equipment Engineer or made available upon request.

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-- INFORMATION SERVICES -- CENTRAL OFFICE EQUIPMENT RECORDS

CONTENTS PAGE

TABLE 4-1 – SUMMARY OF CHANGES IN SECTION 4

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. INTRODUCTION

1.1. General

1.1.1 This section describes the Information Services equipment records that are created and maintained for use by AT&TIS to establish a permanent record of Information Services equipment.

1.1.2 Changes in this issue of Section 4 are summarized in Table 4-1.

1.1.3 The term Information Services record refers to office specific records in a graphical/mechanical Information Services base drawing, tabular (database) format, or electronic document storage system. The term Information Services base records refer to records numbered in the Information Services base record numbering scheme described in this section.

1.1.4 The DESP shall correctly update and/or mark-up for update Information Services records as identified in Table 4-3. These records are the official AT&TIS documentation of Information Services 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 Information Services records are the property of AT&TIS. 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 Information Services records (as shown in this section) are not required at Enclosed Network Extensions (ENE). ENEs are defined as CEVs, CUEs, Huts, Prems, Radio Sites, etc.

2. AT&TIS RECORDS DESCRIPTION

2.1. General

2.1.1 Information Services records reflect the engineering and installation plan for description and location of equipment installed for AT&TIS site. 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 IS sites may have more than one base number.

2.1.3 The existing drawing numbering scheme shall be followed when creating or updating drawings.

2.1.4 The IS sites Base Numbering System is not applicable in the TAB/db environment.

2.2. Information Services Record Document Types

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

Table 4-3- Information Services Record Document Types

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

2.3. Floor Plan Records (FP)

2.3.1 AT&TIS creates Floor Plan Records from architect drawings and plans. AT&TIS Capacity Engineer 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. Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU) Records

2.4.1 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 the regional mechanized database system.

2.4.2 The BDFB/SPDU record provides a relational tabular database of information associated with the BDFB/SPDU and shall include Company, office location, floor, lineup, manufacturer's, fuse panels, fuse blocks, fuse positions, and fuse assignments. 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 shall be populated in PowerPro.

2.5. Power Board Records

2.5.1 Power Board records shall be maintained by the AT&TIS Capacity Engineer in the regional mechanized database system. This 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.

2.5.2 The DESP shall submit DC Distribution (Power Board) assignments to the AT&TIS Capacity Engineer via PowerPro DC Distribution Worksheets or populate directly as applicable into the regional mechanized database system.

2.6. Front Equipment View Records (Rack Elevation Drawings)

2.6.1 Front Equipment View Records are records of the physical location of equipment on various frameworks throughout the IS site. 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 IS site records, such as assignment records support the Front Equipment View Record.

2.7. Assignment Records

2.7.1 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).

2.7.2 The DESP shall maintain the assignment information in the appropriate Tabular Database system.

2.7.3 Remote Alarm Assignments reflects serial and discrete status/command terminations for Network Elements (NE) on a IS site (CO) Telemetry Alarm Unit.

2.8. Equipment Numbering Plans for Information Services Equipment

2.8.1 The numbering of bays and frames on all IS site records shall be consistent with the Floor Plan Record.

2.8.2 Switching equipment shall conform to the manufacturer's lineup and frame numbering scheme.

2.8.3 New equipment frames or lineups shall be designated numerically. These numbers shall be unique and assigned in accordance with AT&TIS Space Planning Guidelines.

2.9. Cable Hole Numbering Plans for Information Servicess

2.9.1 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.

2.9.2 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.

2.9.3 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.

2.9.4 Information Services cable hole numbering may be encountered in AT&TIS 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.

2.9.5 For existing IS site buildings, new cable holes shall be numbered in keeping with the established scheme in use in the building. For new IS site buildings, the second method above (utilizing compass direction) shall be used.

2.10. Grounding Records

2.10.1 The archived Grounding Schematic (650 Series) Drawings are available on the electronic document storage system for pre-merger Legacy-S. 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.

2.10.2 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 or other appropriate drawing 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

2.11. Power Equipment Records

2.11.1 Power Equipment Records are those IS site 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 any time equipment is added, changed, or removed from a CO.

2.12. Fuse Bay Equipment Records

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

2.12.2 Fuse Bays were originally engineered to provide secondary distribution for many different, small amperage equipment types spread over a large area of the IS site. 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.

2.12.3 Some of the active Fuse Bays have been converted to a regional mechanized database system and the DESP shall maintain the Assignment Record when removing circuits. If the fuse bay record has not been created the DESP shall include a specific installer note in the detailed specification to update the fuse record book associated with the bay for circuits being removed.

2.13. AC Service - PDSC Records

2.13.1 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&TIS Capacity 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.

2.14. Miscellaneous Power Records

2.14.1 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.

2.14.2 Miscellaneous Power Record Drawings are no longer available Generic versions of CO power detail information in a AT&TIS Power Drawing format are available in the electronic document storage system for reference.

3. MANUFACTURER AND AT&TIS EQUIPMENT DRAWINGS

3.1. General

3.1.1 The appropriate IS site 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&TIS drawing for the associated equipment.

b) AT&TIS drawings. These drawings always supersede information shown on the associated manufacturer's drawings/documentation.

4. AT&TIS TABULAR AND GRAPHICAL/MECHANICAL AT&TIS RECORDS

4.1. General

4.1.1 Upon receipt of the AT&TIS Equipment Order (AEO), the DESP shall determine which IS site records are required to complete the engineering process.

4.1.2 To determine which IS site records are required, the DESP shall cross-reference Table 4-3. The following details the process for creating or updating IS site records.

5. AT&TIS RECORDS CREATION AND UPDATING

5.1. General

5.1.1 This section details the procedures employed when creating or updating IS site 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 IS site 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 AEO assignment discrepancy with the AT&TIS Equipment Engineer.

5.1.4 The DESP shall make all required "as built" changes to tabular AT&TIS 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 AT&TIS records (refer to Table 4-3) and forward marked hardcopy to the ATTIS Equipment Engineer no later than 30 calendar days following completion of installation.

5.2. AT&TIS 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. AT&TIS Record Marking Standards

5.3.1 The following colors shall be used when manually updating IS site records which will be returned to AT&TIS 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. IS site 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 draftsperson, 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 IS site records are changed:

a) All IS site 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 AT&TIS's AEO 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&TIS 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 draftsperson. When X3 notes are used, they shall be color-coded as described above and formatted as follows.

X3: appropriate note to draftsperson

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 AT&TIS Equipment Engineer.

5.3.4 The DESP shall submit all updated IS site records to AT&TIS Equipment Engineer per instructions on the AEO.

5.3.5 The DESP shall review any installer marked records and insure drawing standards violations are corrected prior to submitting to AT&TIS Equipment Engineer.

5.4. Office Record Distribution

5.4.1 For E&I or EF&I jobs, copies of all new and/or changed AT&TIS records, whether administered by the DESP or AT&TIS, shall be forwarded to the DESP's installer. For E only jobs, copies of AT&TIS records, as part of the installation package, shall be forwarded to the AT&TIS Equipment Engineer or the Installation Supplier as noted in the AT&TIS Equipment Order.

5.5. Updating Floor Plans

5.5.1 The DESP shall request the AT&TIS Equipment Engineer to resolve unexpected space requirements with the AT&TIS Capacity Planner.

5.5.2 The DESP shall forward information on blocked cable holes, cable racks, cable paths, etc. to the AT&TIS Capacity Planner and/or the AT&T Equipment Engineer.

5.6. Updating AC and DC Power Records

5.6.1 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&TIS Capacity Engineer via PowerPro AC and DC Distribution Worksheets (available on the Mechanization Team Web Site under the PowerPro Tab).)

5.6.2 Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU) RECORDS

a) Fuse record application:

1. Fuse position number

2. Fuse size
3. Secondary distribution cable run length, size, and connector type, if required.
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.

b) The DESP shall forward the BDFB/SPDU Worksheet to the turf vendor and the AT&TIS Capacity Manager within 5 working days of completing the BDFB/SPDU installation.

c) The ATTIS Capacity Manager shall input the information from the BDFB/SPDU Worksheet into fuse record database.

1. Engineered BDFB/SPDU Voltage Drop information shall be entered for each BDFB/SPDU into fuse record database.

5.7. Updating Front Equipment View Records (Rack Elevation Drawing)

5.7.1 Front Equipment View Records depict how relay rack (RR) frameworks in a IS site 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

5.8. Updating Assignment Records

5.8.1 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.

5.8.2 When a Network Element is terminated on an alarm surveillance unit, the DESP shall update the alarm assignment drawing where applicable and forward/upload to appropriate center/system except when the AT&TIS Equipment Engineer has updated the database previously.

5.8.3 The In legacy companies that require it, 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.

5.9. Voiding Records

5.9.1 IS site 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.

5.9.2 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 for three years. Voided records may be reinstated within the three-year period only by contacting AT&TIS Equipment Engineer. Records shall not be voided without the concurrence of the AT&TIS Equipment Engineer

[END OF SECTION]

SECTION 5 -- EQUIPMENT LAYOUT & EQUIPMENT ENVIRONMENTS

CONTENTS PAGE

TABLE 5-1 – SUMMARY OF CHANGES IN SECTION 5

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 This section describes the general requirements for Internet Services Equipment (ISE) layout engineering.

1.1.2 Changes in this issue of Section 5 (if any) are summarized in Table 5-1.

1.2. Equipment Layout Requirements

1.2.1 If the AT&T Equipment Engineer has provided a marked floor plan or specific equipment locations, the DESP shall request the AT&T Equipment Engineer to resolve any equipment layout changes with the AT&T Space Planner.

1.2.2 The equipment installation design shall ensure that technicians have optimum access to installed 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. All frameworks shall be designed and constructed for Zone 4 service when installed in AT&T equipment areas.

2.1.2 Free standing, floor anchored 7'-0" equipment frames shall be the AT&TIS standard frame configuration in equipment areas. The frames shall not be required to be top supported to overhead auxiliary framing or cable racks when secured with four floor anchors and frame designed for Zone 4 duty.

2.2. Equipment Frame Requirements

2.2.1 All equipment frames placed in AT&TIS site shall be in compliance with BSP 800-000-102MP, "Central Office Equipment Framework Design Requirements."

2.2.2 Cabinets for AT&T IS assigned areas shall be IS standard designs of Generic cabinet or Video cabinet, wide or standard width versions under purchase agreement from approved suppliers. Non-approved cabinets shall not be deployed.

2.2.3 All frames in a system or a line-up shall be the same height, unless otherwise authorized by the AT&T Equipment Engineer. Exception may exist when adding frames to lineup of existing frames of 9'-0", 9'-6", or 11'-6" height where the AT&T policy is to transition to 7'-0" height for all equipment. 7'-0" height frames are current standard for all new installations.

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. Cable management devices provided between frames leaving gap between rear of frames or guard boxes requires matching depth base box when gap is greater than 3 inches.

d) Rear aisle clearance shall not be less than 3 feet. Raised floor installations must maintain minimum of 1 full tile access (reference Section 3.14).

e) End guards and guard rail closing details shall be provided on all frame uprights not adjacent to another frame or a building obstruction.

f) End guards for equipment relay racks shall cover all cable in the adjacent equipment frame; cabinets shall have side panel installed for all units located at end of aisles.

g) End guards for relay racks 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 AT&T 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.

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

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

3. COLLOCATION

3.1. General

3.1.1 Cages and other floor space arrangements for collocation shall be in accordance with the AT&T Interconnection's Technical Publication for Collocation.

3.1.2 The areas designated as Common Access Area (CAA) shall be covered under collocation guidelines as well.

[END OF SECTION]

SECTION 6 -- EQUIPMENT BUILDING ENVIRONMENT REQUIREMENTS

CONTENTS PAGE

TABLE 6-1 – SUMMARY OF CHANGES IN SECTION 6

Change	Item in 09/08 Issue	Item in this Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		

1. INTRODUCTION

1.1. General

1.1.1 This section outlines environmental requirements for AT&T IS offices. 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 AT&T IS 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 IS 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 then 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.

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.

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-76301 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-76301. This includes openings for building-related services, house telephone equipment service, openings for power (AC and DC), and other cables.

4.4. Fire Suppression Systems

4.4.1 Fire suppression systems may be placed in all AT&T IS non-central office spaces including commercially leased spaces as required by local fire code.

4.4.2 Priority for Fire Suppression Systems in locations requiring fire suppression is:

a.) Pre-action dry pipe

b.) FM-200 Fire Suppression System

c.) Wet pipe

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.

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.

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 supersede 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 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. Equipment lighting shall be provided above the front and rear aisles of equipment related work areas.

8.2.2 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).

8.2.3 For equipment areas with overhead racking and raised floor cooling one of the lighting systems listed below shall be used:

a) Airey-Thompson. See Common Systems Minor Materials List for ordering information.

b) H.E. Williams, Inc. See Figure 6 – 1 for installation and ordering information.

8.2.4 For equipment areas with overhead HVAC cooling, LumiCool lighting fixtures shall be used. LumiCool fixtures include air diffusers. Reference ATT-TP-76202 for engineering and installation details for the LumiCool fixture.

8.2.5 Minimum levels of illumination shall be maintained in 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. Typically a fixture with a single 32W florescent lamp placed in a continuous line down the center of the maintenance aisle at approximately 7’4” height will provide adequate lighting. If dual lamp fixtures are used in the maintenance aisle, fixtures shall be 4’ and spacing between fixtures shall not exceed 4’.

8.2.6 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.

8.2.7 High-intensity lights in each equipment aisle are to be controlled by a switch designated for that aisle. In small offices all lighting can be switched at a single location.

8.2.8 Motion detector lighting controls (infrared technology) shall only be used in AT&T IS 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.

8.2.9 Light fixtures shall not be placed directly over batteries.

8.2.10 Additional frame and aisle lighting requirements are given in Section 8 of ATT-TP-76401. Illumination

8.2.11 Fluorescent lighting and it’s supporting apparatus (i.e.: aux framing, cable racking, unistrut, etc) shall be engineered so the light fixture is no lower than 7’-0” above the finished/raised floor and shall not block cabinet doors, removal of equipment or access to overhead cable racking

8.3. Building Lighting

8.3.1 General building lighting for AT&T IS offices is provided by Corporate Real Estate.

8.3.2 Additional information may be found in ATT 812-000-003..

9. EMERGENCY LIGHTING

9.1. General

9.1.1 Emergency lighting for AT&TIS sites in AT&T owned facilities is provided by Corporate Real Estate (CRE).

9.1.2 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 the building 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 shall be fed from the DC Power Plant. All other emergency lighting and egress systems shall be on CRE supplied equipment

TABLE 6-2 – OPERATING TEMPERATURE & HUMIDITY LEVELS

Area	Normal Operating Ambient Average Temperature Range	Normal Operating Relative Humidity Range
Mission Critical Data Room[2]	68°F - 75°F[1]	40 – 55%
IS Equipment Area	55°F - 78°F[1]	15 – 55%
Power Room with Batteries	55°F - 77°F	5 – 55%

1. See NOTE for paragraph 2.1.2
2. Raised floor cooling and backup HVAC systems

TABLE 6-3--MINIMUM MAINTAINED ILLUMINATION LEVELS

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

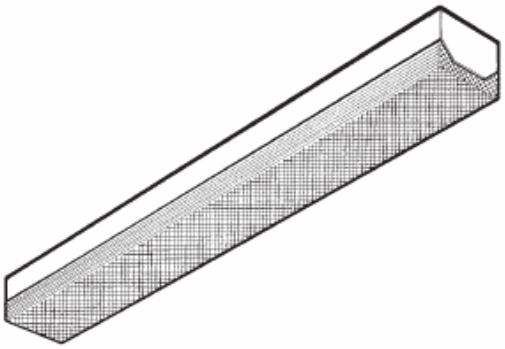
2. Measure illumination in aisle center, five feet above floor, with meter aimed upward.

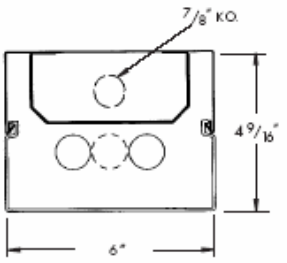
FIGURE 6 – 1, WILLIAMS LIGHTING SYSTEM

CEILING OR WALL MOUNT **WRAP AROUND**

SERIES **20**

VOLTAGE TYPE JOB





SPECIFICATIONS

- HOUSING – 22 Ga. die formed C.R.S.
- SHIELDING – clear acrylic prismatic diffuser
- FINISH – white powder coating with 5 stage iron/phosphate prepared metal. 92% minimum average reflectance
- ELECTRICAL – electronic ballast standard, (where available) rated Class P
- LABELS – UL listed as fluorescent fixture suitable for dry or damp locations. CUL listing for Canada available — consult factory
- MOUNTING – surface or suspended

FEATURES

- Diffuser provides uniform distribution and low brightness side illumination
- Continuous diffuser support system along luminaire sides
- Universal lamp bracket allows for field conversion from 1 to 2 lamps (or 2 to 1)
- 7/8" K.O. in ends for continuous row mounting
- Wireway is accessible without the use of tools
- Ballast secured by 2 captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation and minimal ballast noise
- All parts painted after fabrication to facilitate installation, increase efficiency, and inhibit rusting

SUBMITTAL INFORMATION

NOMINAL LENGTH
2 = 2 ft.
3 = 3 ft.
4 = 4 ft.
8 = 8 ft.

TOTAL LAMPS
1, 2, or 4

SHIELDING
A = Acrylic pattern 12 lens

20-4-232-A-OPTIONS-EB2

LUMINAIRE SERIES

LAMP WATTAGE/TYPE
17 = 2', 17 watt T8
20T12 = 2', 20 watt T12
25 = 3', 25 watt T8
30T12 = 3', 30 watt T12
32 = 4', 32 watt T8
40T12 = 4', 40 watt T12

EM7 = Emergency battery pack (B70A) or equivalent

BALLAST TYPE: (dependent on specified lamp type)
EB1 = 1 lamp electronic ballast
EB2 = 2 lamp electronic ballast
EB4 = 4 lamp electronic ballast
EB2/2 = (2) 2 lamp electronic ballasts
EBLH2 = 2 lamp electronic ballast, <10% THD
MB1 = 1 lamp magnetic ballast
MB2 = 2 lamp magnetic ballast
T8: EB defaults to instant start
T12: MB defaults to rapid start

For more options, accessories, and product details, refer to Information Section

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20 SERIES

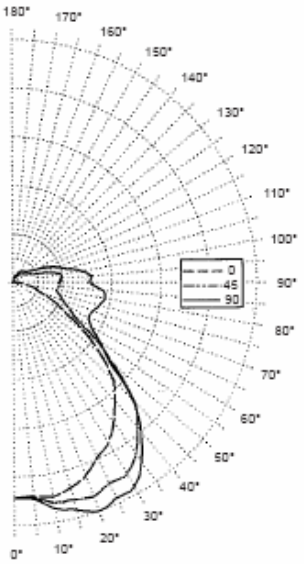
PHOTOMETRY INFORMATION

Williams Catalog #20-4-232-A-EB2-120
Test Report #9966.0, Dated 7/23/98

Lamp Type: F32T8/SPX35/RS
Lamp Quantity: 2

CANDLEPOWER DISTRIBUTION

VERT. ANG.	HORIZONTAL ANGLE 0	45	90	ZONAL LUMENS
0	1207.	1207.	1207.	
5	1199.	1207.	1216.	115.2
15	1187.	1256.	1313.	355.0
25	1081.	1237.	1329.	565.0
35	959.	1168.	1223.	709.7
45	781.	940.	937.	700.1
55	478.	556.	586.	486.5
65	256.	341.	460.	345.7
75	130.	266.	492.	303.6
85	43.	256.	497.	290.2
90	22.	256.	424.	
95	11.	266.	435.	263.2
105	9.	226.	314.	204.3
115	0.	114.	207.	117.0
125	0.	81.	119.	64.9
135	0.	66.	90.	44.7
145	0.	57.	81.	32.1
155	0.	39.	54.	16.2
165	0.	30.	39.	6.1
175	0.	0.	0.	.0
180	0.	0.	0.	



LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% FIXTURE
0 - 30	1035.	17.5	22.4
0 - 40	1745.	29.6	37.8
0 - 60	2932.	49.7	63.5
0 - 90	3871.	65.6	83.8
90 - 120	585.	9.9	12.7
90 - 130	649.	11.0	14.1
90 - 150	726.	12.3	15.7
90 - 180	749.	12.7	16.2
Total Luminaire 0 - 180	4620.	78.3	100.0

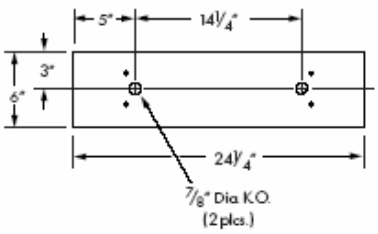
TOTAL LUMINAIRE
OPTICAL **EFFICIENCY** = **78.3** %
SPACING CRITERIA: ACROSS= 1.5 ALONG= 1.3

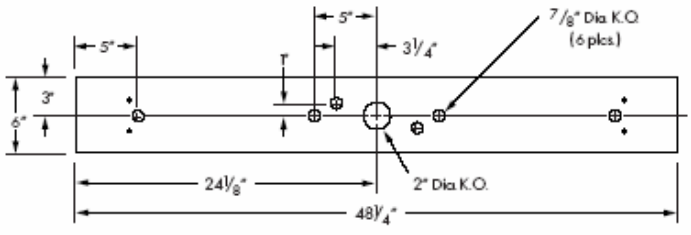
ZONAL CAVITY COEFFICIENTS

EFFECTIVE FLOOR CAVITY REFL = .20

CEILING	.80			.70			.50		
WALL RCR	.70	.50	.30	.70	.50	.30	.50	.30	.10
0	.90	.90	.90	.87	.87	.87	.80	.80	.80
1	.82	.78	.74	.78	.75	.71	.69	.66	.64
2	.74	.68	.63	.71	.65	.61	.61	.57	.53
3	.68	.60	.54	.65	.58	.52	.54	.49	.45
4	.63	.54	.47	.60	.52	.46	.48	.43	.39
5	.58	.48	.41	.55	.46	.40	.43	.38	.34
6	.53	.43	.36	.51	.42	.35	.39	.33	.29
7	.49	.39	.32	.47	.37	.31	.35	.30	.26
8	.45	.35	.28	.43	.34	.28	.32	.26	.22
9	.42	.31	.25	.40	.30	.24	.28	.23	.19
10	.39	.28	.22	.37	.27	.22	.26	.21	.17

MOUNTING





8' fixture (96 1/2" actual length) repeats same pattern both ends

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JP42826 04/02

[END OF SECTION]

SECTION 7+ -- WIRE, CABLE and FIBER REQUIREMENTS

CONTENTS PAGE

TABLE 7-1 – SUMMARY OF CHANGES IN SECTION 7

Change	Item in 09/08 Issue	Item in this Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		

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 PAO and ATT-TP-76401.

1.2 Cable Holes

1.2.1 The addition of new cable hole penetrations shall be coordinated with the AT&TIS 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&TIS Equipment Engineer, power and switchboard cables shall be run on separate cable racks. Unless otherwise specified by the AT&TIS 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 AT&T IS equipment environment 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 Synchronization Cable

2.3.1 See Section 11 of ATT-TP-76401 for synchronization cable requirements.

2.4 Relay Racks

2.4.1 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 Work clearance for newly placed AC panels serving equipment with AC input voltages 150V AC or less to ground shall be a minimum of 36 inches per the NEC Article 110-26. This does not include the rear or side(s) when the equipment is built for no access.

3.1.2 Work clearance for newly placed AC panels serving equipment with AC input voltages greater than 150V AC to ground shall comply with NEC Article 110-26, “Spaces About Electrical Equipment".

3.1.3 All wiring and conduit ordered for AT&T IS equipment space shall meet the requirements of the National Electric Code (NEC), Nationally Recognized Testing Laboratory (NRTL) tests, and local code.

3.1.4 AC feeders in telecommunications equipment areas (including power rooms) shall be enclosed in rigid conduit, intermediate metallic conduit (IMC), electric metallic tubing (EMT), bus duct or metallic raceway. If EMT is used, compression couplings and junction boxes shall be used; set screw type couplings are not acceptable.

3.1.5 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® UA or Liquidtight® LA 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® UA or Liquidtight® LA rated UL 94 V-0) shall not exceed six feet.

c) Jacketed Metallic Clad (JMC) flex (Seal-Tite® UA or Liquidtight® LA 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.

d) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet when utilized as whips in a raised floor environment.

3.1.6 AC branch circuits shall be enclosed in non-flexible metallic conduit or raceway. Metallic Armored Clad (MAC) cable may only be used in the following two circumstances.

a) Factory installed within bay end guards.

b) AC outlet extensions between bays, within the base of the bay.

3.1.7 Romex® cabling and BX-type conduit shall not be used in the IS equipment space.

4. DC POWER CABLE AND WIRE

4.1 Approved Cable

4.1.1 All DC power cable (750 kcmil - 14 AWG single conductors, stranded or flex) shall be of the type approved by AT&T 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 AT&T. Run all leads in continuous lengths unless it is necessary to reduce cable size at the equipment ends.

4.1.2 Power wire and cable that has been previously in service shall not be reused unless directed otherwise by the AT&T Engineer subject to the following restrictions.

Power wire and cable shall only be authorized for reuse subject to the following limitations due to safety and fire hazard concerns associated with the longevity of the cable insulation:

1.) In-service, or previously in service or installed primary or secondary DC Power cable that is still in the cable rack and is less than 15 years old may be re-terminated in the same bay or in a bay closer to the power source as directed by the AT&T engineer.

2.) In-service, or previously in service or installed primary or secondary DC Power cable that is still in the cable rack that is between 15 and 25 years old can only be reused if physically inspected, tested if necessary, and approved by the local METS or Power Technical Support representative.

3.) Power cable more than 25 years old shall not be reused. If the age of the power cable cannot be verified, it shall not be re-terminated.

4.) The Installation Vendor shall notify the AT&T Engineer if any signs of physical compromise of the reused power cable are detected.

5.) In-service, or previously in-service, or installed primary power cable shall not be extended via an inline-tap or other transitional device in order to reach bays farther from the power source.

6.) If there is no way to provide a temporary power feed for an in-service cutover to an existing power bay termination bar, the last two feet of in-service primary power cable (regardless of age) may be reused for cut over to an existing power bay. The existing cable stubs shall have two layers of tape applied from the power bay termination to the H-Tap.

7.) Under no circumstances shall primary or secondary DC power cable that has been removed from the cable racking be reused.

4.1.3 When the equipment manufacturer provides a cabling method, that cabling method shall be utilized.

4.1.4 Flexible class 1, 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.

d) Where the AT&TIS Power engineer authorizes the additional expense (e.g., due to long runs with multiple turns)

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 (ladder-type) 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, which already contain power and transport cable.

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 shall not exceed an ultimate pileup or accumulation of 7" without authorization from AT&TIS Power representative.

4.3.2 Vertical power cable runs of three or more floors without intermediate 20 foot horizontal runs or loops require one clamp (cable brake) 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 The following coaxial cables are intended to transport SMPTE 259M and 292M signals whose frequencies range between 5 MHz and 1.5 GHz as well as satellite L-Band signals whose frequencies range between 950 MHz and 1.45 GHz: 1855A Sub-Miniature type, 23 AWG center conductor; 1505A RG-59/U type, 20 AWG center conductor; and 1694A Low-Loss Serial Digital Coax type, 18 AWG center conductor. These cables are all UL-flammability rated as CMR.

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 conductors. 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): Not applicable to Legacy AT&T and Bell South.
Red - battery wires.
Black - battery return 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 AT&T 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-TELCO-002-531-050. A copy of the ATT-TELCO-002-531-050 may be obtained from AT&TIS.

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-76401.

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.

9.2.3 AC-type materials shall be used as specified on the Minor Materials List (MML).

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 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.

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

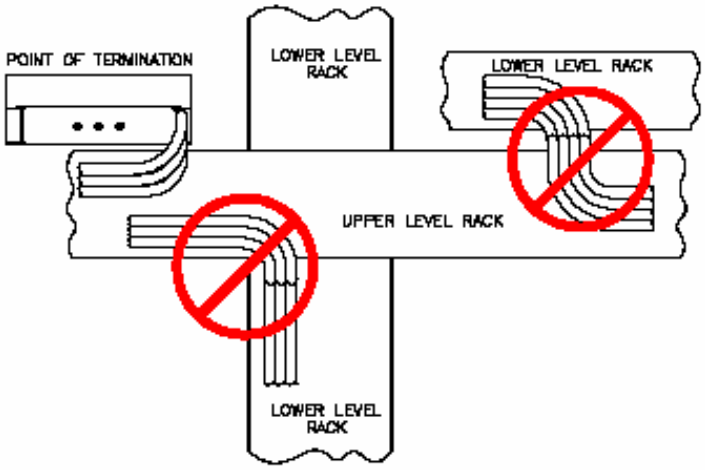
10.1.1 The DESP shall order only AT&T approved fiber patch cords and fiber cable shown in ATT-E-00136-E notes 9, 11, 12 and 15.

11. ETHERNET CABLE

11.1. Ordering Ethernet Cable

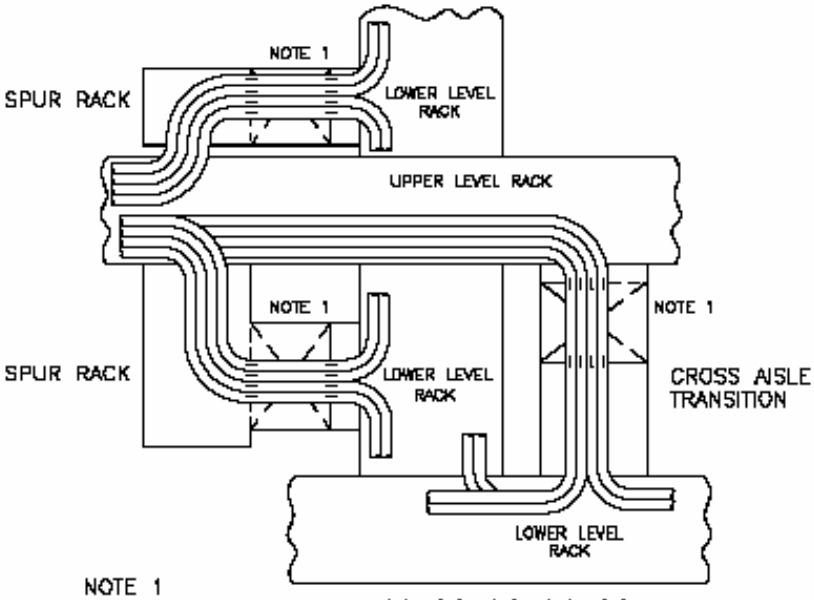
11.1.1 The DESP shall order Ethernet cable per drawing ATT-E-00053-E.

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 TERMIANTION 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

CONTENTS PAGE

TABLE 8-1 – SUMMARY OF CHANGES IN SECTION 8

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. CABLE RACK

1.1. GENERAL

1.1.1 This section covers apparatus requirements for cable racks in Information Systems Equipment (ISE) 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 800-000-101 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 for any applications in the equipment space under any circumstances. Only approved anchor designs such as Hilti HSL, HDI, Kwik-Bolt or epoxy anchors shall be used in the equipment area.

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 h

1.2.4 ave a non-corrosive plated finish. Due to environmental concerns traditional yellow chromate zinc plated or hexavalent finished hardware may no longer be commercially available. New hardware may be protected with RoHS compliant acceptable trivalent or non-chromate conversion coated finish over plating. The new coating shall have a distinctive color other than clear or yellow to allow field personnel to identify a finish on the hardware.

1.2.5 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.

1.2.6 Cable rack pans shall not be extended through a fire rated wall.

1.2.7 Metal is the only approved material that shall be used for cable rack pans.

1.2.8 Cable rack panning shall be provided in sufficient width to cover the cable rack without the need for multiple pans.

1.2.9 Cable rack with welded-on uprights (horns) shall not be provided.

1.2.10 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-76301, 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. In high seismic areas, floor stanchion supported cable rack shall conform to requirements of BSP 800-006-152.

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.

1.6. Cabling Under Raise Access Floor

1.6.1 Running cable under a raised access floor shall be done in a manner similar to running cables overhead on a suspended cable rack. When establishing new raised floor areas or extending an existing raised floor, a specific cable plan record shall be created. When adding cables to an existing raised floor area where a document does not exist, a plan shall be created and the path for the added cables shall be documented. It is not required to

document existing conditions unless negotiated as part of the specific order. This cable plan shall be based on the AT&T development plan, architectural plan and existing telephony records.

1.6.2 All cable paths shall be identified by cable routing coordinates and based on cable type. Cable shall be routed to maintain segregation, allow even cable loading and minimize under floor bridging.

1.6.3 Fiber cables and protection shall follow guidelines for fiber runs in paragraph 4. Fire detection and ground wires shall be run separate from transmission cables.

1.6.4 All cable diversity rules shall be followed under floor as well as above.

1.6.5 Primary power cables shall be located on a cable rack and recorded on a floor plan drawing and secured to cable rack.

1.6.6 For any new installations of under floor cable runs, cables shall be run on cable racks, trays or other cable supporting structure to keep cables off building floor.

1.6.7 Cable bridges shall be used for cross aisles per the office cable plan to prevent mixing of primary power cable.

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 800-000-101 “ 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. CABLE DISTRIBUTION SYSTEMS

3.1. General

3.1.1 This section covers the equipment requirements for engineering of a system of cable racking called cable distribution systems.

3.1.2 For specific hardware and application information for cable distribution systems, refer to the manufacturer's documentation.

3.1.3 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.

3.1.4 Cable distribution systems may provide access between major like systems or unlike systems with proper hardware separation.

3.1.5 Cable distribution systems and assembly hardware shall be of a non-corrosive finish.

3.2. Applications

3.2.1 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.

3.2.2 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).

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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**.**

3.2.7 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.

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

3.3. Definitions

1. Premise Fiber Optic Cable:
Premise Fiber Optic Cable is intended for indoor use within an environmental structure (i.e. home, commercial, or industrial building) to carry optical signals from place to place within the structure. There are two types of Premise cable and they are as follows:

2. Distribution Cable:
Distribution Cable is cable consisting of two or more fibers, assembled individually or as members of multi-fiber units, normally intended for installation in relatively long lengths, and in installations normally requiring each entire cable end to be terminated at a single location. **Distribution cable is what we commonly refer to as OFNR (Optical Non-conductive Riser) cable.**

The minimum requirements for Distribution cable are as follows:
A. Must consist of two or more fibers.
B. Must be for indoor use only.
C. Must be riser rated i.e. rated for use between floors or in a riser shaft.
D. Must be tight buffered.
E. Must be Type 1 construction.
F. Must have an independent strength member that is not part of the fiber construction.

3. Interconnect Cable:
Interconnect Cable consists of one, two or four fibers, reinforced and jacketed, intended for short distance applications. One-fiber cable is often called Simplex Cable, while two-fiber cable is known as Duplex Cable. Duplex Cable consists of two single-fiber (simplex) cables or two individual fibers assembled with an overall jacket, or two simplex cables bonded together or may be referred to as “Zip Cord”. In bulk, these cables are referred to as Simplex Cordage or Duplex Cordage. Quad cables consist of four single fibers reinforced and

jacketed or four simplex cables assembled and jacketed or bonded as a unit. **Interconnect cable is what we commonly refer to as either a jumper or a patch cord.**
Note: The difference between a jumper and a patch cord is defined as follows:
Patch Cord – A connection between a FOT panel and a Network Element.
Jumper – Defined as a connection within the FDF complex between panels i.e. FOT to FOT, FOT to OSP etc.

The minimum requirements for Interconnect cable or jumpers/patch cords are as follows:
A. Must consist of only one, two or four fibers.
B. Must be for indoor use only.
C. Must be tight buffered.
D. Must be Type 1 construction
E. Must **not** have an independent strength member that is not part of the fiber construction.

3.4 Cable Distribution Systems for Fiber Optic Cable and Associated Equipment

3.4.1 Fiber optic cable shall be run on dedicated fiber cable rack. Fiber cable slack shall not exceed 5 feet..

3.4.2 The use of inner-duct shall not be used within the cable distribution system or between equipment lineups.

3.4.3 Refer to Section 9 of ATT-TP-76401 for equipment requirements for fiber optic cabling and its associated equipment, including: Fiber Splice Facilities (FSF), and the Fiber Distribution Frame (FDF).

3.4.4 When OFNR cable transitions downward from a horizontal cable rack to a vertical plane, a preformed turndown shall be utilized. If using L-brackets in this scenario, no preformed turndown is required.

3.5 Fiber Protection System (FPS)

3.5.1 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 ISE equipment and the FDF. All equipment which uses fiber optic connectivity will hub to the FDF for all intra-office 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 its own unique color which is yellow. The only color approved for use within AT&T for Fiber Protection Systems is Yellow. 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. Note: There are different FDF requirements for Legacy T IXC service. They can be found in this document in Section 9, Sub-section 6.

3.6 Fiber Diversity

3.6.1 Definitions

A) Diversity is defined as “working” and “protected” circuits placed in separate routes.

3.6.2 Minimum Diversity Requirements

Diverse routing capability between NE's and FDF's or between NE's for primary and protect paths shall be required. Diversity may be accomplished in two ways: Example 1) by placing working and protect fibers on opposite sides of the same physical trough, duct or cable rack or Example 2) by placing working and protect fibers in completely separate routes. NOTE: It is not necessary to add multiple ducts, troughs or racks down the same line-up simply to achieve route diversity. Thus, a maximum of only one route per lineup will be allowed. Route diversity will be achieved via main aisles not line-ups. Optical Carrier or Gigabit rates of OC-192, their equivalent or higher shall require diverse routing for connections between the high speed Optical Carrier and the FDF to be accomplished via example 2 listed above. Fiber diversity for Optical Carrier or Gigabit rates less than OC-192 may be accomplished by example 1 or 2. Figures 8-22 through 8-27 provide examples of diverse fiber routing.

NOTE: More stringent Levels of diversity may be required due to specific customer requests, marketing product requirements or specific network requirements.

3.7. FDF Panel Diversity (OSP)

3.7.1 When OSP cable is brought into a location and those cables are routed diversely, all the way to the FDF (LGX), it is an acceptable practice to terminate these cables within the same bay as long as these cables are terminated in separate FDP (LGX) Shelves. These cables must be routed on opposite sides of the bay as well. If in the event pre-terminated LDS is being used than there could be a situation where both cabled will be running on the same side of bay. This is allowed as long as the cables take diverse routes after leaving the bay.

3.7.2 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 splice tray 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 Splice tray.

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.

3.7.3 Fiber Optic Cables (not to be confused with fiber optic patch cords or jumpers) shall not be placed in any fiber raceway/duct work of the fiber protection system. Fiber Optic Cable placements within the Central Office shall be placed on/in dedicated cable rack, L-Brackets, U-shaped cable rack horns or metallic conduit and will adhere to the standards as outlined in ATT-TP-76305, *Cable Installation, Removal and Mining Requirements - Cable Racks and Raceways*.

Note 1: Fiber optic cable shall be defined as multiple count fibers contained within a common fire retardant protective sheath.

Note 2: Fiber optic jumper/patch cord shall be defined as a single or dual stranded fiber independently contained within its own protective sheath without an independent strength member. Fix numbering.

3.7.4 An approved Fiber Protection System (FPS) shall be used for fiber optic patch cords between the FDF and the equipment/network element. The Fiber Protection System shall be provisioned along the entire length of the FDF and extended from the FDF to the associated network element.

3.7.5 The Fiber Protection System shall be placed horizontally parallel to within 6 inches of the terminating equipment i.e. FDF or Network Element. Each bay in the lineup should have a downspout. Each vertical drop from the downspout going to the bay should be placed within two inches of the top of the bay.

3.7.6 Horizontal Fiber Protection System routes between Optical Carrier systems with speeds of OC-192 (or equivalent i.e. 10G) or higher and FDF lineups should be provisioned with a minimum of 12” trough.

3.7.7 The Fiber Protection System over the FDF should be provisioned with 12” wide horizontal troughs and 4” wide vertical drops as a minimum.

3.7.8 The minimum trough size for overhead horizontal FPS is 4 inches.

3.7.9 When placing 12” Fiber Protection system, if threaded rod supports are required, the installation vendor shall use 5/8” threaded rod only.

3.7.10 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.

3.7.11 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.

3.7.12 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.

3.7.13 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.

Method 2 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. 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. **Note: Spiral wrap shall no longer be used as a drop option method.** In cases where the manufacturer provided split tube support can't be used and split tube needs to be attached to the FPS, the split-corrugated tubing shall be secured to the duct with either pop rivets, with nuts and bolts or waxed twine i.e. nine cord. Bolts shall be installed with the head of the bolt on the inside of the tubing and the nut on the outside of the FPS duct. Enough of the tubing must penetrate the FPS duct to eliminate any sharp bends; however, the tubing shall never be allowed to block any of the cable runs.

3.7.14 Jumper capacity in the FPS shall not exceed 75%. Fiber patch cords shall not be placed within the FPS with excessive slack or with a bend radius of two inches or less.

3.7.15 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). These fiber jumpers shall not be less than 6 feet in length. These fiber optic jumpers shall be ordered from an approved manufacturer. Fiber jumper slack shall be conditional as follows:

No more than 10ft of slack is permitted for fiber jumper runs over 100ft. Fiber jumper runs less than 100ft shall have no more than 10% of the jumper length as slack.

3.7.16 Fiber cable shall be placed on its own dedicated cable rack. Fiber cable shall not be placed in the Fiber Protection System (FPS).

3.7.17 For Fiber Protection System standards refer to the Standard Drawing: ATT-C-50002-E-00.

4. FRAME AND AISLE LIGHTING - FLUORESCENT

4.1. General

4.1.1 This section outlines engineering requirements for framework supported lighting systems employing fluorescent fixtures. See Section 6 of ATT-TP-76401 for emergency lighting and general building lighting.

4.1.2 General building lighting shall be on Essential Power.

4.1.3 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.

4.1.4 All wiring, conduit and fixtures installed in AT&TIS locations shall meet or exceed the requirements of the National Electrical Code (NEC) and local building codes.

4.1.5 For lumen levels see Section 6 of ATT-TP-76401.

4.1.6 See Section 13 of ATT-TP-76401 for grounding of equipment in the conduit system.

4.1.7 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)..

4.1.8 All fluorescent light fixtures shall be equipped with positively fixed lamp guards.

4.1.9 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).

4.1.10 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 IS Implementation Engineer.

4.2. Engineering Requirements

4.2.1 The DESP shall provide the installer specific work items for the placement of conduit, fixtures and switches for frame and aisle lighting.

4.2.2 All equipment lighting apparatus including wire and electrical raceways shall be listed for its purpose by a nationally recognized testing laboratory.

4.2.3 Conduits should be securely fastened at 5’0” intervals, and shall not exceed 6’0”.

4.2.4 Conduit shall not be run in locations normally occupied by auxiliary framing, cable racks, etc.

4.2.5 Conduit shall, where possible, be run parallel and adjacent to superstructure to assure maximum headroom and to provide easy access to cable racks.

4.2.6 Conduit shall not be run on cable racks.

4.2.7 All conduit and fittings shall be metallic

4.2.8 Lighting circuits supplied by multiphase service shall be assigned to balance the load on the different phases as closely as practicable.

4.2.9 Lighting equipment and convenience outlet circuits shall not be supplied by the same branch circuit.

4.2.10 Wiring for lighting equipment and convenience outlet circuits shall be run in the same conduit wherever possible.

4.2.11 Motor wiring shall be run in a separate conduit.

4.2.12 All fluorescent type lighting fixtures over equipment areas shall be rigidly attached and shall not be supported with chains.

4.2.13 NRTL listed solderless connectors shall be used for making all splices in junction boxes and fixtures.

4.2.14 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.

4.2.15 L Light fixtures in equipment areas shall be connected to lighting panels supplied by essential AC Power

4.2.16 If the kline 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.

5. CONVENIENCE OUTLETS AND MISCELLANEOUS CONDUIT

5.1. General

5.1.1 All wiring, conduit, and fixtures installed in AT&TIS locations shall meet or exceed requirements of the NEC and NRTL.

5.2. Convenience Outlets

5.2.1 The DESP shall provide the installer specific work items for placement of convenience outlets and risers.

5.2.2 Convenience outlets shall be furnished in accordance with the drawings associated with the equipment to be served. All convenience outlets shall have 3-wire parallel polarized receptacles of the duplex type.

5.2.3 Only grounding type receptacles shall be used for general purpose convenience outlets.

Convenience outlets may be located the on the aux framing supporting the aisle lighting fixtures with the face of the outlet facing down for ease of connectivity. One duplex outlet shall be installed every other aux bar at a minimum not to exceed 10 feet. Convenience outlets shall be placed in the front and rear of bays / cabinets.

6.2.7 Branch circuit conductors serving convenience outlets shall be #12 AWG copper. All conductors shall be insulated to 600 volts and meet the requirements of the National Electrical Code.

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 8-1A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

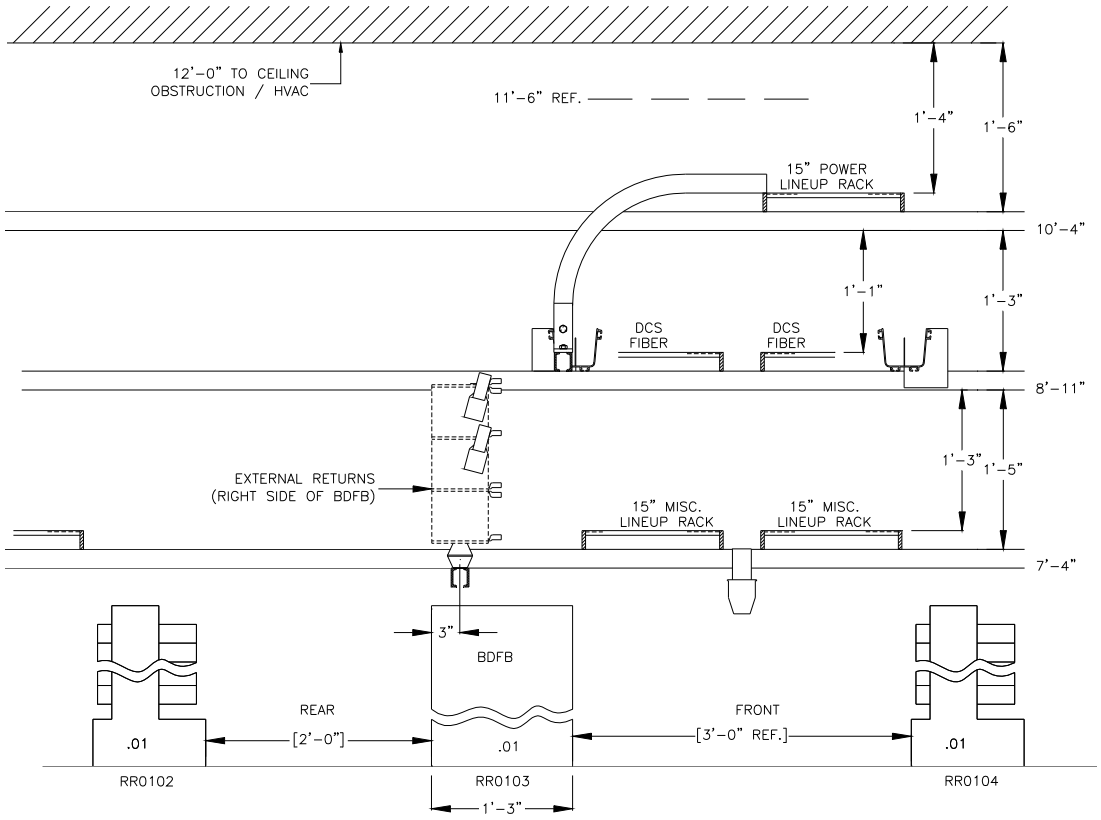


FIGURE 8-1B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

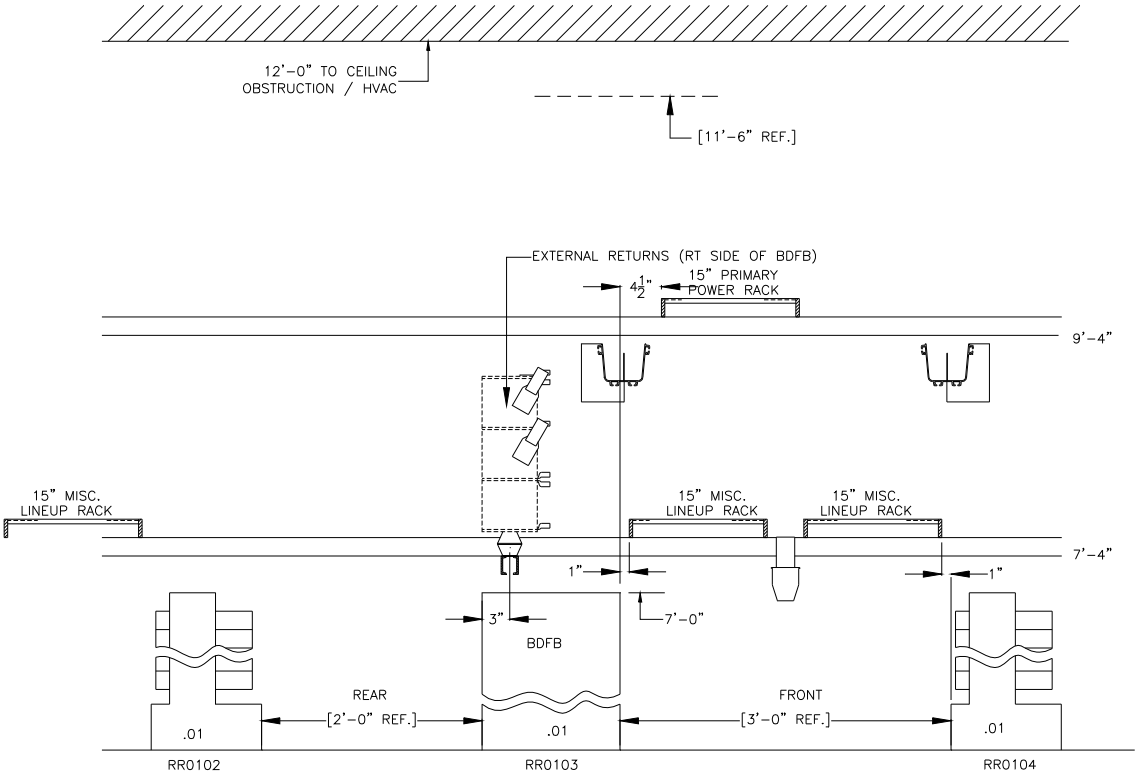


FIGURE 8-2A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

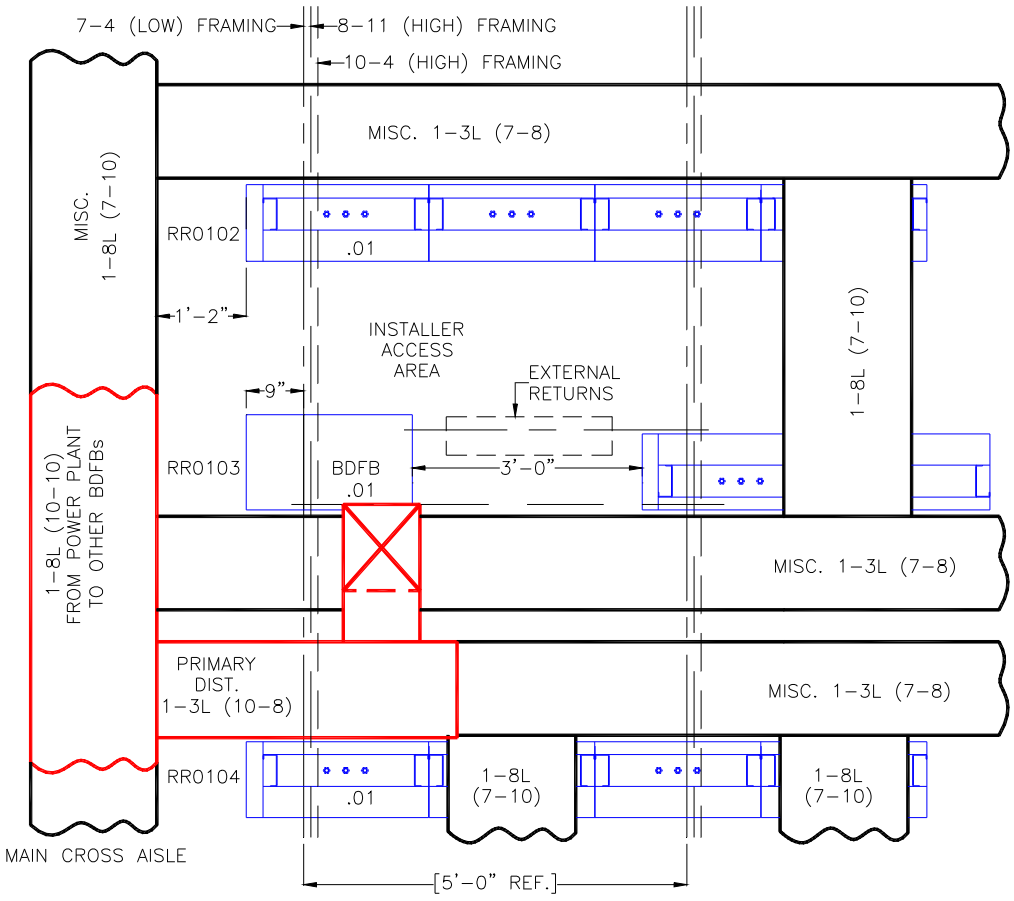


FIGURE 8-2B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

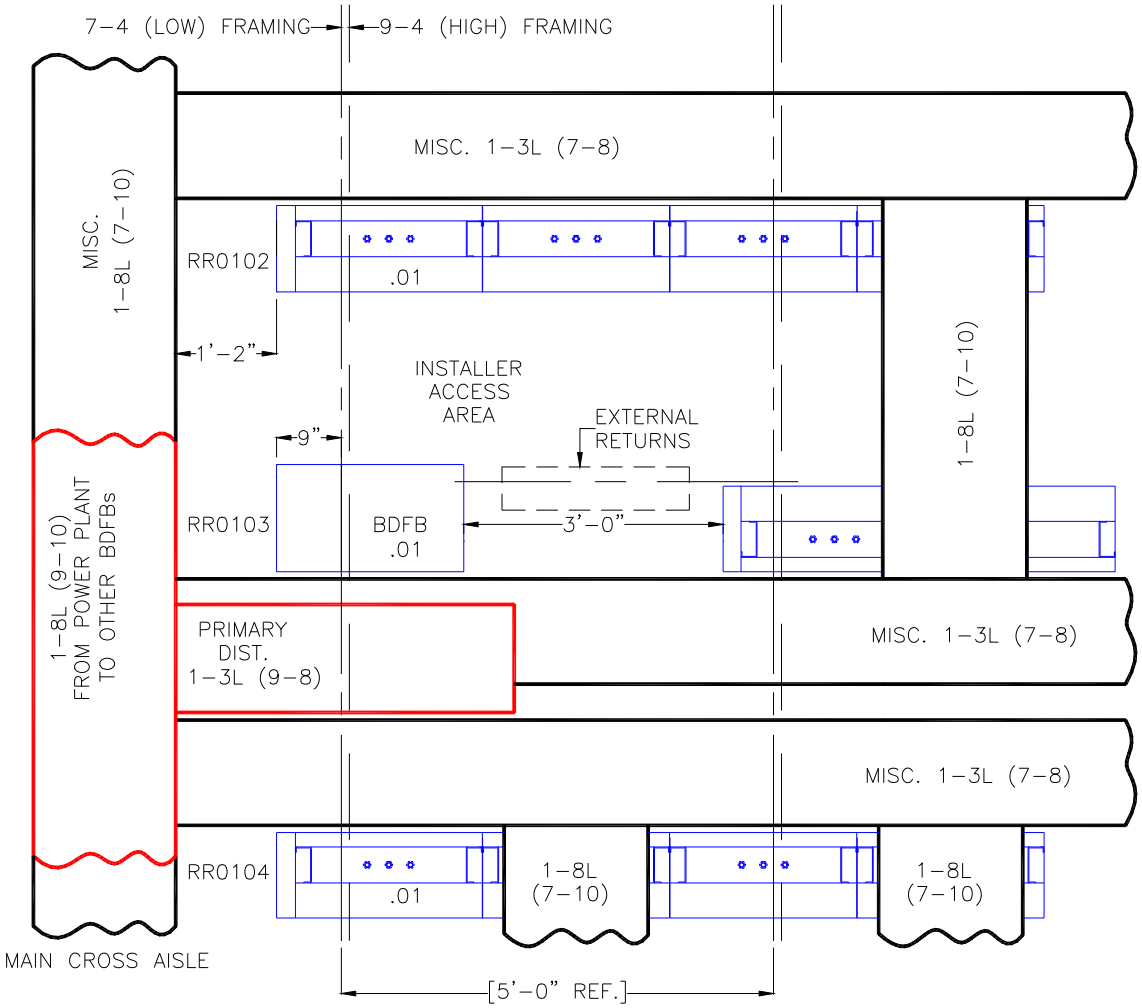


FIGURE 8-3A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

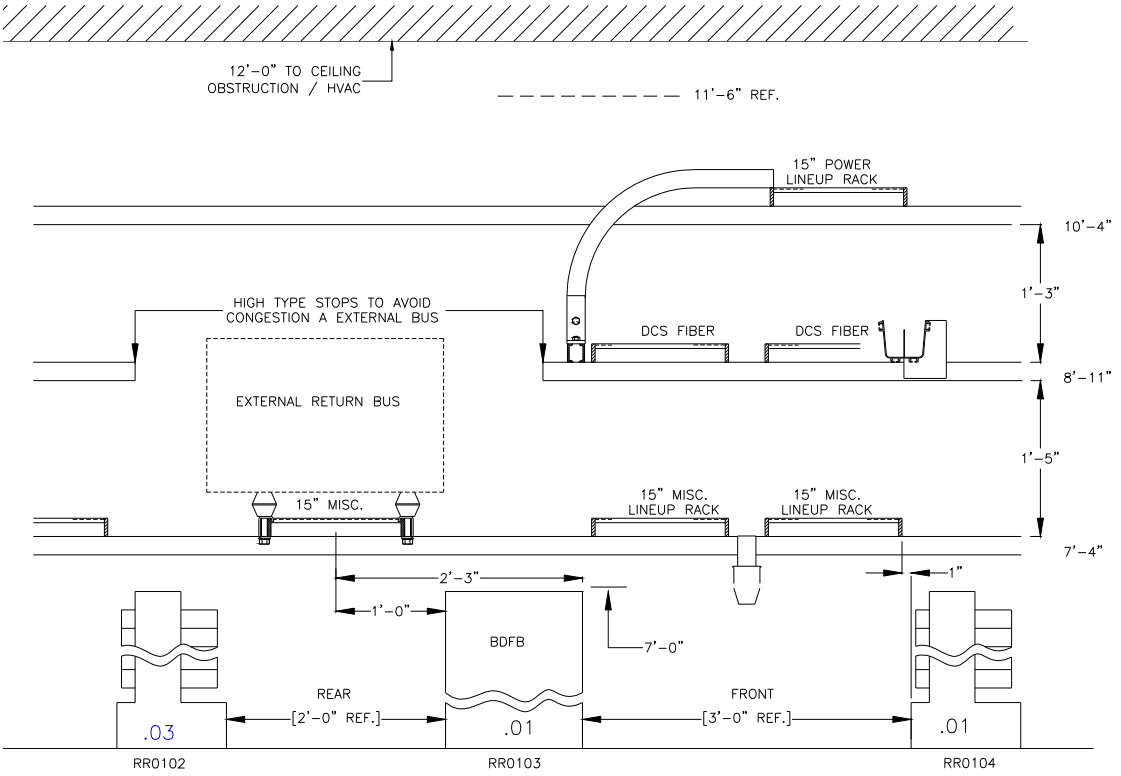


FIGURE 8-3B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

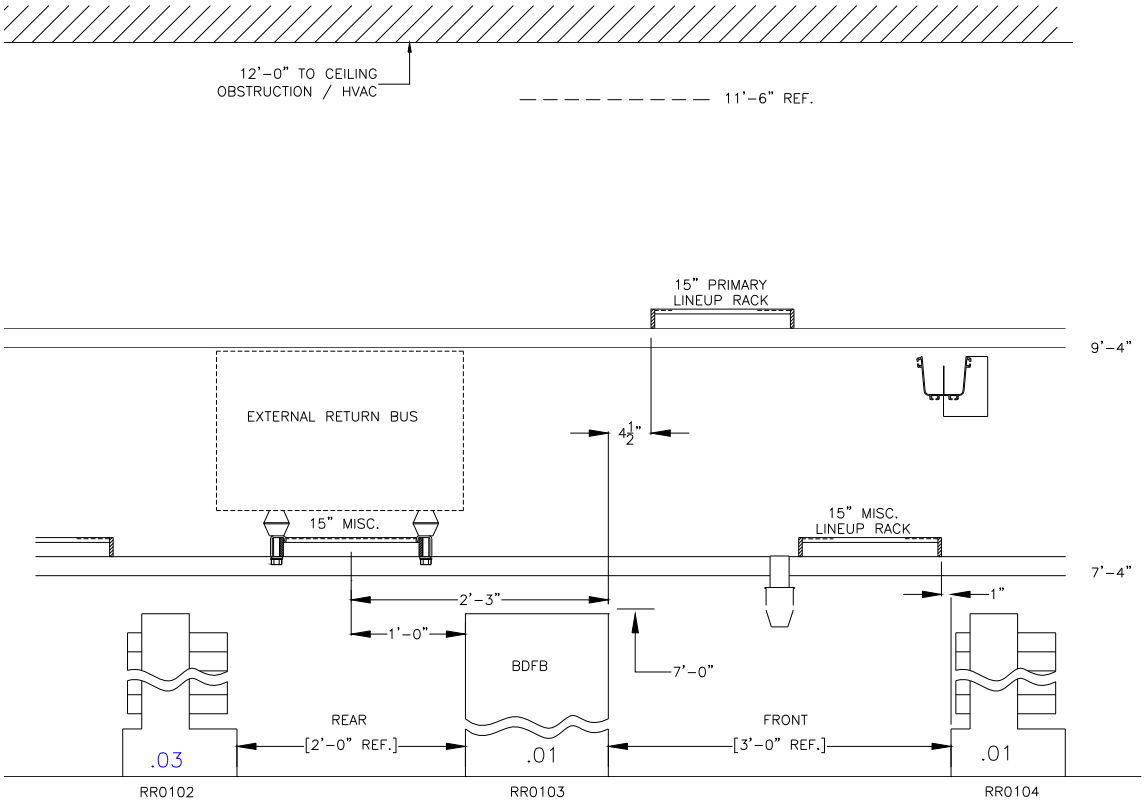


FIGURE 8-4A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

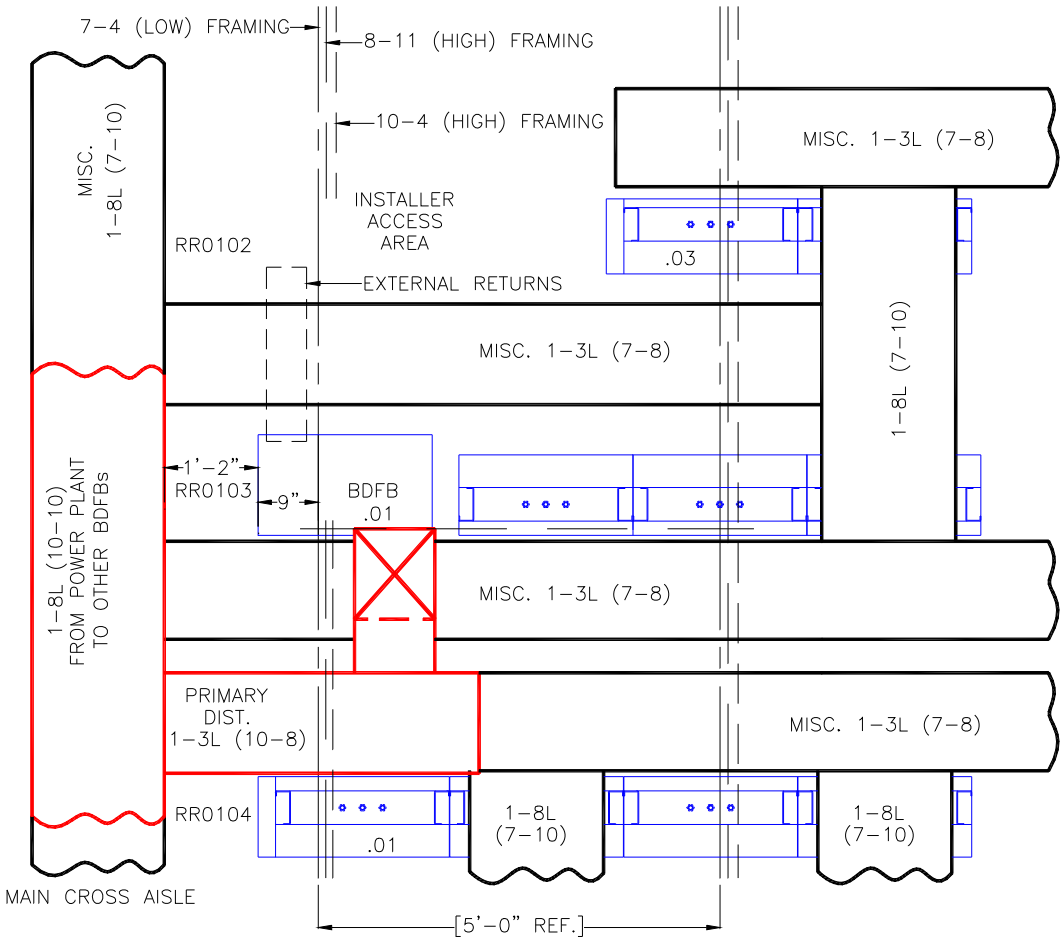


FIGURE 8-4B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING EXTERNAL RETURNS AT SIDE OF BDFBs

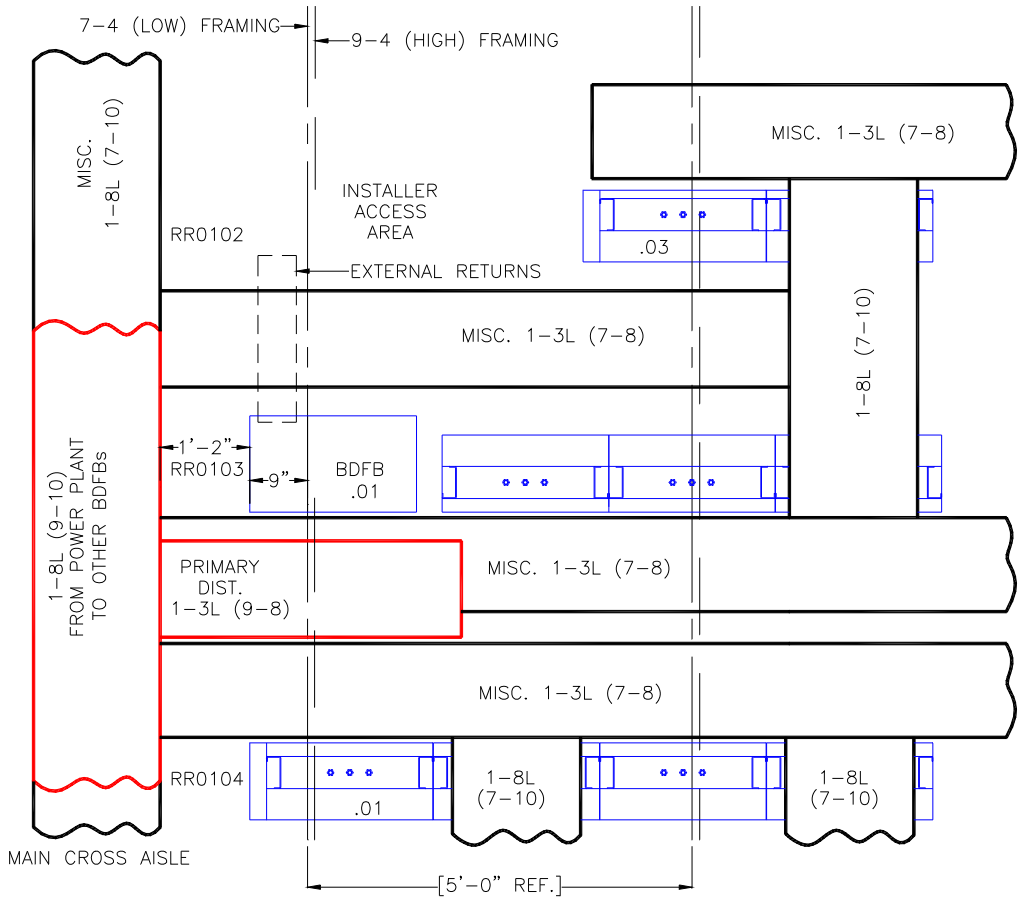


FIGURE 8-5 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH

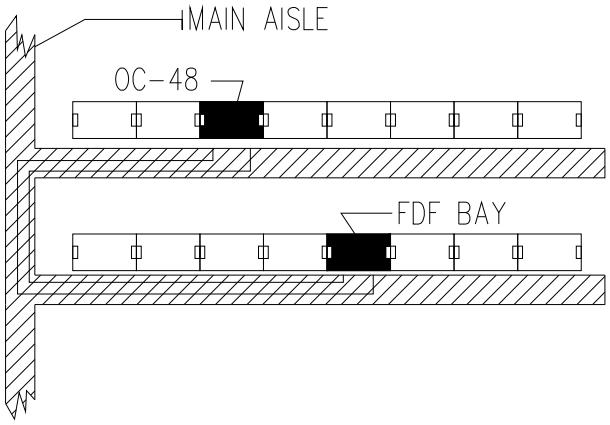


FIGURE 8-6 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH AND FROM FDF TO OC192 USING SEPARATE PATHS

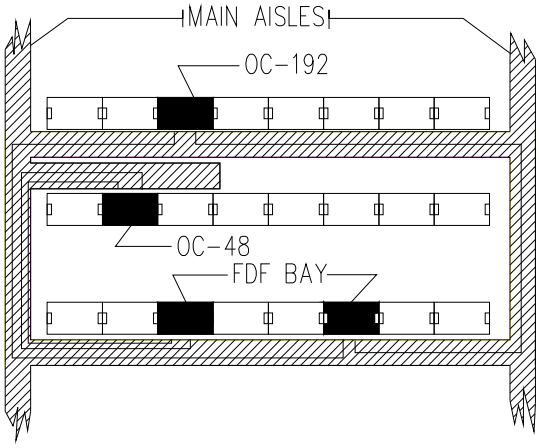


FIGURE 8-7 – DIVERSE ROUTING FROM FDF TO OC48 AND FROM FDF TO OC192 USING DIFFERENT PATHS.

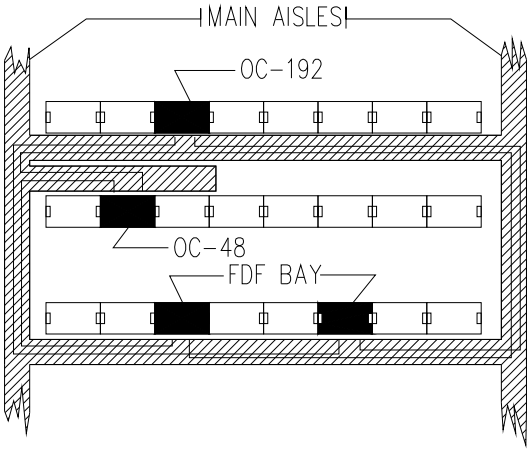


FIGURE 8-8 – DIVERSE ROUTING FROM FDF TO OC192 USING SEPARATE PATHS.

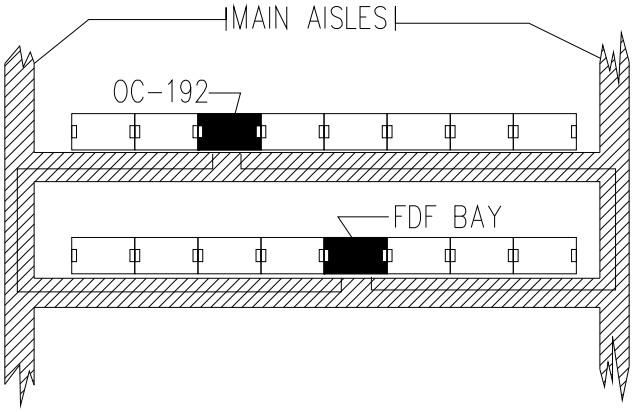


FIGURE 8-9 – DIVERSE ROUTING FROM FDF TO OC48 USING THE SAME PATH AND FROM FDF TO OC192 USING SEPARATE PATHS.

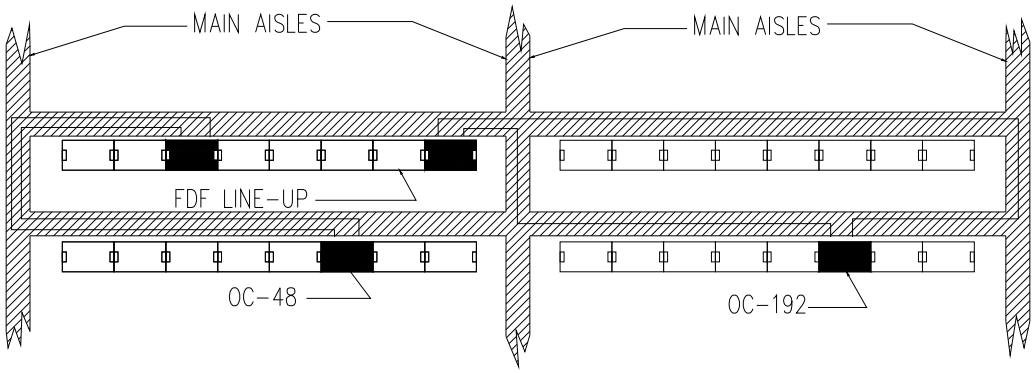


FIGURE 8-10 – DIVERSE ROUTING FROM FDF TO OC48 USING SEPARATE PATHS AND FROM FDF TO OC192 USING SEPERATE PATHS.

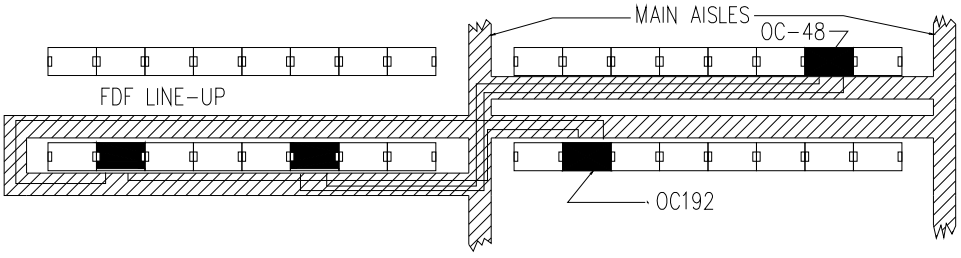
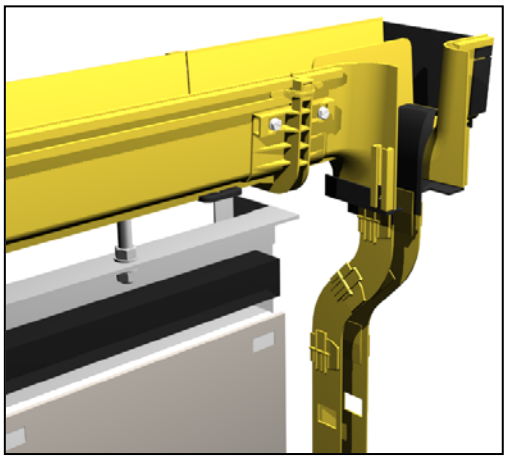


FIGURE 8-11 – DOWNSPOUT DROP OPTIONS



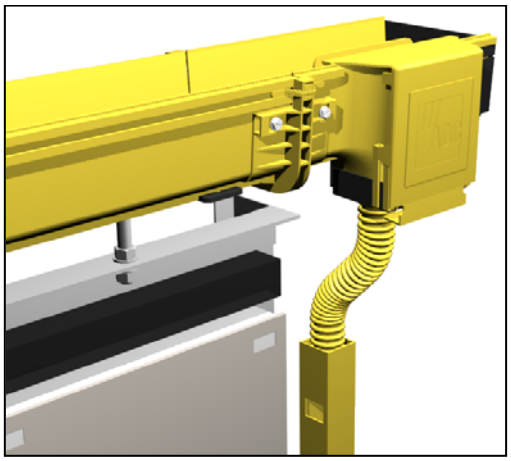
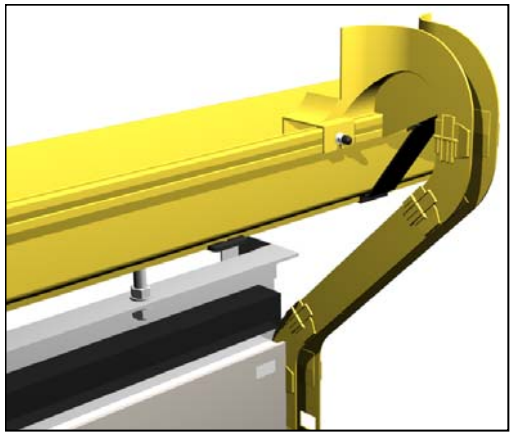
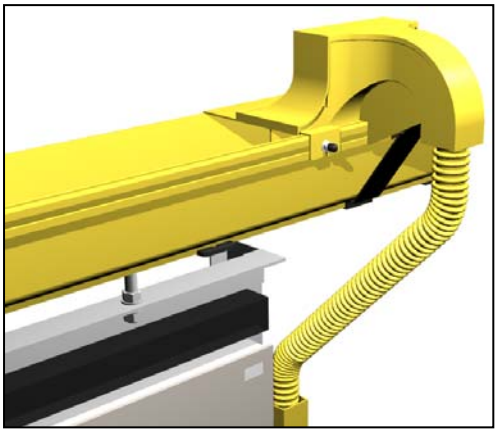


FIGURE 8-12 – EXPRESS EXIT DROP OPTIONS





[END OF SECTION]

SECTION 9 - CROSS CONNECT SYSTEMS

CONTENTS PAGE

TABLE 9-1 – SUMMARY OF CHANGES IN SECTION 9

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

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.

1.1.4 Inter-floor ties for IS equipment shall be fiber.

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 different pieces of IS equipment and outside plant fiber cable facilities.

2.1.2 The Distributing Frame support the interconnection needs for customers, carriers, other technology platforms, transport equipment, and cable facilities within the serving IS equipment area.

3. COPPER CONNECTOR BLOCKS

3.1. General

3.1.1 The standard connecting block for AT&T IS frames is the 89-type block. Note: The term, "89" type block, is intended to define a block with the general characteristics of Commscope's 89 type blocks. This reference is commonly used as a method of identifying these blocks. It is not meant to imply or infer any kind of approval of Commscope's product line.

3.1.2 Frame assignments shall be provided by the Site Operations Engineer.

3.1.3 The Design Engineer shall contact Site Operations Engineer specified by the AT&T IS Equipment Engineer in the AEO.

3.1.4 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.

3.1.5 Bifurcated (read dual) pins are required for connecting blocks used for IS equipment. This facilitates half taps for cutovers, cable throws and "from/to" service orders.

3.1.6 Only AT&T IS approved frame blocks shall be used.

3.1.7 No variances from 3.1.6 shall be allowed.

4. MANUAL DIGITAL SIGNAL CROSS-CONNECT (DSX)

4.1. General

4.1.1 A DSX frame provides a manual method of cross connecting DS1 and DS3 services. The recommended services and applications which should terminate on a DSX1/DSX3 are ones such as: DS1, DS3 and DIA.

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

4.2. DSX-1 Considerations

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

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

4.2.3 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 TP76401.

4.3. Interbay Patch Panels

4.3.1 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).

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

4.3.3 For any existing four bay interbay panel configurations, 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.

4.4. Cross-Aisle Tie Pair Panels & Bridges

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

4.4.2 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.

4.4.3 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.

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

4.5. DSX-1 Cross-Connect Rules

4.5.1 In order to maintain complete flexibility, planning of the AT&T IS equipment area size is of primary importance and determines the ultimate size and layout of the DSX1and 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 AT&T IS 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

4.5.2 To alleviate cable congestion in the relay rack duct, 5 inches of space shall be provided between each 56 port/panel-bay.

4.5.3 To alleviate cable congestion in the relay rack duct, 7-1/2 inches of space shall be provided between each 84 port/panel-bay.

4.5.4 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

4.5.5 DSX-1 panels shall be located no more than 9 feet above the floor in new installations of 9ft and 11ft-6in bays. In Grandfathered locations where there is an 11 foot 6 inch environment, the existing lineups will be finished out at the existing height.

4.5.6 Any tie cable panels should be mounted at the top of the DSX-1 bay at the 6-7 foot level.

4.5.7 For new DSX-1 lineups in AT&T IS offices high-density bantam type jack panels shall be provided.

4.5.8 All DSX patch panels shall be physically and electrically compatible in the same DSX1 lineup.

4.5.9 An upper and lower express trough shall be provided for each bay.

4.5.10 All hardwired cables between the connecting equipment and the DSX1 shall be sized according to length as follows. The 22, 24 and 26-gauge cables preferably should be wire wrapped at the AT&T IS element; but may be connectorized. The following length limitation tables from a DSX1 panel apply to AT&T IS elements.

A. Length limitation from DSX1 panel to the AT&T IS element:

1.) 22 gauge 612.5 feet (STANDARD FOR USE)

2.) 24 gauge 507.5 feet

3.) 26 gauge 407.5 feet

B. 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 ATT Standard Drawings.

The above stated Length limitations from DSX-1 panel to an AT&T IS 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.

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

4.6. DSX-3 Considerations

4.6.1 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.

4.6.2 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 type) cross-connect cords, in excess of the stated 45 foot limitation, which may be up to a maximum of 70 feet in length.

4.6.3 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

4.6.4 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.

4.6.5 Vertical rings shall be provided for each bay between the troughs.

4.6.6 Cross-aisle jumper troughs shall be mounted in the rear for rear cross-connect bays and at the front for front cross-connect bays

4.6.7 Kings BNC connectors are the AT&T IS standard in AT&T West, Southwest and East. Trompeter BNC connectors are the AT&T IS standard 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.

4.6.8 The hardwired cables from the connecting equipment to the DSX-3 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 IS office, by an AT&T approved Installation Supplier.

B. Bulk coaxial cable requiring field crimping, within an AT&T IS office, by an AT&T approved installation supplier on BOTH ends.

4.6.9 All Network Equipment DS3s originating from an equipment unit should appear on the same DSX-3 bay.

4.6.10 The maximum number of bays in a DSX-3 lineup shall not exceed 20, but the most critical issue is the maximum cross connects length.

4.6.11 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.

4.6.12 DSX3 lineup interconnects should not exceed three parallel adjacent lineups.

4.6.13 Tracer lamp colors shall be Red.:

4.6.14 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 TP76401.

4.7. DSX Cross-Connect References

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

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

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

ATT-E-01115-E ATT-Equipment Drawings (DSX-3) FX

ATT-E-01175-E ATT-Equipment Drawings (DSX-1) RX

ATT-E-01175-W ATT-Interconnect Drawings (DSX1) RX

ATT-E-01117-W ATT-Interconnect Drawing DSX-3 RX

ATT-E-01117-E ATT-Equipment Drawing DSX-3 RX

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

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

ATT-E-01101-E ATT-Equipment Drawings DS1-IOR

ATT-E-01101-W ATT-Interconnect Drawings DS1-IOR

5. FIBER DISTRIBUTING FRAMES (FDF)

5.1. General

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

5.1.2 In smaller legacy POPS (a pre-existing facility typically less than 2000 square feet) fiber may be run directly from the splitter shelf to the NE.

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

5.1.4 FDF systems are suitable for use in both large and small POPs.

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

5.1.6 The FDF shall be the primary interface and cross-connect point for all Fiber Optic products, cabling and equipment.

5.1.7 The FDF shall be the direct cable cross-connect point for all AT&T Internet Services Network Elements to one another. However, Inter-bay LAN connections (typically multimode) may be run NE to NE without the use of a FDF.

5.1.8 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.

5.1.9 Passive devices such as Optical Splitters and WDM technologies shall fit within modules developed for use in the miscellaneous 12-slot vertical shelf or shall be

required to be hard-cabled to an off-site location from the FDF, with the exception of LAN elements.

5.1.10 Optical Carrier systems that use primary and protect paths for signal transmission shall have path diversity for cross-connects and cabling within the AT&T IS building beyond the initial Network Equipment lineup in accordance with ATT-002-316-087*, Intra-office Routing Diversity for the AT&T IS office*.

5.1.11 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.

5.1.12 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.

5.1.13 Fiber Optic Termination (FOT) assemblies shall be comprised of:

(1) an overall housing that is rack mountable and designed to manage all fiber cable within

(2) the fiber enclosure shall be loaded (IE: contain enough bulkheads or adapter plates to fully populate the enclosure; some of the plates may be blanks to complete this requirement)

(3) Adapters shall be of the type that corresponds to the fiber interfaces on the equipment being installed.

a. Like interfaces reduce the needs for expensive custom-made hybrid patch cables

b. Maintaining an inventory of hybrid patch cables lengths is not cost effective

5.1.14 The full cross-connect architecture provided by the Fiber Distributing Frame shall be used in the AT&T Internet Services Companies.

5.1.15 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.

5.1.16 Outside plant cable shall not exceed 50’ within the building unless enclosed in conduit.

5.1.17 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.

5.1.18 The FOT and OSP terminations shall be cross-connected via cross connect fiber optic jumpers at the time a service request is initiated.

5.1.19 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.

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

5.2. Satellite Fiber Distributing Frame

5.2.1 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.

5.2.2 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.

5.2.3 The remote area shall be supported through Fiber patch cords to the Network Element.

5.2.4 Fiber Protection Systems and Fiber Optic patch cords shall not traverse firewall partitions and floors.

5.2.5 Fiber Protection Systems in a 7' environment shall be provisioned between the 7' and 9' heights, unless otherwise obstructed.

5.3. FDF Applicability

5.3.1 The Generation II is a medium density Fiber Distribution Frame using a bay arrangement. This is AT&T IS' **STANDARD FOR USE.** This FDF has 72 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.

5.3.2 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 CS has approved the Generation III frame for general use. 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.

5.3.3 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 AT&T-TP-76401.

5.4. The FDF

5.4.1 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.

5.4.2 All passive devices shall conform to the AT&T IS 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.

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

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

5.4.5 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.

5.4.6 The preferred method is to set frames in the normal arrangement of OSP-FOT-OSP-FOT. However, in extremely small IS offices, the first FDF bay may 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.

5.4.7 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 systems.

5.4.8 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 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

5.4.9 FDF layouts 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.

B. The OSP Bay used for Outside Plant Cabling terminations.

C. The Miscellaneous Bay used for additional slack storage, phone, drawer, etc.

5.4.10 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.

5.4.11 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.

5.4.12 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.

5.4.13 On Generation II (IS-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.

5.4.14 On Generation III (IS-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.

5.4.15 If ordered by IS, Fiber Optic jumpers/patch cords shall be ordered from a Procurement approved supplier.

5.5. Fiber Splitters

5.5.1 Optical Splitters are either Single-Mode or Multi-Mode 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 splitters provide a 90/10 or a 50/50 percent split of the input signal intensity.

5.5.2 The Optical Splitter provides a tool for measurements that can be placed as a terminus point for IS 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.

5.5.3 Fiber Optic Splitters shall not be placed in a back-to-back mode.

5.5.4 The number of fiber optic splitters in the overall circuit shall not exceed three.

5.6 Optical Terminations and Connectors

5.6.2 Fusion splices are rated as Standard in AT&T IS and shall be used.

5.6.3 Mechanical Splices will only be permitted on an exception basis for the immediate service restoration of damaged facilities.

5.6.4 Mechanical splices shall not remain in place for any longer than 30 days before conversion to a fusion splice.

5.6.5 Mechanical splices in fiber optic patch cords/jumpers shall not be converted to a fusion splice. The entire jumper shall be replaced within 30 days.

5.7 Attenuators

5.7.2 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.

5.7.3 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
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

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

5.7.5 For all new installations, attenuators shall be placed in the FOT panel itself. In legacy locations attenuators may be installed at NE when necessary.

5.7.6 In-line bulkhead attenuators shall be used at the FOT panel.

5.8 FDF References

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

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

ATT-TELCO-IS-002-316-043, AT&T Fiber Distributing Frame Deployment Standards

ATT-002-316-053, AT&T-Fiber Protection System Standards

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

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

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

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

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

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-50002-E-00, AT&T ADC Fiberguide Fiber Protection System

[END OF SECTION]

SECTION 11 -- SYNCHRONIZATION

CONTENTS PAGE

TABLE 11-1 – SUMMARY OF CHANGES IN SECTION 11

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 This section has been prepared to provide general guidelines necessary to assure compliance with the AT&TIS 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 AT&TIS's method of providing and sustaining intraoffice synchronization. The BITS plan specifies that each office shall have one master clock signal source called the BITS/TSG (TSG = Timing Signal Generator). Under the BITS concept, every externally timed digital Network Element (NE) in the office shall derive its timing DIRECTLY from that single source within that office. A timing capable Network Element is defined as any digital equipment piece that is able to 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 signals, but the option 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/ST2 (E) master oscillators, is redundantly DS-1 signal fed and has PRS-traceability.

2.1.2 Each IS location 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-IS locations (i.e., mini/maxi huts, CEVs, VRAD 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&TIS Equipment Engineer when these conditions occur.

2.1.4 All externally timed network elements within a building shall derive timing input signals directly from a BITS/TSG.

2.1.5 Any Network Primary Reference Supply (PRS) shelf must be in the same bay or an adjacent 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 be equipped with Stratum 2(E) 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&TIS Equipment Engineer shall be consulted regarding the addition of new cable racks in existing equipment areas.

2.2.2 Redundant BITS input/output timing signal leads and any other leads requiring diversity or redundancy shall be routed via separate cable paths when and where possible.

2.2.3 When completely diverse cable paths can not be obtained, the redundant BITS clock leads may be routed on a common cable rack for the portion in common as follows:

a) Redundant leads shall be placed on opposite sides of the rack to the point separate cable paths can be taken. For ladder type cable racks, the cables shall be secured every third

strap. When panned cable racks are provided, the cable shall be loosely tied to the inside of the cable rack stringer or the cable rack horn every six feet.

2.2.4 When redundant leads must pass through a common cable hole, the length of commonality shall be minimized. Separate cable routes shall be used as soon as possible on either side of the cable hole.

2.2.5 Redundant BITS clock input and output leads shall not 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 the BITS clock OUTPUT ports to network elements shall be run using approved 1175A red jacketed shielded cable. The only exception to this is the allowance of the use of the gray jacketed 1175A cable in legacy AT&TIS applications because the red color is used exclusively with power cables. 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.

2.3.4 Timing signal leads from the BITS clock OUTPUT ports to network element inputs shall NOT be run through DSX jacks. (for exceptions refer to Sync Collocation documents and the use of Timing Bridging Office Repeaters (TBORs))

2.3.5 The sleeve/drain ground wire of the 1175A cable shall be insulated with spaghetti sleeve.

2.3.6 All critical network element timing leads shall originate from BITS/TSG shelves that have phase holdover capabilities. This includes expansion shelves associated with the Master shelf or Remote Master shelves that are equipped with Remote Track and Hold Cards (RTHC) or oscillators capable of phase holdover. The AT&TIS Equipment Engineer shall be notified when this is not possible. This applies to existing installations as well as new ones. Examples of Critical network elements include:

a) All CCS7 related equipment (STPs, LPPs, LIMs, FLIS, ACCESS7 and D4 bays serving SS7 Links).

b) All Remote Master Clock (Slave) Shelves

c) Any other equipment specified by the AT&TIS Equipment Engineer as being “critical”.

2.3.7 All timing signal output cards shall be deployed in adjacent mated pairs (odd & even assignments within a DCD shelf) alternate card assignments. Outputs shall be equally assigned in matched sets of cards such that both card sets will exhaust at the same time period. Output timing signal feeds shall be routed from alternate sides of the BITS shelf. The Detail Engineering Service Provider (DESP) shall not change existing wiring arrangements of the BITS shelf without approval of the AT&TIS Equipment Engineer.

2.3.8 The DESP shall provide the sync assignment record book, record book holder and assure all assignments accurately match in the regionally approved record keeping system (ex. TAB/dB, SyncTrac, or GeoLink) initially provided with the BITS shelf.

2.3.9 When directed to do so, the DESP shall specify that the discrete, visual and audible 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&TIS Equipment Engineer will provide for timing reference input signals. Wiring of the input timing reference shall be in accordance with the appropriate ATT-IS Wiring interconnection drawing through the Mini-DSX

2.4.2 Timing reference signals to the BITS shall be diversely routed from points of origin to the BITS shelf input points of termination.

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 adjacent 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. When multiple BDFBs are not available on the same floor, the leads shall originate from diverse loads within the single BDFB.

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) Where completely distinct and diverse cable routes are not available, both “A” and “B” leads can be routed on a common cable rack for the portion in common 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 signal input leads to a BITS clock from a network element must be AT&TIS approved 1175A specified cable. If the lead has a DSX appearance, the shield/drain shall be grounded at the network element and the clock, but left un-terminated 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 shield/drain ground connections 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, with primary and secondary DS1 reference signals from adjacent T1 (DS1) output cards, with odd-even or alternate group slot assignments per AT&TIS interconnect drawings.

2.7.2 In the event of DS1 output card exhaustion, daisy-chaining to enable cascading of synchronization to all terminals within a bay framework is NOT an AT&TIS 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 timing cable to the BITS. The only exception to this is the allowance of the use of the gray jacketed 1175A cable in legacy AT&TIS applications because the red color is used exclusively with power cables. Shield lead conductors of all SONET sync signal input cables shall be DC-grounded at the BITS shelf only and left insulated and un-terminated at the SONET terminal/ADM connector/terminal strip.

2.7.4 The network element “CLOCK OUT” connections (PRIMARY and SECONDARY) shall not be cabled, except when required for office BITS clock reference. These connections should be available on separate wire wrap pins from the “CLOCK IN” connectors terminating on the network element., 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).

2.8. 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 the sync record assignment book and assure all updates match and are reflected in the regionally approved record keeping system (ex. TAB/db, SyncTrac, or GeoLink).

[END OF SECTION]

SECTION 12 -- POWER SYSTEMS

CONTENTS PAGE

TABLE 12-1 – SUMMARY OF CHANGES IN SECTION 12

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

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.

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 IS Operations Engineer for the provisioning of the manufacturer's recommended spare parts for each type of power equipment

1.1.5 The DESP shall provision alarms for all new power equipment in accordance with ATT 801-601-900 AT&T Alarm Standards Practice, and the ATT-P-05010-E Power Equipment Alarm Standards drawing.

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 Detailed 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 the TP76301, Section G: Floor Drilling.

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.

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 (VRLA) batteries shall use connectors specified by the battery manufacturer.

1.2.8 On a going forward basis, NiCad battery connections shall be tin plated copper lugs without inspection holes for inside plant. Connections shall be coated with a thin layer of No-ox-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, 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 rather than cable, unless the battery cabling to the farthest string does not exceed 25 feet. No new aluminum bars shall be used.

1.2.13 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-chromium plated SAE J429 **– Grade 5 hardware that meets** ASTM B117 & B633 specifications or ASTM B99 silicon bronze finished bus bar joint, fastening and support bolts, nuts, washers, etc. as listed on the Minor Material List. 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 pal-nut 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-chromium 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. This is not intended to apply to battery return bus bars.

2. BATTERY/RECTIFIER (AC/DC)

2.1. General

2.1.1 This unit covers requirements for battery/rectifier systems utilized within Information Services Equipment (ISE) facilities and non-regulated/non-utility locations and subject to the rules and requirements as defined in NFPA 70- National Electrical Code (NEC) or Local Electrical Code. .

2.1.2 AT&T IS will deploy single architecture DC Power Plants with four hours of battery reserve. The DC Plant will provide feeds to single (not dual) BDFBs. Each BDFB will be, at a minimum, dual load and will provide an A&B feed to each DC-powered network element. Refer to ATT-790-100-656, DC Power Distribution, for BDFB engineering.

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 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 AT&TIS electrical installations shall 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. 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 over-current protection devices, and the downstream power conductors to the load equipment. Furthermore, 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).

5. 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 and the next. BDFB supply fuses shall only be loaded to 50% of fuse size based on actual measurement. This requirement does not apply to protection devices internal to the network element

e) DISTRIBUTION CIRCUIT COMPONENTS

DC distribution systems consist of three basic components:

- Circuit protection device
- Battery and battery return conductors
- 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 (see Minor Materials List e.g. Liquid tight LA or Sealtite UA) 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, steel fittings shall be used.

2.3 Batteries

2.3.1 Flooded lead acid batteries are the AT&T standard. VRLA batteries will be used only as a last choice.

2.3.2 The DESP shall provide the intercell connectors and associated hardware recommended by the battery manufacturer.

2.3.3 For flooded lead acid batteries the recommended alarm points for the 52.8 float are: Very High Voltage – 54.0V; High Voltage – 53.50V; Low Voltage – 51.25V; Very Low Voltage – 46.50V.

2.3.4 Nickel-Cadmium (NiCad) batteries are a replacement for small capacity battery plants using VRLA batteries or the lower capacity flooded lead acid batteries that have been manufacturer discontinued or unapproved.

2.3.5 The NiCad battery strings for AT&TIS 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.

2.3.6 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.

2.3.7 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.

2.3.8 NiCad battery racks shall have sliding shelves, and shall meet the seismic rating for the geographical area.

2.3.9 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.

2.3.10 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.)

2.3.10.1 DESP shall include a Specific Installation Supplier Note to insure spill kits shall be left on-site.

2.3.11 NiCad batteries shall use constant voltage charging to maintain float voltage. Temperature compensated voltage control shall not be used for NiCad applications.

2.3.12 Additional details regarding NiCad batteries can be found in AT&T Standard Power Drawing – ATT-P-05330-E.

2.3.13 Plastic battery stands used for round type lead acid cells shall be provided with earthquake rated floor mounted corner details and secured with Hilti HDI ½ anchors in Seismic Risk

Zones 2 or below; approved seismic rated metal stands secured with Hilti 16mm HSL or other AT&T tested and approved anchors shall be used for round cells in Seismic Risk Zones 3 & 4.

2.3.14 When engineering new battery plants the DESP shall provide approved spill kits.

2.3.14.1 DESP shall include a Specific Installation Supplier Note to insure spill kits shall be left on-site.

2.3.15 The DESP shall determine and provide approved battery spill containment on a site by site basis if required by local code mandates and/or direction of the AHJ.

2.3.16 When engineering flooded lead acid battery installations, cells of different manufacturers shall not be placed in the same string.

2.3.17 Battery strings of the same float voltage (including alternative technologies, e.g. flooded lead acid and lithium) may be placed in parallel.

2.3.18 Cells of different battery technologies shall not be placed in the same string.

2.3.19 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.

2.3.20 Measured at floor level, a minimum distance of 36 inches shall be maintained between a battery rack, equipment, and non-movable obstructions. The non-serviceable end of the battery stand may be placed perpendicular to the wall within 8 inches.

2.3.21 A single row rack parallel to a wall shall be a minimum of 8 inches from the wall.

2.3.22 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 Figure 12-4 taken from ATT-TELCO-IS-790-100-656, “DC Power Distribution”, to prevent heating or exceeding the voltage drop requirement.

FIGURE 12-5 BUS BAR SIZING CHART

Bus bar sizing chart											
# OF BARS	THICKNESS OF BARS	WIDTH OF BARS	AREA IN CM	ALUMINUM				COPPER			
	IN INCHES			AMPACITY		LBS PER FT.	Micro-ohms Per Foot. @ 70 C	AMPACITY		LBS. PER FT.	Micro-ohms Per Foot. @ 70 C
1	1/8	1/2	29.6	114	112	0.07	271.6	154	152	0.242	159.49
1	1/8	3/4	119.4	159	157	0.11	180.9	215	212	0.362	106.32
1	1/8	1	159.2	203	200	0.15	135.8	275	271	0.483	79.74
1	1/8	1 & 1/2	238.7	287	283	0.22	90.54	390	385	0.725	53.16
1	1/8	2	318.3	370	364	0.29	67.91	503	496	0.966	39.87
1	1/4	1/2	159.2	177	174	0.15	135.8	238	234	0.483	79.74
1	1/4	1	318.3	302	297	0.29	67.91	409	403	0.966	39.87
1	1/4	1 & 1/2	477.5	471	415	0.44	45.27	572	564	1.45	26.58
1	1/4	2	636.6	537	529	0.59	33.95	731	721	1.93	19.94
1	1/4	2 & 1/2	795.8	651	636	0.73	27.16	887	869	2.42	15.95
1	1/4	3	954.9	762	746	0.88	22.63	1040	1019	2.9	13.29
1	1/4	3 & 1/2	1,114.00	873	841	1.03	19.4	1192	1152	3.38	11.39
1	1/4	4	1,273.00	982	946	1.17	16.98	1342	1298	3.86	9.97
1	1/4	6	1,910.00	1408	1320	1.76	11.32	1931	1820	5.8	6.65
1	1/4	8	2,546.00	1823	1649	2.34	8.49	2506	2292	7.73	4.98
1	3/8	1	477.5	387	381	0.44	45.27	524	517	1.45	26.58
1	3/8	1 & 1/2	716.2	533	525	0.66	30.18	724	714	2.17	17.72
1	3/8	2	954.9	675	665	0.88	22.63	919	906	2.9	13.29
1	3/8	2 & 1/2	1,194.00	814	796	1.1	18.11	1110	1087	3.62	10.63
1	3/8	3	1,452.00	951	960	1.32	15.09	1298	1272	4.35	8.85
1	3/8	4	1,910.00	1219	1175	1.76	11.32	1667	1612	5.8	6.65
1	3/8	6	2,865.00	1740	1629	2.64	7.55	2388	250	8.69	4.43
1	3/8	8	3,820.00	2248	2035	3.52	5.66	3092	2828	11.59	3.32
1	1/2	1	636.6	466	459	0.59	33.95	632	622	1.93	19.94
1	1/2	1 & 1/2	954.9	636	626	0.88	22.63	863	851	2.9	13.29
1	1/2	2	1,273.00	800	788	1.17	16.98	1088	1073	3.86	9.97
1	1/2	3	1,910.00	1118	1093	1.76	11.32	1525	1494	5.8	6.64
1	1/2	4	2,546.00	1427	1376	0.34	8.49	1951	1887	7.73	4.98

1	1/2	6	3,820.00	2029	1899	3.52	5.66	2783	2623	11.59	3.32
1	1/2	8	5,093.00	2615	2366	4.69	4.25	3596	3289	15.46	2.49
2	1/4	2	1,273.00	969	935	1.18	16.98	1301	1259	3.86	9.97
2	1/4	3	1,910.00	1363	1285	1.76	11.32	1834	1735	5.8	6.65

Continuation

# OF BARS	THICKNESS OF BARS	WIDTH OF BARS	AREA IN CM	ALUMINUM				COPPER			
	IN INCHES			AMPACITY		LBS PER FT.	Micro-ohms Per Foot. @ 70 C	AMPACITY		LBS. PER FT.	Micro-ohms Per Foot. @ 70 C
2	1/4	4	2,546.00	1745	1596	2.34	8.49	2350	2163	7.72	4.98
2	1/4	6	3,820.00	2483	2152	3.52	5.66	3352	2937	11.6	3.32
2	1/4	8	5,093.00	3198	2605	4.68	4.25	4325	3583	15.46	2.49
2	1/2	2	2,546.00	1458	1411	2.34	8.49	1961	1902	7.72	4.98
2	1/2	3	3,820.00	2015	1906	3.52	5.66	2715	2577	11.6	3.22
2	1/2	4	5,093.00	2555	2346	4.68	4.24	3445	3182	15.46	2.49
2	1/2	6	7,639.00	3597	3131	7.04	2.83	4861	4275	23.2	1.66
2	1/2	8	10,186.00	4608	3770	9.38	2.12	6236	5189	31.92	1.25
3	1/4	2	1,910.00	1397	1336	1.77	11.32	1865	1787	5.79	6.65
3	1/4	3	2,865.00	1957	1813	2.64	7.54	2616	2432	8.7	4.43
3	1/4	4	3,820.00	2496	2226	3.51	5.66	342	296	11.58	3.32
3	1/4	6	5,730.00	3543	2947	5.28	3.77	4745	3992	17.4	2.22
3	1/4	8	7,640.00	4552	3495	7.02	2.83	6105	4770	23.19	1.66
3	1/2	4	7,640.00	3670	3291	7.02	2.83	4918	437	23.19	1.66
3	1/2	6	11,460.00	5146	4311	10.56	1.88	6902	5848	34.77	1.11
3	1/2	8	15,280.00	6572	5083	14.07	1.42	8824	6950	46.38	0.831
4	1/4	2	2,546.00	1823	1735	2.16	8.49	2426	2313	7.72	4.89
4	1/4	3	3,820.00	2549	2337	3.52	5.66	3394	3123	11.6	3.32
4	1/4	4	5,093.00	3249	2850	4.58	4.25	4328	3819	15.44	2.49
4	1/4	6	7,639.00	4598	3728	7.04	2.83	6130	5026	23.2	1.66
4	1/4	8	10,186.00	5899	4354	9.16	2.12	7872	5916	30.92	1.24
4	1/2	4	10,186.00	4782	4228	9.36	2.12	6384	5679	30.92	1.25
4	1/2	6	15,280.00	6688	5473	14.08	1.42	8933	7392	46.36	0.831
4	1/2	8	20,372.00	8527	6362	18.76	1.06	11395	8659	61.84	0.623
5	1/4	4	6,365.00	3999	3471	5.85	3.4	5312	4637	19.3	1.99
5	1/4	6	9,550.00	5650	4502	8.8	2.26	7512	6048	29	1.33
5	1/4	8	12,730.00	7242	5202	11.75	1.7	9634	7041	38.65	0.99
5	1/2	4	12,730.00	5892	5161	11.7	1.69	7847	6915	38.65	0.997
5	1/2	6	19,10.0	8227	6626	17.6	1.13	10960	8921	57.95	0.665
5	1/2	8	25,460.00	10475	7624	23.45	0.849	13960	10340	77.3	0.498
6	1/4	4	7,640.00	4748	4090	7.04	2.83	6295	5452	23.16	1.66
6	1/4	6	11,460.00	6702	5273	10.6	1.89	8891	7064	34.8	1.11

Continuation

# OF BARS	THICKNESS OF BARS	WIDTH OF BARS	AREA IN CM	ALUMINUM				COPPER			
	IN INCHES			AMPACITY		LBS PER FT.	Micro-ohms Per Foot. @ 70 C	AMPACITY		LBS. PER FT.	Micro-ohms Per Foot. @ 70 C
6	1/4	8	15,380.00	8585	6043	14.15	1.42	11395	8154	46.38	0.83
6	1/2	4	15,280.00	7002	6092	14.04	1.42	9309	8148	46.38	0.831
6	1/2	6	22,920.00	9765	7775	21.12	0.943	12980	10445	69.54	0.554
6	1/2	8	30,560.00	12425	8876	28.14	0.707	16520	12005	92.76	0.415
7	1/4	6	13,370.00	7753	6041	12.32	1.62	10270	8076	40.6	0.95
7	1/4	8	17,822.00	9926	6878	16.38	1.21	13150	9259	54.11	0.71
7	1/2	6	26,740.00	1130	8921	24.64	0.808	15000	11860	81.13	0.475
7	1/2	8	35,644.00	14345	10120	32.83	0.606	19080	13660	108.2	0.356
8	1/4	6	15,280.00	8804	6808	14.08	1.42	11645	9086	46.4	0.83
8	1/4	8	20,372.00	11265	7711	18.72	1.06	14905	10760	61.84	0.62
8	1/2	6	30,560.00	12840	10065	28.16	0.707	17020	13475	92.72	0.415
8	1/2	8	40,744.00	16320	11365	37.52	0.53	21635	15310	123.7	0.313
9	1/4	6	17,190.00	9854	7575	15.84	1.26	13020	10095	52.2	0.74
9	1/4	8	22,914.00	12605	8541	21.06	0.94	16660	11455	69.57	0.55
9	1/2	6	34,380.00	14375	11205	31.68	0.629	19040	14985	104.3	0.369
9	1/2	8	45,828.00	18265	12605	42.21	0.472	24190	16955	139.1	0.277
10	1/4	6	19,100.00	10905	8338	17.6	1.13	14400	11100	58	0.67
10	1/4	8	25,460.00	13945	9369	23.4	0.85	18415	12545	77.3	49
10	1/2	6	38,200.00	15910	12350	35.2	0.566	21060	16495	115.9	0.332
10	1/2	8	5,920.00	20210	13840	46.9	0.424	26745	18600	154.6	0.248
11	1/4	6	21,010.00	11955	9102	19.36	1.03	15775	12105	63.8	0.6
11	1/4	8	28,006.00	15285	10195	25.74	0.77	20170	13640	85.03	0.45
12	1/4	6	22,920.00	13005	9866	21.12	0.94	17150	13110	69.86	0.55
12	1/4	8	30,560.00	16625	11025	28.08	0.71	21925	14725	92.86	0.41

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 1900AH on battery tier-to-tier or tier-to-termination bar applications. Size 350kcmil, flexible type power cable, shall be used on 1901AH 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.

3 AC DISTRIBUTION (GENERAL)

3.1 AC Panels

3.1.1 These requirements shall apply when the installation environment is in a non-regulated and non-utility workspace. If there are conflicts between the NEC or Local Electrical Code and the AT&T general requirements listed in this document, the NEC or Local Electrical Code shall prevail. Permits will be required and all applicable local and city codes shall be followed

3.1.2 Working Space around all newly placed AC panels and serving equipment shall comply with the NEC, Article 110.26, Spaces About Electrical Equipment.

NOTE: Working clearances vary based on voltage and AC equipment configurations.

3.2 AC Cabling

3.2.1 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.

d) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet when utilized as whips in a raised floor environment.

d) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet when utilized as whips in a raised floor environment.

3.3 AC General Purpose Receptacles in the DC Environment

3.3.1 All AC general purpose receptacles are connected to Power Service Cabinets (PSCs) outside the protected load network. These receptacles are engineered and intended to support portable test equipment or portable electrical tools.

3.3.2 All wiring and conduit installed in the Non-Regulated/Non-Utility work space shall meet the requirements of the National Electrical Code (NEC), local code and shall be Listed.

3.3.3 Circuit breakers shall only be opened with prior authorization by the AT&T Representative.

3.3.4 While work is being done on AC circuits, circuit breakers shall be opened whenever it is practical to do so without causing a service interruption.

3.3.5 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a "**Warning - Working on Circuit**" tag at the AC source. The tag shall only be removed by the person performing the work.

3.3.6 All conduit raceways, regardless of the type, shall have an Equipment Grounding Conductor (a.k.a. ACEG) installed with the feeder or branch circuit conductors. Minimum size Equipment Grounding Conductors for raceway and equipment shall comply with Table 250.122 in the NEC.

3.3.7 The spacing of general purpose AC receptacles shall be every third bay, not to exceed 10 feet in equipment frames. A single or stand-alone frame shall be engineered to have a general purpose receptacle provided or placed in the base. The circuits shall be designed with no more than 10 duplex outlets per 15 ampere circuit breaker or 13 duplex outlets per 20ampere circuit breaker.

3.3.8 AC general purpose receptacles shall be specified to be flush and equipped with a cover plate.

3.3.9 The entire length of the metallic raceway, conduit or trough shall be designed to provide a continuous conductive path for grounding.

3.3.10 Isolated ground AC receptacles (orange) shall not used or be specified.

3.3.11 Wire and cable utilized to distribute AC power shall meet the requirements of the NEC or local electrical code and shall be Listed.

3.3.12 All wiring used to distribute AC power shall be copper.

3.4 Conduit

3.4.1 Refer to Section I of TP76301 for information regarding conduit.

3.5 Branch Circuits

3.5.1 The AT&T IS Infrastructure Engineer shall specify a green ACEG lead for all AC lighting fixtures.

3.5.2 When extending an existing circuit, the AT&T IS Operations Engineer working with the AT&T IS Infrastructure Engineer shall confirm that enough capacity on the protection device rating exists for the additional load and the voltage drop allowance for the circuit is not exceeded (NEC, Chapter 9, Table 9).

4 AC REQUIREMENTS – (PROTECTED POWER)

4.1 General Requirements

4.1.1 UPS systems shall be in a dual architecture, identically sized, to meet a five year growth projection or sized identically based on a 50-100 watt per square foot factor. All UPS units will be on-line, double conversion, single module systems containing their own external maintenance bypass switch. On the input side, it is preferable that each UPS unit, "A" and

"B", be fed by a separate main distribution panel. On the output side, UPS "A" and UPS "B" shall be wired out to their own distribution panel.

NOTE: As of November 2005 this model is under review by AT&T labs and may change.

4.1.2 Distribution configurations shall be based on load requirements. Dual powered equipment loads shall be directly fed from both UPS A and UPS B PDUs. Single load equipment may be fed from either a UPS A or UPS B PDU, or a Static Transfer Switch (STS) PDU connected to UPS A and UPS B based on the service criticality of the load.

4.1.3 UPS "A" and UPS "B" shall have its own battery back-up. Battery reserve time shall be engineered to 30 minutes based on full load. Flooded cell batteries are first choice but, based on space and loading limitations, VRLA can be the second choice. Batteries may be in attached or detached cabinets or in battery racks as best fits the application. Approved Products shall be used in all applications.

4.1.4 Where space is available it is a preference that batteries be partitioned with appropriate exhaust to the outside.

4.1.5 In installations with VRLA batteries battery monitoring will be included.

4.1.6 In the dual architecture (e.g. two 400kVA units), load must be monitored to insure that either UPS unit can pick up the full load in the event it's counterpart fails or goes down. Neither UPS should be loaded beyond 40% nor shall a load of 35% trigger the AT&T IS Infrastructure Engineer to begin the planning and engineering process to relieve the load or upgrade the UPS units.

4.1.7 These requirements shall apply when the installation environment is in a non-regulated and non-utility workspace. If there are conflicts between the NEC or Local Electrical Code and the AT&T general requirements listed in this document, the NEC or Local Electrical Code shall prevail. Permits will be required and all applicable local and city codes shall be followed

4.1.8 Where required, the Power DESP may reference the specific requirements for AC equipment connections in accordance with the NEC or Local Electrical Code.

4.1.9 All equipment engineering details and instructions shall include language to insure installation technicians and circuits are adequately protected from voltage hazards and service interruptions.

4.1.10 Detail engineering instruction shall be written to insure that all electrical circuits, Information Services Equipment (ISE), AC conductors and bus bars are protected any time there is installation activity in the immediate vicinity. See the NEC and Section B of ATT-TP-76301.

4.1.11 Working Space around all newly placed AC panels and serving equipment shall comply with the NEC, Article 110.26, Spaces About Electrical Equipment.

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

5.1. General

5.1.1 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. These protected loads shall be distributed through Protected Power Service Cabinets or Foundation Distribution Cabinet (PPSC or FDC).

5.1.2 All protected AC receptacles shall be engineered to connect to a PPSC within the protected load network. These receptacles are engineered to support protected ISE.

5.1.3 Protected Power equipment distribution shall maintain separate and distinct paths from other forms of power distribution.

5.1.4 Circuit breakers shall only be opened with prior authorization by the AT&T Representative.

5.1.5 While work is being done on AC circuits, circuit breakers shall be opened whenever it is practical to do so without causing a service interruption.

5.1.6 If a service interruption is part of the work to be performed, this information shall be duly noted and highlighted on the Installation procedures and approved by the AT&T Representative prior to any work activity.

5.1.7 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a “**Warning - Working on Circuit**” tag at the AC source. The tag shall only be removed by the person performing the work. This documentation shall be included in the job specification.

5.1.8 The entire length of the metallic raceway, conduit or trough shall be designed to provide a continuous conductive path for grounding.

5.1.9 Isolated ground AC receptacles (orange) shall not be used or specified.

5.1.10 Wire and cable used to distribute AC power shall meet the requirements of the NEC or local code and shall be listed.

5.1.11 All wiring used to distribute AC power shall be copper.

5.1.12 As a minimum, AC circuits in this section shall comply with the NEC requirements for *Information Services Equipment* found in Art. 645.

5.2 AC Circuit Protection Devices

5.2.1 Thermal breakers are acceptable for most applications and may be used unless indicated by the equipment manufacturer’s documentation or specifically instructed by the AT&T Equipment Engineer.

5.2.2 For equipment loads having start surges (such as those using capacitors) it is recommended that thermal-magnetic circuit breakers be specified.

5.2.3 Circuit design shall not include circuit protection devices engineered in parallel to increase the circuit capacity.

5.2.4 Circuit Protection devices shall be engineered based on an 80% rating unless the circuit protector is rated at 100%. Therefore, the continuous load on a circuit breaker should not exceed 80% of its listed capacity. The circuit protection device shall be sized at 125% of the maximum equipment connected load.

5.2.5 Circuit protection devices installed in PPSC distribution cabinets shall be specified as bolt-on type rather than the clip-on type. This configuration avoids poor connections, overheating of the circuit and distribution panel, and premature circuit failure.

5.2.6 All distribution panel types shall have a nameplate that includes the distribution panel designation, input power source (supply panel designation), supply panel protection device rating, voltage and phases. (Reference TP 76301, Section L)

5.2.7 When a new distribution panel is installed in the PPSC architecture, the existing single line drawing shall be modified or created to reflect the changes and provided during the installation/completion of the job. (Reference TP 76301, Section L)

5.3 AC Cabling

5.3.1 All cable specified, shall meet current AT&T Standards and the requirements of the NEC or Local Electrical Code for the specific application. Reused cable is not acceptable (excluding whip cables).

5.3.2 Conductors used in ISE circuits shall be engineered at no less than 125% of the worst case connected equipment load (see NEC Art. 645.5.) and must include ampacity equal to or greater than the serving protection device.

5.4 AC Conduit, Bus Ducts & Troughs

5.4.1 As noted in the NEC Art. 645 there are multiple forms of acceptable conductor ducting including conduit, bus duct, troughs and etc. The following identifies four specific distribution segments that AT&T requires.

a) **Primary Power:** Conductors routed from the Main HSB to the UPS. Typically ≤480 Vac. Cable and conduit shall meet the applicable sections of the NEC or Local Electrical Code as defined by the equipment type and physical location. Die-cast fittings shall not be used.

b) **UPS System Distribution**: Conductors routed from the UPS to the first Distribution Center. Cable and conduit shall meet the applicable sections of the NEC or Local Electrical Code as defined by the equipment type and physical location. Die-cast fittings shall not be used.

c) **Distribution Center**: Equipment bay/rack ISE circuits shall be distributed from the Distribution Center panel to the equipment cabinet line ups through NEMA 1 level metallic troughs equipped with knockout capability. This may be ≤ 240 Vac.

d) **Cabinet/Bay Protected Power Strip:** Final distribution found at the ISE equipment bay/cabinet. From the aisle trough; the use of ZLHA flexible Liquidtite™ shall be hardwired from the trough to the cabinet equipped Protected Power Strip. This could be a 110 or 208/240 Vac circuit

5.4.2 All primary, secondary distribution troughs, ridged conduits and Liquidtight Flexible Metal Conduit (LFMC) feeding equipment bays shall be installed per the NEC, or Local Electrical Code. This method shall be used in either the raised floor or overhead environments.

5.4.3 AC conduit runs and bus duct (if used) shall be installed per the NEC, or Local Electrical Code requirements.

5.5 Inverters (DC/AC) and Uninterruptible Power Systems (UPS).

5.5.1 If the AC load is identified as "uninterruptible", it shall be fed from an inverter plant or Uninterruptible Power System (UPS), as determined by the AT&T Equipment Engineer. These protected loads shall be distributed through Protected Power Distribution Service Cabinets (PPSCs).

5.6. Inverter Apparatus Considerations

5.6.1 As a default, inverter systems shall be provisioned to operate in a DC (Inverter Preferred) mode where the system is designed to operate in a DC or AC mode.

5.6.2 The preferred location for the Inverter system shall be in the Power Room, in close proximity to the DC power source.

5.6.3 A Static Transfer Switch (STS) and Maintenance Bypass Switch (MBS) shall be provided for inverter systems supporting critical service-affecting network load. Maintenance Bypass Switches shall be provided as required for inverter systems that support ancillary network support systems that are not customer affecting.

5.6.4 The AC Maintenance Bypass Switch shall be mounted in such a manner as to allow maintenance or removal of the inverter unit.

5.6.5 AC Maintenance Bypass Switches provided without a Static Transfer Switch shall be labeled to indicate that operation of the switch will cause a service interruption.

5.6.6 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 from the serving DC Power Plant. However, 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.

5.7. UPS Apparatus Considerations

5.7.1 AC wiring shall be sized to meet manufacturer's specifications or NEC specifications, whichever is more stringent.

5.7.2 Rigid metallic conduit shall be used in areas where activity could jeopardize the integrity of the system.

5.7.3 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.

5.8 UPS Battery DC Cabling.

5.8.1 Battery cabling within the string shall be gray braided insulated or black non-braided insulated flex cable.

5.8.2 Inter-cell straps shall meet manufacturer requirements and shall be attached with stainless steel hardware.

5.8.3 UPS battery posts and the ends of the connectors where they contact the posts shall have a thin coat of NO OX-ID-A applied.

5.9 UPS Battery Disconnect Switch.

5.9.1 UPS battery disconnect switch cabling to the UPS shall be either supplied by the manufacturer or the electrical contractor

5.9.2 UPS battery disconnect switches (one per string) shall be located within the battery area. The local AHJ may dictate the specific location.

5.10 UPS Battery Applications

5.10.1 Flooded batteries are considered the first choice in any UPS application, however floor space limitations may dictate the use of Valve Regulated Lead Acid batteries (VRLA).

5.10.2 UPS Batteries approved for use are listed on the AT&T Common Systems Power Approved Products list. Additionally AT&T standardizes on low specific gravity batteries to further life expectancy.

5.11 UPS Battery Stands/Cabinets

5.11.1 The battery and stand/cabinet selection shall be coordinated to insure the correct battery is matched with the stand/cabinet designed for that specific battery. All battery stand/cabinets shall meet NEBS Level 1 and the prevailing seismic zone (or better). To minimize the battery stand/cabinet selection process. Zone 2 stand/cabinets shall be engineered for all Zone 2 and below applications. Zone 4 battery stand/cabinets shall be engineered for all Zone 3 and above applications. Appropriate battery choices may be found on the AT&T Battery Technology Comparison Table found at; http://mechteam.sbc.com:8080/Power/infotech.html

5.11.2 VRLA battery cabinets shall be listed.

5.12 UPS EPO Switches

5.12.1 Where require, UPS EPO switches may be placed at the exits of the equipment rooms and at the exit or entrance of the UPS equipment rooms. Switches shall be adequately labeled, covered and protected from accidental activation. The EPO switches must lock in place to identify activation when depressed.

5.13 Protected Power Service Cabinets (PPSC)

5.13.1 The term PPSC will be included in the labeled identification of all AC Protected Distribution Panel cabinets located on the load distribution side of any UPS

5.13.2 Only bolt-on type distribution circuit breakers (no clip-on type) shall be specified for all Protected Power Service Cabinets. This configuration avoids poor connections, overheating of the circuit and distribution panel, and premature circuit failure.

5.14 Protected Power Strips

5.14.1 Protected Power Strips serve as the final point of AC distribution typically found in the ISE cabinet/bay.

5.14.2 The AT&T IS Infrastructure Engineer shall specify Protected Power Strips that are approved for use by AT&T. Power strips in the protected power architecture shall be equipped with the following features:

5.14.3 Protected power strips shall be connected by one of the two following methods:

1. Hardwired between the strip and the adjoining cable trough by a flexible conduit.
2. Via a cord equipped with a twist-lock plug.

5.14.4 The Protected power strip shall be bolted and permanently affixed to the cabinet/bay structure.

5.14.5 Depending on the ISE configuration the protected power strip may be specified as horizontal or vertical mounting.

5.14.6 The ISE configuration shall include separate protected power strips to support the A & B loads independently.

5.14.7 Each Protected Power Strips shall be engineered with a dedicated supply circuit and load managed (monitored), not to exceed 80% of the supply circuit breaker.

5.14.8 The protected power strip shall not include local fusing or a cut off switch.

5.14.9 Surge protection is not required and shall not be included in the protected power strip.

5.14.10 The protected power strip shall be listed.

6. DC POWER DISTRIBUTION

6.1. Power Distribution Sources

6.1.1 Circuit breakers may be used for circuits with design requirements less than or equal to 400 amps. Fuses are required for circuits with design requirements of 401 amps or larger. Fuses are considered the preferred method of circuit protection. Circuit breakers shall not be protected by a fuse.

6.1.2 A network element being engineered with multiple loads (i.e. “A”, “B”, “C”, etc.):

6.1.2.1 shall be assigned to different load supplies on the BDFB unless specified otherwise in the AT&T installation/engineering documentation.

6.1.2.2 shall maintain separate primary fuse integrity throughout the circuit.

6.1.3 Primary battery and battery return leads shall be run on un-panned 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 racks, which already contain power and transport cable.

6.1.4 A separate battery return lead shall be paired with each distribution or source lead.

6.1.5 A and B battery return leads from the same network element may be connected to the same battery return bus bar position

6.1.6 The DESP shall provide 145-Type or approved equivalent tags for both ends of every battery and battery return lead, except secondary power leads internal to a rack.

6.1.7 Preferred fuse panels for BDFBs are telecommunications power-style (e.g. TELPOWER® or TELCOM®), which accommodate fuse sizes from 1 to 150 amps.

6.1.8 The maximum fusing for a supply to a single or multiple bays BDFB shall be sized to the bus distribution, not to exceed 800 amps per load, unless prohibited by the state commission (e.g. Illinois).

6.1.9 The DESP shall provide a work item to designate the BDFB shunt size on the front of the BDFB.

6.1.10 The largest fuse to be used in a BDFB shall be 150 amps.

6.1.11 In a BDFB, a single panel shall not have multiple feeds connected to it.

6.1.12 Only factory manufactured 45 or 90 degree lugs shall be used to minimize cable congestion within the BDFB.

6.1.13 Any secondary distribution equipment located on one floor shall not be used to supply equipment located on another floor, unless required by the equipment manufacturer’s documentation.

6.1.14 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 ATT-TP-76401, Section 8 figures for common systems cabling and rack details.)

6.1.15 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.

6.1.16 The use of early vintage miscellaneous fuse bays shall be discontinued as bay mounted fuse panels shall be the source of secondary distribution.

6.1.17 SPDUs shall be fused at their source (BDFB, Power Board) with a fuse size not to exceed the maximum rating of the fuse panel.

6.1.18 Every SPDU shall be fed individually from the power source (either from the Power Board, a BDFB, distribution panel or intermediate PDU) using a single fuse and set of power cables per load. SPDUs shall not be "daisy chained" to the same source (sharing the same cable or fuse).

6.1.19 SPDUs fed at 150 amps or less 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 maximum allowable one way voltage drop from batteries to the served equipment via a BDFB/SPDU shall be 1.0 volt for standard configuration offices with an equipment end-voltage of 42.6V DC per reference drawing ATT-P-05410-E.

6.2.2 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 the appropriate records data base 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 for standard configuration offices with an equipment end-voltage of 42.6V DC:

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 X L X Feet) / CM

Where:

V = Allowable voltage drop one way

L = 2/3 (.667) 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 Over current protection (fuses or circuit breakers) and secondary distribution cables are sized using List 2X current drain. List 2X current drain is the amperage that will flow in one side of a dual powered circuit if the other supply circuit is failed and the power plant feeding the remaining circuit is at 42.64 volts at the equipment load or the total wattage divided by 42.64volts.

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:

CM = (11.1 X L X Feet) / V

Where:
CM = Circular Mil area of the cable
L = 2/3 (.667) of the List 2X 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 (≤) #2AWG.

b) Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect shall be up to (≤) 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 2X load by 1.25 (125%) to determine the correct protector size. **Caution:** This does not apply to protectors at BDFB or Power Board which supplies 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 2X drain.

6.3.9 Circuit breakers not rated at 100% shall be larger than the load on the cable. Multiply the List 2X 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® or TELCOM®) 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® or TELCOM®) 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.

FIGURE 12-1--POWER SYSTEM

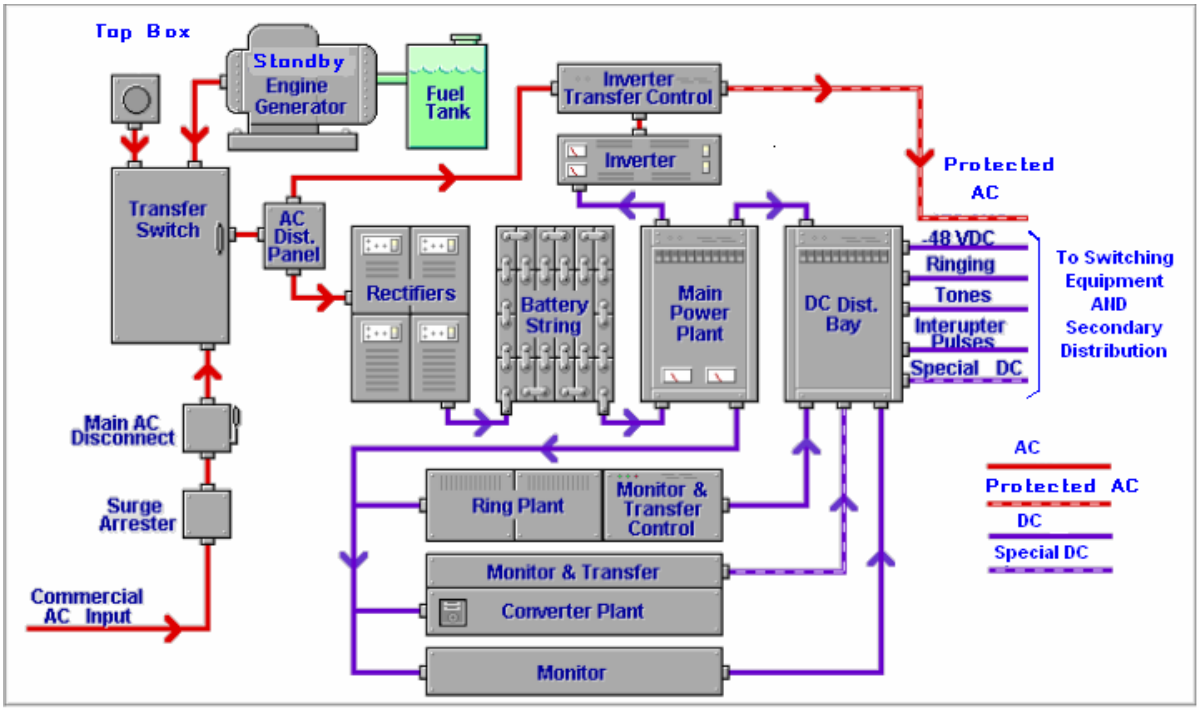


FIGURE 12-2--RECTIFIER PLANT

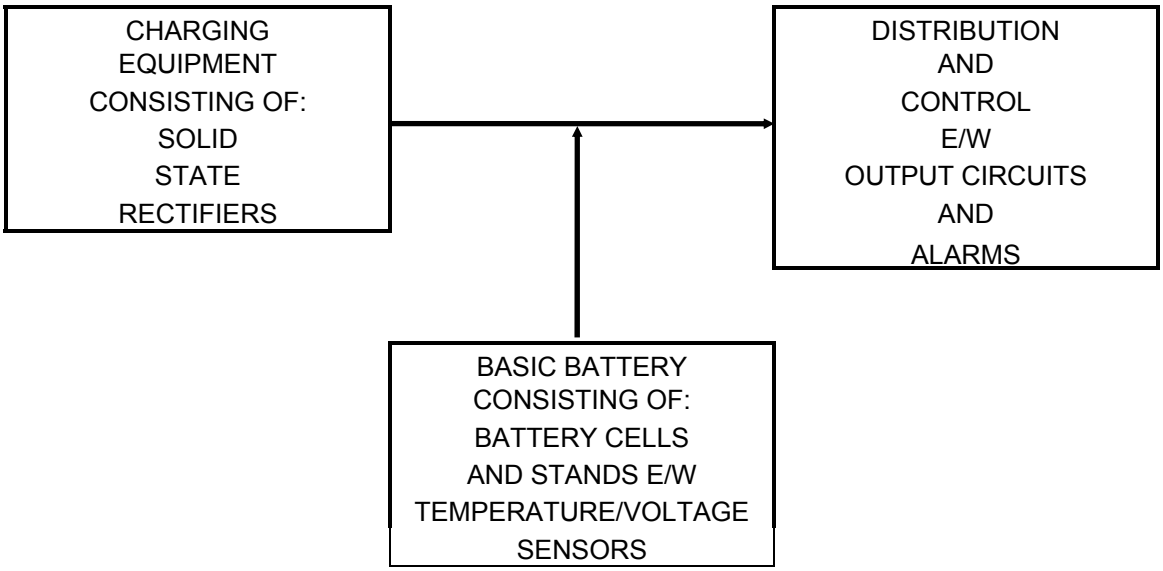
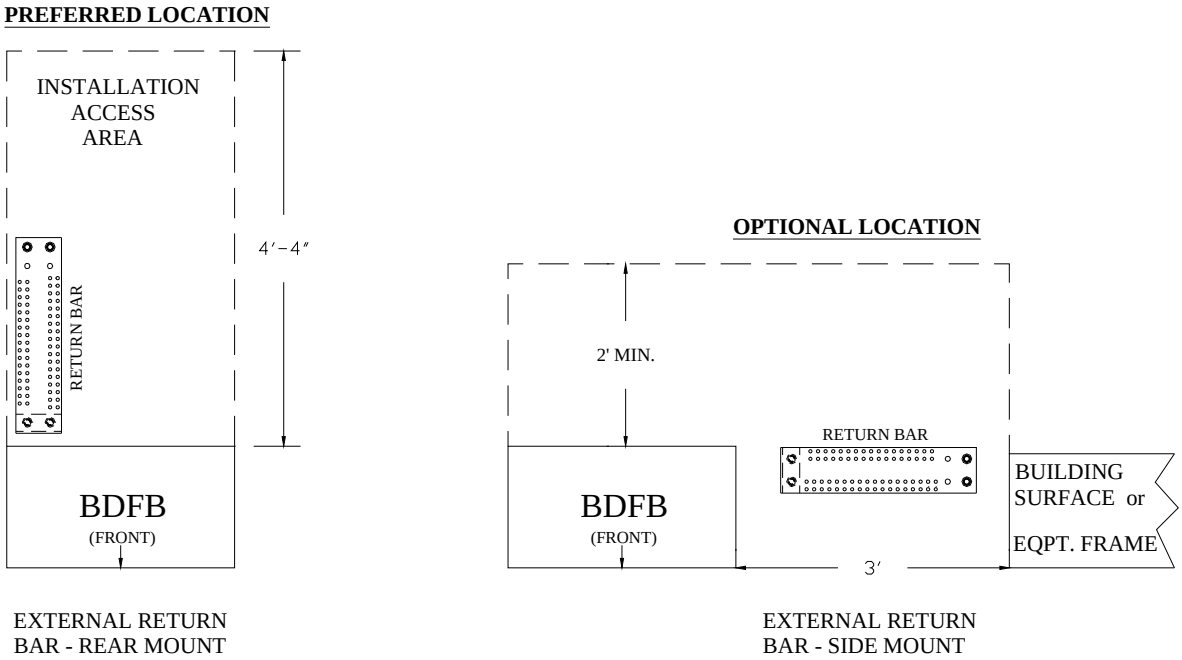


FIGURE 12-3 – BDFB EXTERNAL BATTERY RETURN BAR PLACEMENT (TOP VIEWS)



12-4 CABLE SIZES

WIRE SIZE		AMPACITY
GAUGE	CM	(COPPER)
14	4110	15*
12	6530	20*
10	10380	30*
8	16510	55
6	26250	75
4	41470	95
2	66370	130
0	105600	170
00	133100	195
0000	211600	260
350 MCM	350000	350
500 MCM	500000	430
750 MCM	750000	535

Source: National Electrical Code (NEC) Handbook, 1996, Table 310-16

The ampacity values reflected here are standard copper wire/cable values

Please refer back to the NEC Handbook for standards on any non standard wire/cable

- Allowable ampacity may be effected by items such as insulation rating -

*Maximum fuse size

[END OF SECTION]

SECTION 13 -- GROUNDING AND BONDING

CONTENTS PAGE

TABLE 13-1 – SUMMARY OF CHANGES IN SECTION 13

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 This section identifies the requirements for the grounding and bonding of network equipment engineered for AT&T .

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-76403

2.1.1 Instructions for ordering a copy of ATT-TP-76403 are in Section 1, of ATT-TP-76401.

2.1.2 The Detail Engineering Service Provider (DESP) shall engineer to the applicable bonding and grounding requirements of ATT-TP-76403, Grounding and Bonding Requirements for Network Facilities. For convenience, the sub sections of ATT-TP-76403 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 Internet Services and Operational Support Systems Equipment

5 Customer Premises Equipment

6 Video 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 AT&T 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.

[END OF SECTION]

SECTION 15 -- CABLE ENTRANCE FACILITY

CONTENTS PAGE

TABLE 15-1 – SUMMARY OF CHANGES IN SECTION 15

Change	Item in 09/08 Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

1. GENERAL

1.1. Introduction

1.1.1 This section covers the grounding requirements in the cable vault and Cable Entrance Facility (CEF). Note: Non-Central Office locations will need to meet the requirements of the National Electrical Code; Fiber Cable – Article 770 Copper Cable – Article 800.

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 termination frame(s) in the IS 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 termination frame.

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 or building 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 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.

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

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

1.3.5 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 Central Office Ground bar.

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

1.4. Requirements – Insulating Joint CEFS

1.4.1 IS 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 IS 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 IS 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 ¾ inch air gap 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 IS office side of the insulating joint shall be connected to the IS 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.

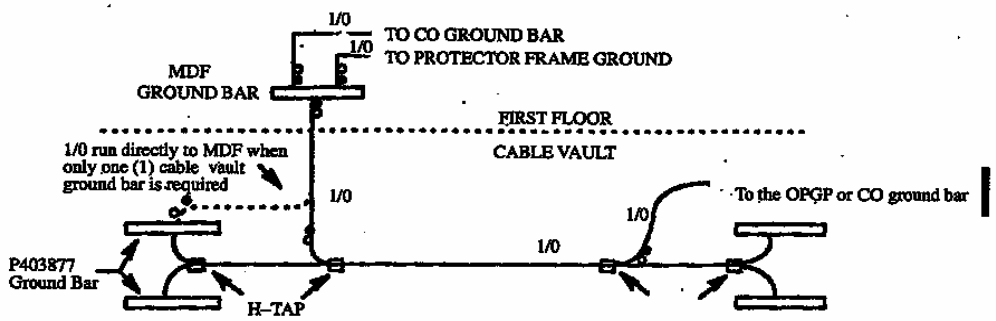
1.5. Interbonding

For Cable Entrance Facility requirements see ATT-TP-76416.

1.6 Fiber Optic Cable

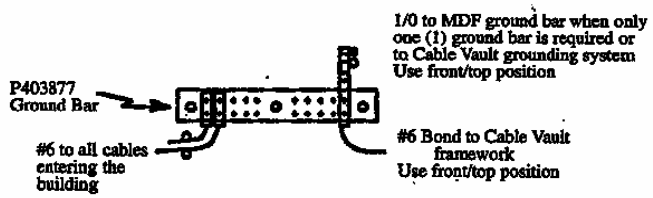
Any Fiber Optic cable containing a metallic shield shall be bonded to the CEF.

FIGURE 15-1 -- CABLE VAULT GROUNDING



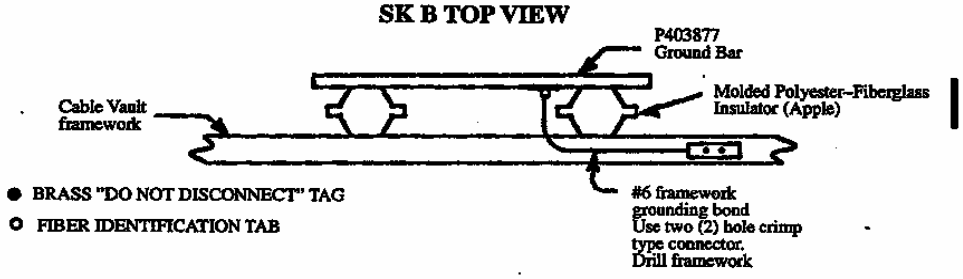
CABLE VAULT GROUNDING SYSTEM

SK – A



10 POSITION GROUND BAR
ONE REQUIRED PER 18 CABLES

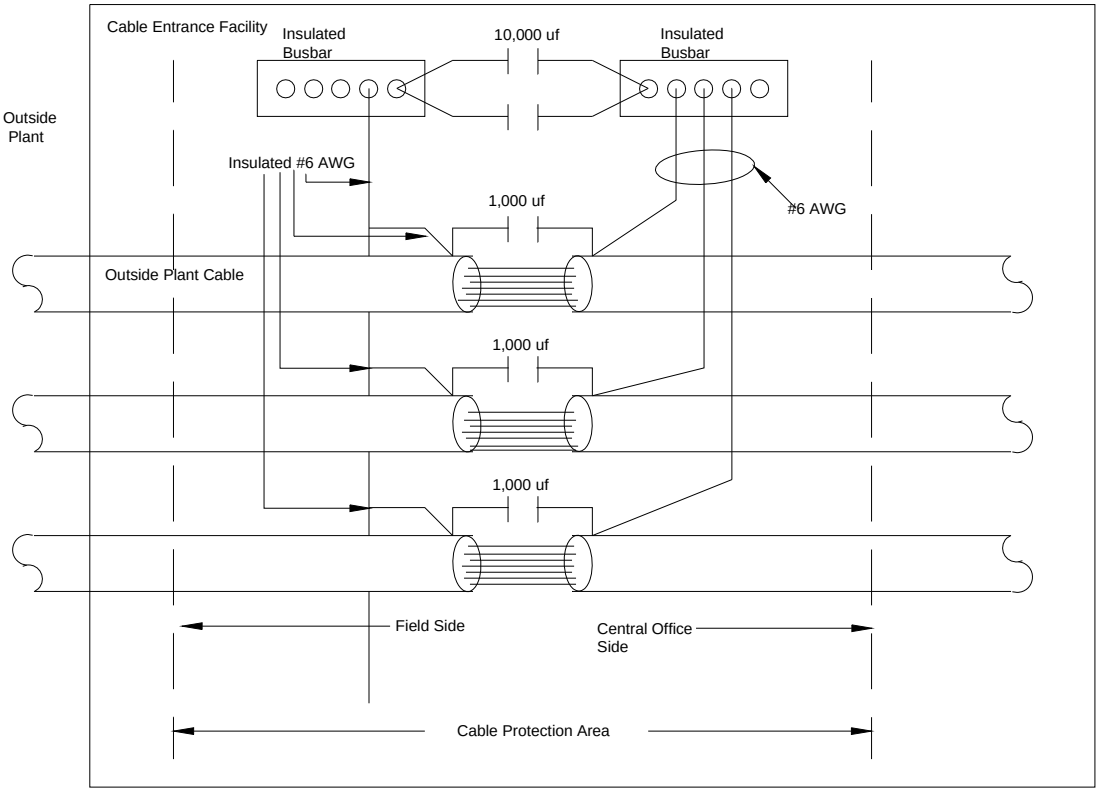
SK B TOP VIEW



10 POSITION GROUND BAR MOUNTED ON INSULATORS
AND BONDED TO THE LINEUP FRAMEWORK

SK – C SIDE VIEW

FIGURE 15-2 -- INSULATING JOINT CEF



[END OF SECTION]

SECTION 16 -- STANDBY ENGINE/ALTERNATORS

CONTENTS PAGE

TABLE 16-1 – SUMMARY OF CHANGES IN SECTION 16

Change	Item in 09/08Issue	Item in This Issue
Revised	Revised to update document in comparison to TP76400	
Deleted		
Added		

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 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 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 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.).

2.2.4 Tap boxes shall be provisioned as required for the connection of portable standby engines.

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 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-76401.

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 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 113°F shall be marked with warning labels. Surfaces with temperatures greater than 140° 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 140° 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.

[END OF SECTION]