AT&T
TECHNICAL PUBLICATION

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[END OF SECTION]

CHECKLIST OF CURRENT SECTIONS

Updates to ATT-TP-76400 may be issued on a section-by-section basis when deemed necessary. Shown below are current sections of ATT-TP-76400 as of January, 2012.

Section	Issue Date	Effective Date	Latest Revision
Preface	01-01-2012	01-01-2012	--
Checklist Of Sections	01-01-2012	01-01-2012	--
Table of Contents	08-01-2012	08-01-2012	--
Section 1	08-01-2012	08-01-2012	01-15-2018
Section 2	03-11-2016	03-11-2016	06-04-2018
Section 3	03-11-2016	03-11-2016	06-01-2021
Section 4	08-01-2012	08-01-2012	07-05-2016
Section 5	08-01-2012	08-01-2012	05-19-2023
Section 6	08-01-2012	08-01-2012	04-01-2019
Section 7	03-11-2016	03-11-2016	05-01-2020
Section 8	03-11-2016	03-11-2016	02-21-2024
Section 9	03-11-2016	03-11-2016	06-09-2022
Section 10	08-01-2012	08-01-2012	--
Section 11	08-01-2012	08-01-2012	06-01-2021
Section 12	08-01-2012	08-01-2012	05-19-2023
Section 13	01-01-2012	01-01-2012	01-05-2016
Section 14	08-01-2012	08-01-2012	--
Section 15	08-01-2012	08-01-2012	--
Section 16	08-01-2012	08-01-2012	07-05-2016

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SECTION 1 – INTRODUCTION

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TABLE 1-1 – SUMMARY OF CHANGES IN SECTION 1

Revision Date	Item	Action	Requirements Change Notification
7/28/2017	Table 1-2	Addition	ATT-TP-76400-206
1/16/2018	Table 1-2	Modification	ATT-TP-76400-210

1. GENERAL

1.1. Introduction

1.1.1 ATT-TP-76400, Detail Engineering Requirements, delineates the requirements for providing detail engineering services to AT&T.

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

1.1.3 AT&T assumes no responsibility for any costs incurred by a given manufacturer or supplier in conforming to the requirements of ATT-TP-76400. Further, conformance to all requirements in this document does not constitute a guarantee of acceptance of a given supplier's product/service for use in the AT&T.

1.1.4 AT&T reserves the right, without prior notice, to revise ATT-TP-76400 for any reason.

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

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

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

1.1.5 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-TP-76400 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-76400 is to:

a) Establish engineering requirements for Detail Engineering Service Providers (DESP) engaged in detail engineering;

b) Provide the information the DESP can expect to receive from the AT&T Equipment Engineer;

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

d) Provide guidance on the required methodology used in constructing or correcting Carrier Communications Space records;

e) Promote engineering compatibility with ATT-TP-76300, AT&T Installation Requirements.

1.3. Scope

1.3.1 ATT-TP-76400 applies to all detail engineering services provided to all AT&T and supersedes all detail engineering requirements documents previously issued by AT&T.

1.3.2 ATT-TP-76400 is applicable to all types of new and reused telecommunications equipment.

1.3.3 ATT-TP-76400 is applicable to central offices, towers, controlled equipment vaults (CEV), and huts, as well as some customer premises locations per applicable contracts and tariffs. For the purpose of this document, all these locations are hereinafter referred to as “central offices”. For detail engineering at Public Safety Answering Point (PSAP) locations, refer to ATT-TP-76911.

1.3.4 ATT-TP-76400 applies to Engineering, Furnish and Install (EF&I) orders, Engineering and Install (E&I) orders, or Engineering Only (EO) orders. The focus is on the “Engineering” activity, regardless of the “Furnish” or “Install” status.

1.3.5 In addition to contracted equipment DESPs, ATT-TP-76400 also applies to AT&T personnel who perform equipment detail engineering, as well as to AT&T personnel and contracted firms who provide building engineering services. In this document, these personnel and firms also are called DESPs.

1.4. Definitions

1.4.1 Definitions of certain terms used in ATT-TP-76400 are as follows:

a) **Detail Engineering Service Provider (DESP)** - Detail Engineering Service Provider.

b) **AT&T Equipment Engineer** - The AT&T engineering representative or the AT&T real estate management representative who is directly responsible for the engineering and installation of the job and who has overall responsibility for job completion and acceptance.

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

d) **Shall** - Verb used to indicate mandatory requirements subject to audit.

e) **Should** - Verb used to indicate recommendations that should be met if existing conditions allow.

f) **Telephone Equipment Order (TEO)** – The AT&T document to the DESP to authorize engineering services. The TEO may be conveyed in various forms, such as Growth Equipment List (GEL), Partners in Procurement (PIP) order, etc.

g) **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.

h) **Space & Power Request Form** – The document the AT&T 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&T.

1.5. General Requirements

1.5.1 The current issue of each section of ATT-TP-76400 as of receipt of the Telephone Equipment Order is the issue in effect and shall be used. Revisions may be issued on a section-by-section basis. The Checklist of Current Sections at the front of ATT-TP-76400 indicates the date of issue. Along with the revised section(s), an updated Checklist of Current Sections will be issued to indicate the current date of issue for each section.

1.5.2 In addition to ATT-TP-76400, building codes, national (e.g., NEC) and local electrical codes or other ordinances, statutes, rules, or governmental regulations may be applicable to the job and shall require compliance. Where more than one requirement applies to any matter related to personnel safety or property protection, the strictest requirement applies.

1.5.3 ATT-TP-76400 is intended to be used in conjunction with the equipment manufacturer's product specific engineering information, product specific equipment drawings, and other documents listed herein or specified in any applicable contract between the DESP and AT&T. The DESP shall notify the AT&T Equipment Engineer for resolution of any discrepancy between the manufacturer's engineering information and ATT-TP-76400.

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

1.5.5 Some requirements in ATT-TP-76400 are delineated by reference to other AT&T standards such as ATT-TP-76300 and industry standards. These standards are summarized in Table 1-2 and shall be considered part of ATT-TP-76400.

1.5.6 The DESP is responsible for:

a) Providing a positive response to the AT&T Equipment Engineer within the timeframe specified by the ATT Equipment Engineer for any requests for work.

b) Obtaining all required documentation to engineer the order;

c) Ensuring detail engineering services are done in accordance with AT&T requirements and federal, state, and local laws and regulations;

d) Ensuring the equipment supplier's installation and interconnection requirements are met. This understanding is especially important when the DESP is not the equipment supplier. This document is not intended to provide specific equipment or interconnection engineering standards;

e) Ensuring licenses, copyrights, or permits are available if an equipment supplier requires them in the course of engineering;

f) Providing information and direction to the equipment supplier in accordance with the requirements established by the AT&T's practices or requirements;

g) Developing and providing the detail specification(s) per ATT-TP-76400;

h) Creating and updating Technical Equipment Records as required by Section 4, ATT-TP-76400;

i) Ensuring that the job, as detail engineered, can be installed in accordance with ATT-TP-76300;

j) Providing interpretation and direction to the installation supplier on questions related to the detailed engineering of the job.

1.5.7 The DESP shall submit requests for a variance from any ATT-TP requirements to the AT&T Equipment Engineer. The AT&T Equipment Engineer shall confirm the validity of the variance request and input the request to the AT&T GEOlink Wavier Request System. Approval of a variance shall be determined by the assigned AT&T GES SME and documented through the formal waiver process.

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

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

1.6. Proprietary Information

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

1.7. Ordering Information

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

Rosalind Edwards
3763 Howard Hughes Pkwy, Suite 200
Las Vegas, NV 86169
re1783@att.com

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

1.8. Comments On ATT-TP-76400

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

Serena Kwong
Specialist - Technical Process/Quality
sk5945@att.com

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

Reference	Title
ATT-TP-76200	Network Equipment Power, Grounding, Environmental, and Physical Design Requirements
ATT-TP-76300	AT&T Installation Requirements
ATT-TP-76900	AT&T Installation Testing Requirements
ATT-TP-76911	AT&T E911 Requirements
ATT-TELCO-IS-812-000-016	Floor Loading of Equipment Superstructure Suspended from Building Ceilings
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
ATT-TP-76461	AT&T Fiber Optic Connector & Adapter Inspection and Cleaning Standards
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
ATT-812-000-713	Network Equipment Anchoring Requirements
BSP 800-000-102MP	Carrier Communications Space Equipment Framework Design Requirements
BSP 800-000-104MP	Bracing Requirements For Network and Data Equipment On Raised Floor System

Reference	Title
ATT-812-000-032	Reference of Approved Firestopping Products and General List of Product Suppliers
BSP 800-006-152MP	Floor Stanchion Supported Cable Rack System Requirement
BSP 800-068-150MP	Carrier Communications Space Equipment Framework Support Requirements
ATT 801-601-900	AT&T Alarm Standards Practice
Infrastructure Deployment Guidelines (AT&T)	Main Distributing Frame (MDF) & Modular Frames
BR 751-410-101 (Telcordia Technologies)	Common Language Standard Abbreviation List
BR 781-822-005 (Telcordia Technologies)	
BR 781-826-001 (Telcordia Technologies)	List of DSX Bellcore Practices
BR 781-826-004 (Telcordia Technologies)	DSX-1 and DSX-1C Engineering Guidelines
TM-ARH 001287	Research and Engineering Opportunities in the DSX-1 Environment
TM-NPL 008523	DSX-3 and DSX-4 Engineering Guidelines
TR-NPL 000320	Fundamental Generic Requirements for Metallic Digital Signal Cross-Connect Systems DSX-1,-1C, -2, -3
TR-NPL 000321	Generic Requirements Digital Signal Cross-Connect Frames DSX-1,-1C, -2
BSP 201-200-060 (Telcordia Technologies)	Distributing Frames-General
BSP 201-219-101 (Telcordia Technologies)	Protector Frames-General
BSP 201-220-101 (Telcordia Technologies)	Conventional Frames-General
BSP 201-222-050 (Telcordia Technologies	COSMIC DSS System-General
ADC Fiber Management System Application & Installation Manual	Network Equipment Fiber Distribution Systems
American National Standards Institute (ANSI) information	

Reference	Title
Building Codes, National and Local Electric Codes, Ordinances, Statutes, Rules and Government Regulations	
Federal Communications Commission Rules	
National Fire Protection Association standards	
Nationally Recognized Testing Laboratory (NRTL) information	
Under Writers Laboratories standards	

[END OF SECTION]

SECTION 2 -- TELEPHONE EQUIPMENT ORDERS (TEOs)

CONTENTS PAGE

TABLE 2-1 – SUMMARY OF CHANGES IN SECTION 2

Revision Date	Item	Action	Requirements Change Notification
03/11/2016	Entire Document	Modification	N/A; March 2016 TP76400 Rewrite
07/05/2016	2.3.1	Modification	ATT-TP-76400-187
06/04/2018	2.3.1	Modification	ATT-TP-76400-212

1. GENERAL

Installation Supplier = Organization performing the requested work activity.

AT&T Engineer = Person requesting the work activity.

1.1. Introduction

1.1.1 This section describes the information that shall be provided to the Detail Engineering Service Provider (DESP) by means of the Telephone Equipment Order (TEO).

1.1.2 Changes in this issue of Section 2 of ATT-TP-76400 are summarized in Table 2-1.

2. INFORMATION PROVIDED BY THE AT&T ENGINEER

2.1. General

2.1.1 The AT&T Engineer shall provide a TEO for every job issued to the DESP to identify relative billing information, work effort and job schedules. The DESP shall receive a TEO before issuing the detail specification.

2.1.2 The AT&T Engineer shall provide an appendix/ revision to the TEO when the job scope changes (i.e. additional services, assignment updates, date changes).

2.2. TEO Facesheet

2.2.1 The TEO Facesheet shall contain, at a minimum:

a) **Job address (Installation Location)**

b) **Project Number (e.g. CFAS or equivalent)**

c) **Telephone Equipment Order (TEO) Number.** (AT&T Order Number)

d) **CLLI Code.** Eight or eleven character Common Language Location Identifier code associated with the installation location.

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

f) **GEO LOC** AT&T Accounting Location Code (a.k.a. GEO plus the Parcel Code)

g) **Appendix or Revision No.** The original TEO starts with the number 0 and is incremented accordingly (e.g. 0, 1, 2, 3, etc.)

h) **Material Want/ Delivery Date.** Date requested for material to arrive at the ship to location

i) **Vendor Start Date.** Date installation is scheduled to start

j) **Vendor Complete Date.** Date vendor is scheduled to complete installation

k) **Service Date.** Date equipment can be provisioned to provide service can be provisioned to provide service or work requested has been validated completed (no circuits involved).

l) **Completed Date.** Date no additional TEO work is required.

m) **Description.** A summary of the scope of work including; Activity, Equipment Type(s) and Quantity, Bay/Shelf Location(s), and Circuit quantity

n) **AT&T Engineer.** Name of the AT&T Engineer responsible for the job

o) **Engineering Issue Date.** Date AT&T Engineer issues the TEO

p) **Phone Number and/or EMAIL.** Telephone number and/or e-mail address of AT&T Engineer

q) **Cost Center Code.** Cost Center Code (i.e., RCO, OC, ORG C) of the AT&T Engineer.

r) **Installation Site Contract.** Telephone and E-mail of the installation site contact person.

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

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

a) A listing of AT&T provided equipment

b) Tracking number of any pre-approved variances (e.g. wavier numbers)

c) Equipment make and model numbers

d) Required assignments or instructions for obtaining them (e.g., Alarms, FDF, DSX etc.)

e) Required connections to the remote management systems (e.g. Conexus CO, CO WAN, NSDNet, Netcool, etc.) or instructions for obtaining them

Note: In regions where the AT&T Engineer acquires the Out of Band assignment provides this information with the TEO.

f) In offices with Modular (e.g. COSMIC, etc.) type distributing frames, provide assignments or instructions for obtaining them.

g) Conventional distributing frame termination locations or instructions for obtaining this information

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

i) Specify whether cable mining is to be performed and to what extent cable mining is to be performed ("A" to "Z" locations)

j) Name and telephone number of the AT&T Representative

k) For cabinets, relay racks, and MDF Frame Blocks being added or removed, provide the relay rack and/or frame block locations. This can be accomplished by providing a copy of the floor space request form (e.g. SAF, ACT, FESRA) via Space & Power Request or SAF Form.

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

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

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

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

p) The Power Engineer's name and telephone number

q) Material Ship To. "Ship To" location for material ordered for the job

r) Mail Installers Papers To. The "Ship To" for Installer's Papers (e.g. mailing and/or E-mail address). Required for jobs when DESP is not the installation supplier

s) Cabling type, quantity, length and configuration.

[END OF SECTION]

SECTION 3 -- DETAIL ENGINEERING SPECIFICATION REQUIREMENTS

CONTENTS PAGE

TABLE 3-1 – SUMMARY OF CHANGES IN SECTION 3

Revision Date	Item	Action	Requirements Change Notification
03/11/2016	Entire Document	Modification	N/A; March 2016 TP76400 Rewrite
05/02/2016	3.7.5	Deletion	ATT-TP-76400-185
06/01/2021	3.12.1	Modification	ATT-TP-76400-242

1. GENERAL

Installation Supplier = Organization performing the requested work activity.

AT&T Engineer = Person requesting the work activitiy.

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 Upon receipt of the TEO the Design Engineer Service Provider (DESP) shall provide a Detailed Specification for all items requested in the TEO.

1.2.2 Along with the Detailed Specification, the DESP shall provide a copy of the TEO (including all attachments) to the installer and the issuer of the TEO (directly or indirectly (e.g. EJF) no later than the vendor start date (VSD) of the installation.

1.2.3 The DESP shall obtain from AT&T written approvals for variations (e.g. waivers) from ATT-TP-76400 and include this correspondence with the Detailed Specification.

1.2.4 Established patterns within the Carrier Communications Space should be considered by the DESP (e.g. distributing frame blocks wiring patterns). The DESP shall obtain from AT&T written approvals for variations.

1.2.5 The DESP shall insure that the correct TEO number is identified on the Spec for marking the material being shipped to the job site.

1.2.6 Any known discrepancies in the information provided by the TEO shall be resolved with the issuer of the TEO prior to issuing the Detailed Specification.

1.2.7 DESP shall ensure equipment installed in the field accurately reflect quantities of equipment and material AT&T has ordered.

1.2.8 DESP that participate in the building block program shall only utilize Firm Price Quote (FPQ) drivers when other Building Blocks and Drivers are unavailable.

1.2.9 DESP shall only utilize FPQ drivers when other Building Blocks and Drivers are unavailable.

1.2.10 DESP shall install include supporting documents with respect to 3rd parties that they hire and pass the cost along to AT&T (e.g. building union personal, power vendor, etc.).

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 ordered

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. Office Drawing Records List
8. AT&T Equipment and Interconnect Drawing List
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 except voice switch. 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&T Engineer.

1.3.5 The DESP shall ensure that distributed paper copies of the Detailed Specification are consistent in content and format with this electronic file.

1.3.6 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 companies except under written agreement.

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

2. SPECIFICATION COVER SHEET

2.1. Contents of Cover Sheet

2.1.1 The Cover Sheet is the first page of a specification. It contains information from the TEO Facesheet, as well as information to be provided by the DESP.

2.1.2 On the Cover Sheet, the DESP shall transfer all information from the fields of the TEO Facesheet and add the following information:

a) Supplier Order Number

b) SPEC Appendix No. The original 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.

c) For voice switch specifications formatted in sub-specifications as described in Section 3 below, the appendix numbers apply to the index sub-specification only

d) List of AT&T TEOs and appendices if included in this specification

e) Table of Contents

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

g) DESP's Contact and Telephone Number

h) Instruction to mark packages with TEO Job Number

3. SPECIFICATION FORMS

3.1. General

3.1.1 Voice switch specifications may be grouped in sub-specifications. If the 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) TEO Number

c) Page X of Y (consecutively)

d) CLLI (Installation Location)

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&T approved variances from ATT-TP-76400

3.3. General Installation Supplier Notes

3.3.1 General Installation Supplier Notes provide instructions to the equipment installer that are general in nature. General Notes shall be numbered consecutively, starting with "1." If appendices are issued, the General Notes should continue in sequence.

a) General Notes shall always contain the following:

1. The entire installation shall be in compliance with ATT-TP-76300.
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-TP-76300, 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 BDFB load readings and the List 1drain for all equipment associated with new BDFB fuse positions on the BDFB Load Demand Worksheet, and forward the worksheet to the AT&T Engineer and Power Planner/ Capacity Manager on all jobs that add a power load to a BDFB. This includes jobs that add load to the BDFB via an existing bay fuse panel and/or circuit additions to the BDFB. Approval is required prior to adding new circuit fuse positions at the BDFB.

   Note: BDFB refers to any Secondary Power Distribution Unit (SPDU).
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 firestop covers. BDFB Power Boards and cable hole firestop covers are to be removed intact. Activities which impact (e.g. removal, drilling) resilient flooring, such as asbestos containing sheet or rolled goods (e.g. linoleum), are prohibited unless performed by a Zurich approved abatement contractor in accordance with applicable regulatory requirements for work controls and training. Procedures for drilling into floor covering material containing Asbestos or Presumed to contain Asbestos are defined in ATT-TP-76300, Section G.

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

3.4. Work To Be Done By The Installation Supplier

3.4.1 The DESP's specific instructions (work items) to the installer shall be included on the Work to Be Done by the Installation Supplier form. These instructions may also direct work operations to be performed on existing Carrier Communications Space equipment associated with the operation.

3.4.2 Detailed instructions to the installer shall be listed under the following headings:

a) ITEM - The consecutive number of the individual operation instruction. Always start with "1"

b) OPERATION - The type of work operation (work item) required to be performed, e.g., add, extend, modify, remove, etc.

c) QUANTITY - The number of items to be added, extended, modified, removed, etc. (by specific unit of measure i.e. feet, number, weight, volume) if other than each.

d) DESCRIPTION - A narrative description of the work operation required to be performed. The Description shall include references to current relevant drawings

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

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

a) Adding, extending, or removing circuits or multiples

b) Adding, relocating, or removing the wiring and apparatus in existing positions, sections, bays, frames, etc.

c) Renumbering circuits, when no other wiring or apparatus changes are required

d) Modifying equipment, or the installer cutting or disconnecting wiring furnished by the supplier to meet job requirements, except when covered by notes and standard drawings

e) Adding, relocating, removing, or modifying apparatus or equipment, e.g., cable racks, frames, etc.

f) Adding, relocating, removing, or modifying cable racks, auxiliary framing lighting, etc.

3.5. Operation Types

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

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

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

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

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

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

MULT - Required when like leads are 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 reordered. List the wiring diagram number and figure numbers involved and show both present assignment or termination and the new assignment and termination.

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

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

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

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

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

RETIRE IN PLACE - Required when the AT&T 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 distributing frame terminal strips, an installer's note shall be included, containing a sketch if necessary, to convey the terminal strip lead arrangement.

3.7. Material Listing Notes

3.7.1 Material Listing Notes are lettered notes containing instructions and information about the material being provided. These shall be used to indicate the supplier or source, and any special handling requirements of material ordered in the Material Listings page, including instructions to the supplier and installer, as appropriate. This information may be provided by the AT&T Engineer in the TEO.

3.7.2 Notes shall be alphanumeric.

3.7.3 The note “symbol”, e.g. A, B, C, etc., is to be placed in the “note” column of the Material Listing Notes page. The variable, worded portion of notes is to be placed in the “Description” column of the form.

3.7.4 When two or more notes with a particular alphabetical symbol are used, the note shall be given a numerical suffix: for example, three additional “T” notes would be numbered T1, T2 T3, etc.

3.7.5 When Material listing Notes are used, the following shall be used as standard designations. Other notes may be used, when there is a need.

AA - The length shown in the narrative is the minimum allowable length required for installation. The supplier can provide one length as specified in the quantity field or variable lengths as specified in the narrative.

H - Denotes 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. Refer to ATT-TP-76300.

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

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

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

Note: Use this note for material that has been ordered in advance (Pre-ordered) of the release of the complete detail engineered specification. The advance ordered material has been previously processed by the AT&T 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. All AT&T Approved Minor Material and all Building Block items necessary for the job shall be listed in detail.

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. Carrier Communications Space Records

3.9.1 The DESP shall list on the Carrier Communications Space Records page the Carrier Communications Space records updated as a result of the job.

3.10. AT&T Equipment and Interconnect Drawings

3.10.1 The DESP shall list on the AT&T Equipment and Interconnect Drawings page the following drawing(s), with issue numbers, used in engineering the job:

a) Manufacturer's (equipment) drawings

b) Circuit or interconnect drawings

3.11. Reference Drawings

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

Note: Reference Drawings listed here are electronically available to the installation supplier.

3.12. Cable Running List

3.12.1 All cable or wire (power, switch, transport, miscellaneous) to be run by the installer shall be listed under the subsection, "Cable Running List." Near-end and far-end termination locations shall always be specified.

3.12.2 The heading for a Cable Running List entry shall show the interconnect drawings, figures and options related to cabling of each end of the circuit.

3.12.3 The DESP shall provide the following information on a cable running list:

a) Cable run number of each cable

b) A reference note, if required, shall be cross-referenced to the applicable Specific Installation Supplier note

c) The length of each cable run in feet

d) The number of cables to be run

e) The code/type of the cable being run

f) When cable route diversity is required the DESP shall indicate "Diversity" in the cable route column.

g) The from and to locations of the cable run. When diverse cables are required, the side of the bay or relay rack on which to run the cables shall be shown in the "TO DROP" and "FROM DROP" columns. Cable drop in feet may be included if desired. For example, L indicates drop on the left side of the bay, as referenced from the front of the bay, or 10L indicates a ten foot drop if the cable drop in feet is included

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

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

3.13. Equipment Inventory Update

3.13.1 The DESP shall provide a completed Equipment Inventory Update (EIU) from where inventory is required by the scope of the job.

a) General Information

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

b) Cabling Information

1. Equipment Information

i) Equipment Description (FLM 150, TELLABS 532L, etc.)

ii) HECI/CLEI code (if required)

iii) Floor location where equipment is installed

iv) Relay Rack (Aisle / Bay) location where equipment is installed

v) Shelf / Unit or Group number

vi) Cable length (if required)

2. Termination Information

i) Fiber, DSX-1 and DSX-3 Floor, Relay Rack location, Panel, and Jack port

ii) Digital Cross Connect (DCS) machine Relay Rack location, Electronic Address (eleven-character machine name), Shelf, Slot number and how used (STS, 3 to 3, 3 to 1) and port / unit assignment.

iii) Distributing Frames

(MDF, CDF, TDF) Horizontal / Vertical location

COSMIC and SMDF frame module, shelf, block.

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

d) When cabling to DCS equipment, the electronic addresses (SDF, Port, CLLI, HECI/CLEI, RR, and Unit) are required for both ends of the cable.

3.13.2 Prior to the vendor complete date, if any changes to the EIU Form information occur, the DESP shall revise the EIU form and provide a copy to the AT&T Engineer.

3.14. Inventory Staging

3.14.1 The Installation Supplier shall stage equipment into the appropriate provisioning inventory database as directed in the TEO. What application is used is based on equipment type, its configuration and its owner

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&T Engineer or made available electronically on-line.

5.1.2 For Engineering & Installation (E&I) or Engineering, Furnish & Installation (E, F, & I) jobs, the detailed specification shall be forwarded to the DESP‘s installer and the AT&T Engineer. For E only jobs, the detailed specification shall be forwarded to the AT&T Engineer electronically or made available on-line.

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 -- TECHNICAL EQUIPMENT RECORDS

CONTENTS PAGE

TABLE 4-1 – SUMMARY OF CHANGES IN SECTION 4

Revision Date	Item	Action	Requirements Change Notification
01/05/2016	(entire document)	Modification	ATT-TP-76400-173
03/03/2016	2.11.1, 2.11.2	Modification	ATT-TP-76400-182
07/05/2016	2.2.1	Modification	ATT-TP-76400-188

1. INTRODUCTION

1.1. General

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

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

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

1.1.4 The Detail Engineer shall correctly update and/or mark-up for update technical equipment records as identified in Table 4-3. These records are the official AT&T documentation of technical equipment.

1.1.5 The records listed on Table 4-3 shall be maintained only in those regions where they are currently updated.

1.1.6 All records are the property of AT&T. 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 Technical equipment records (as shown in this section) are not generally required at Enclosed Technical Extensions (ETE). ENEs are defined as CEVs, CUEs, Huts, Prems, Radio Sites, etc.

2. TECHNICAL EQUIPMENT RECORDS DESCRIPTION

2.1. General

2.1.1 Technical equipment records reflect the engineering and installation plan for description and location of equipment installed for AT&T. 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 Detail Engineer shall ensure the appropriate base or bases are reviewed and updated because some locations may have more than one base number.

2.1.3 The existing drawing numbering scheme shall be followed when creating or updating drawings specified in Table 4-3.

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

2.2. Record Document Types

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

Table 4-3- Record Document Types

Document Type Code	Description	Marked for Update	Updated By	Data Base
FP	Floor Plan	Detail Engineer(Updates will be required only if there are DESP requested changes or identified corrections)	AT&T Space Planner	L-B = creLink L-T = creLink L-S = creLink L-M = crelink NTC/RTC = CingWEB VHO/SHO/IS = creLink
PL	Plan Drawing (Lighting, grounding, racking, fiber protection, etc)	L-B, L-S and L-T: AT&T no longer maintains these records. Operating Territory Vendors will be responsible for the ongoing upkeep and maintenance of these records as desired for their own internal operations. ***L-M: Alaska, Hawaii & Puerto Rico records will be retained & updated by AT&T. See below for instructions specific to these offices.**		
DF	Distributing Frame	L-B by Turf vendor L-T by DESP L-S by DESP	OTV L-T by Eng vendor L-S OTV/DESP/MDRC/Eq. Eng.	L-T = GEOLink L-S = creLink
BF	Battery Distribution Fuse Board (BDFB) and Secondary Power Distribution Unit (SPDU)	L-B by Turf vendor L-T by DESP L-S by DESP	OTV L-T by Eng vendor L-S OTV	L-B = PowerLink_ERMA L-T = GEOLink L-S = TABdb

Document Type Code	Description	Marked for Update	Updated By	Data Base
PB	Power Boards	L-B by Turf vendor L-T by DESP L-S by DESP	OTV L-T by Eng vendor L-S Eng Vendor	L-B = PowerLink_ERMA L-T = GEOLink L-S = PowerLink
FE	Front Equipment	L-B by Turf vendor L-T none L-S by DESP	OTV L-T none L-S OTV	L-T = none L-S = TABdb
AR	Assignment Record (i.e. DSX, fiber, timing)	L-B by Turf vendor L-T by DESP L-S by DESP	OTV L-T by Eng vendor L-S OTV	L-B = DSXFOX L-T = GEOLink L-S = TABdb
AL	Remote Alarm Records	L-B by Turf vendor L-T by DESP L-S by DESP	L-B by turf vendor L-T by Eng vendor L-S MDRC/Eq. Eng.	L-B = BTAS L-T = GEOLink/ DMS L-S = TARS/Manual
MF	Misc fuse panel	L-B by Turf vendor L-T by DESP L-S by DESP	OTV L-T DESP L-S OTV	L-B = PowerLink_ERMA L-T = Electronic L-S = TABdb
AC	PDSC & AC Service Records	L-B by Turf vendor L-T DESP L-S DESP	OTV L-T by Eng Vendor L-S Eng Vendor	L-B = CT L-T = GEOLink L-S = PowerLink

2.3. Floor Plan Records (FP)

2.3.1 AT&T creates Floor Plan Records from architect drawings and plans. AT&T Space Planners maintain floor plan records to reflect the locations of planned and installed equipment.

2.3.2 Floor Plan Records are the official AT&T record to be used to locate and install technical equipment.

2.4. Distributing Frame Records (DF)

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

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

2.4.2 Distributing Frames can be either single-sided or double-sided. On a double-sided frame, the sides are referred to as the horizontal side and the vertical side. Some single-sided DFs are arranged with the horizontal elements located on the lower portion of the framework and the vertical elements on the upper part.

2.4.3 On the horizontal portion, each level within a bay is identified with a letter designation beginning with "A" on the lowest level, "B" on the next to the lowest level and continuing to the top of the framework, excluding alphas I and O. First is the level letter, followed by the bay number. For example, HMDF L15 refers to a frame block on the horizontal side of the MDF located on level “L" at bay 15.

2.4.4 On the vertical portion of the DF, the frame blocks are mounted in vertical rows. Each vertical is assigned a number, beginning with the numeric one at the first vertical, and continuing in consecutive order to the end of the framework. Frame blocks are assigned a level letter beginning with A at the bottom and continuing up in consecutive order to the top of the framework, excluding letters I and O. On the vertical side, specify the vertical number first, followed by the level designation. For example, VIDF 2E is a frame block on vertical 2, at level E of the IDF.

2.4.5 Although the numbering of vertical and horizontal positions on a frame is usually in one direction, a frame can grow in two directions. The Floor Plan Record shall be reviewed to determine frame growth patterns and numbering. If a frame grows in two directions, the horizontal and vertical positions are numbered 1, 2, 3, etc., in one direction and 901, 902, 903 etc. in the opposite direction.

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

2.4.7 In all regions, COSMIC and modular ESS Distributing Frame Records are tabular and the records shall be maintained in FrameMate. There is no graphical/mechanical Carrier

Communication Space base record. Southeast office conversion to FrameMate has been completed.

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

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

2.5.2 The BDFB/SPDU record provides a relational tabular database of information associated with the BDFB/SPDU and shall include Company, office location, floor, lineup, manufacturers, 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 the system.

2.6. Power Board Records (PB)

2.6.1 Power Board records shall be maintained by the AT&T Power 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.

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

2.7. Front Equipment View Records (FE)

2.7.1 Front Equipment View Records are records of the physical location of equipment on various frameworks throughout the AT&T Technical Space. They contain equipment information in pictorial or tabular form. This information is related to the location, position, and specific mounting details of technical equipment as derived from supplier's standard equipment drawings. Other AT&T Technical Space records, such as assignment records support the Front Equipment View Record.

2.8. Assignment Records (AR)

2.8.1 Assignment Records contain specific information for the interconnection and monitoring of the capacity of technical elements. Assignment records may include DSX, Fiber Distributing Frame, and timing, fuse panels and alarm records (Remote Alarm Records are maintained manually).

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

2.8.3 Remote Alarm Assignments reflects serial and discrete status/command terminations for Technical Elements (TE) on an AT&T Technical Space Telemetry Alarm Unit.

2.9. Equipment Numbering Plans for AT&T Technical Space Equipment

2.9.1 The numbering of bays, frames and cabinets on all records shall be consistent with the Floor Plan Record. Floor Plan Records are the official AT&T record to be used to locate and install technical equipment. The AT&T Space Planner is responsible for the floor plan. The Detail Engineer shall contact the AT&T Space Planner to reconcile any of the following conditions prior to installation start.

a) Floor Plan for the equipment location specified in the TEO is not available from the floor plan data bases identified in this section.

b) The current Floor Plan does not reflect the equipment being installed.

c) The bay/cabinet number(s) and/or the location(s) specified in the TEO do not match the numbering and/or location reflected on the Floor Plan.

2.10. Cable Hole Numbering Plans

2.10.1 Before the start of the job the Detail Engineer responsible for E&I jobs shall submit an electronic floor plan sketch to the AT&T Equipment Engineer identifying where new cable hole(s) must be opened. For floor cable holes only, the Equipment Engineer responsible for the job will forward the sketch to the AT&T Space Planner requesting approval of the location of new cable hole(s) before the hole(s) are opened.

2.10.2 The sketch shall accurately reflect new cable hole(s) size and include a minimum of two reference distances from the nearest column(s) and/or permanent building walls that are adequate to accurately record the location of the cable hole on the floor plan.

2.10.3 The AT&T Space Planner is responsible for floor cable hole numbering only, using one of the numbering methods as described in 2.10.6. The Space Planner shall notify the Equipment Engineer of the assigned designation(s). Floor cable hole designations will be tracked on office floor plans by the Space Planner as he/she is best equipped to know if a new hole will conflict with space allocation plans.

2.10.4 The Equipment Engineer is responsible for forwarding the assigned designation(s) to the Detail Engineer and coordinating new cable hole openings with the AT&T CRE Facility Planner/Manager.

2.10.5 The Detail Engineer is responsible for wall cable hole numbering using one of the numbering methods as described in 2.10.6. No record of wall cable holes will be maintained by the Space Planner on the floor plan. The Detail Engineer shall inform the Installation Supplier of the wall cable hole designations who shall stencil the designations on the cable hole covers.

2.10.6 Cable hole numbering in AT&T technical equipment buildings shall utilize one of the following three methods;

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.

c) Cable holes in technical equipment buildings without columns shall be numbered as follows utilizing the TEO No. of the TEO under which the cable hole designation shall be applied. Floor–TEO No.–Sequential letter uniquely identifying the cable hole(s) designated under the TEO. For example: 01-49545-A identifies the first cable hole (A) designated under TEO 49545 on the first floor (01).

2.10.7 For existing technical equipment buildings, new cable holes shall be numbered in keeping with one of the above established methods in use in the building. For new AT&T Technical Space buildings, and existing buildings utilizing column support construction where the above numbering methods have not been utilized Method B (utilizing compass direction) shall be used. Otherwise Method C shall be used.

2.11. Grounding Records

2.11.1 For wireline and Legacy T Central Offices (COs), and Mobile Telephone Switching Offices (MTSOs) – 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) or other equivalent AT&T representative. The floor plan will be used for overall CO Ground System reference. The archived Grounding Schematic (650 Series) Drawings are no longer available on the mechteam.sbc.com electronic document storage system for pre-merger Legacy S. See TP-76416, paragraph 2.4.7.

2.11.2 For AT&T Integrated Cloud (AIC), Internet Services (IS), and Video Hub Offices (VHO) equipment locations - The location of the OPGP and AIC/IS POP/VHO GRDs shall be recorded on the appropriate building plan electrical drawing. No grounding system detail is maintained. See TP-76403, paragraph 2.4.7.

2.12. Power Equipment Records

2.12.1 Power Equipment Records are those AT&T Technical Equipment Space records that include details of the equipment used to produce, control and distribute power to AT&T Technical Space equipment. Power Equipment DC and AC Distribution Records shall be updated any time equipment is added, changed, or removed from an AT&T Technical Space.

2.13. Fuse Bay Equipment Records

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

2.13.2 Fuse Bays were originally engineered to provide secondary distribution for many different, small amperage equipment types spread over a large area of the AT&T Technical Space. Dedicated power distribution units (PDU's) (feeding equipment in same rack) and non-dedicated (PDU's) (feeding equipment in an adjacent rack) are not considered Fuse Bays.

2.13.3 Some of the active Fuse Bays have been converted to 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.

2.14. AC Service - PDSC Records

2.14.1 The AC Service Records including cabinet or panels, input feeder circuit breaker source, capacity, wire sizes, and AC branch distribution circuit assignments shall be recorded in the regional mechanized database system.

2.14.2 The DESP shall submit AC Distribution (PDSC) assignments to the AT&T Power Engineer via the AC Distribution Worksheets or populate directly as applicable into the regional mechanized database system.

2.15. Ring, Tone And Cadence Records

2.15.1 Ring, Tone and Cadence Records are maintained in the regional mechanized database system, by the AT&T Power Engineer or the DESP, as applicable.

3. MANUFACTURER AND AT&T EQUIPMENT DRAWINGS

3.1. General

3.1.1 The appropriate AT&T Technical Space records shall be updated or created to indicate the proper equipment drawings, as well as their associated lists, groups, figures, etc.

3.1.2 There are two types of equipment drawings:

a) Manufacturer's equipment and interconnect drawings. These drawings should only be used if there is no existing AT&T drawing for the associated equipment.

b) AT&T drawings. These drawings always supersede information shown on the associated manufacturer's drawings/documentation.

4. AT&T TABULAR AND GRAPHICAL/MECHANICAL AT&T TECHNICAL SPACE RECORDS

4.1. General

4.1.1 Upon receipt of the AT&T Telephone Equipment Order (TEO), the DESP shall determine which AT&T Technical Space records are required to complete the engineering process.

5. RECORDS CREATION AND UPDATING

5.1. General

5.1.1 This section details the procedures employed when creating or updating 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 Records shall be created or updated when:

a) Equipment is added.

b) Equipment is removed.

c) Equipment is relocated.

d) Assignment record updates are identified;

e) Other changes take place, including renumbering records, record only changes and equipment modifications, which may change a list or option designation.

5.1.3 The DESP shall resolve any TEO assignment discrepancy with the AT&T Equipment Engineer.

5.1.4 The Detail Engineer shall make all required “as built” changes to tabular records no later than 15 calendar days following completion of installation, except in legacy companies that require by completion of installation.

5.1.5 The Detail Engineer shall mark the required “as built” changes on graphical/mechanical records and forward/upload marked record to appropriate center/system no later than 15 calendar days following completion of installation, except in legacy companies that require by completion of installation.

5.2. AT&T Technical Space Drawing Title Block

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

a) Type of Record: Indicate the type of record 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. Equipment Record Marking Standards

5.3.1 The following colors shall be used when manually or electronically updating equipment records which will be returned to AT&T by the Detail Engineer.

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. 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. Records which do not reflect equipment being added or removed, but which represent new information concerning existing equipment 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 equipment records are changed:

a) All paper records shipped to a job site shall be clearly labeled with the DESP Name, Detail Engineer's Name or Initials, Detail Engineer's Phone Number and the AT&T TEO order number.

b) Only approved abbreviations shall be used. Refer to Telcordia Technologies document BR 751-410-101, Common Language Standard Abbreviation Master List for standard abbreviations.

c) Any new symbols added to the body of the record shall be defined in the General Notes.

d) All notes shall be referenced somewhere on the body of the record.

e) All applicable records shall be updated.

f) Whenever measurements are required, such as on floor plans they shall be shown and the appropriate records updated.

g) Entire records shall be provided in a legible format. Partial prints may be submitted, if attached and referenced to an entire record.

h) 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 Detail Engineer shall bring any updated record to current standards as outlined in this section.

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

5.3.4 The Detail Engineer shall submit all updated equipment records to AT&T per instructions on the TEO.

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

5.4. Record Distribution

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

5.5. Updating Floor Plans

5.5.1 The Detail Engineer shall notify the AT&T Equipment Engineer of unexpected space requirements. The AT&T Equipment Engineer will resolve all space requirements with the AT&T Space Planner.

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

5.5.3 AT&T equipment building floor plans are available as AutoCAD® .dwg files. The recommended tools for use by the Detail Engineer to perform floor plan markups are AutoCAD ,DWG TrueView and Autodesk Design Review or comparable software for markup of .DWFx files. DWG TrueView and Design Review are available as free downloads from the Autodesk web site. Paper markups are not recommended. (® Copyright 2011 Autodesk, Inc.)

5.5.4 The following options for floor plan markup are recommended. Either option will produce an electronic marked drawing that can be provided to the AT&T Space Planner for use in updating the master floor plan and/or used by the Installation Supplier if a marked print record is required for the Electronic Job Folder (EJF).

a) Use a copy of the AT&T .dwg floor plan file and AutoCAD to mark changes.

b) Either AutoCAD or DWG TrueView may be used to open the .dwg floor plan and publish it as a .dwfx file. Autodesk Design Review or comparable .DWFx markup software may then be used to open and markup the .DWFx file with the required changes.

5.5.5 Changes shall be marked as instructed in TP-76400 Sec.5. All changes shall be clearly identified with "revision clouds". Text notes should also be inserted onto the drawing clearly explaining the changes being communicated via the markup.

5.5.6 Refer to "Supplier Instructions for AutoCAD Floor Plan Markup" at the AT&T supplier documentation web site.

5.6. Updating Distributing Frame (DF) Records

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

5.6.2 Some conventional frame records are electronically maintained in FrameMate. For those not in FrameMate, marked prints shall be required for mechanical updates that are posted on electronic storage system as active (TBASE) records.

5.6.3 When a frame block is added on a conventional frame, and the office is not in FrameMate, it shall be shown on the drawing by darkening the location at the chosen coordinates. The terminating circuit title, bay location, and circuit numbering shall be indicated.

a) If insufficient space is available to show the information, an expanded sketch may be used. This sketch is identified by the location coordinates of the frame block. On the sketch, each tick mark is one row of connecting terminals on the frame block;

b) When the expanded sketch is not used, and all of the rows of a frame block are not assigned, the abbreviation "SR" (Spare Rows) shall be used along with the quantity of spare rows remaining for example [10SR]. Only that portion representing rows of terminals utilized shall be darkened.

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

a) Circuit title;

b) Originating location;

c) Spare rows;

d) Circuit numbering;

e) Title box information;

f) Jack box and connecting block information - assignments and multiples;

g) Sketches showing individual circuit information, such as location, circuit title, spare rows, and circuit numbering.

5.6.5 The DESP shall update the “Location of Equipment” table on the drawing with information relating to wiring diagram numbers and figures, frame block code, and the horizontal or vertical location of the frame block.

5.7. Updating AC and DC Power Records

5.7.1 AC and PDSC Power Distribution Panel changes and Power Board DC Distribution Changes will be entered into the power records database. The DESP shall submit AC and DC Distribution (Power Board) assignments to the AT&T Power Engineer.

5.7.2 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 technical element relay rack number
5. Assigned technical element description and load designation
6. L-2 type DC drain of the assigned technical 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 Installation Supplier responsible for AT&T Technical Space record updates and the AT&T Power Engineer within 5 working days of completing the BDFB/SPDU installation and load additions in Regions where the BDFB/SPDU Worksheets are available.

c) The Installation Supplier responsible for AT&T Technical Space record updates 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.

5.7.3 DESP shall enter BDFB/SPDU information into the appropriate systems in Regions where the BDFB/SPDU Worksheets are not utilized.

5.8. Updating Front Equipment View Records

5.8.1 Where applicable, the Front Equipment View Records depict how relay rack (RR) frameworks in an AT&T TECHNICAL SPACE are equipped. They shall contain the following items:

a) RR height

b) Height of first mounting plate from the floor

c) Mounting plate width and height

d) Individually added units depicting the correct location and number of occupied mounting plate spaces

e) Manufacturer, equipment description, part number and list/group structure

f) Unit/Panel numbering

g) Circuit numbering

h) Adapter arrangements where applicable.

i) Miscellaneous and overhead equipment not occupying mounting plates within the frame (TAB/db only).

j) Removed units eliminated from drawing when units are removed

5.9. Updating Assignment Records

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

a) Equipment description and part number of equipment

b) Wiring diagram number, quantity of units, circuits, figures

c) Relay rack location

d) Shelf/unit/panel numbering

e) Circuit numbering

f) Notes.

5.9.2 When a Technical 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&T Equipment Engineer has updated the database previously.

5.9.3 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.

5.10. Updating Switch Records

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

5.11. Voiding Records

5.11.1 AT&T TECHNICAL SPACE base records may be voided for any of the following reasons:

a) A record has been entirely substituted by a new record;

b) A new record has been established, and the order to which it applies has been entirely canceled;

c) The removal of equipment, circuits, framework, etc. that covers an entire record.

5.11.2 Records are placed on a void status, rather than destroyed, so that a record of equipment configurations is available in case the equipment is reused in another office. Voided records are retained for three years. Voided records may be reinstated within the three-year period only by contacting AT&T. Records shall not be voided without the concurrence of the AT&T Equipment Engineer.

[END OF SECTION]

SECTION 5 -- EQUIPMENT LAYOUT & EQUIPMENT ENVIRONMENTS

CONTENTS PAGE

TABLE 5-1 – SUMMARY OF CHANGES IN SECTION 5

Revision Date	Item	Action	Requirements Change Notification
09/04/2018	2.2.21	Modification	ATT-TP-76400-219
11/02/2018	2.2.9, 2.2.10, 2.2.12	Modification	ATT-TP-76400-224
11/02/2018	2.2.21, 2.2.23	Modification	ATT-TP-76400-225
04/01/2019	2.2.6	Modification	ATT-TP-76400-235
05/19/2023	2.2.15	Modification	ATT-TP-76400-251

1. GENERAL

1.1. Introduction

1.1.1 This section describes the general requirements for technical equipment layout engineering

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

1.1.3 Equipment engineered for installation in AT&T locations shall be in compliance with applicable requirements of ATT-TP-76200 Network Equipment Power, Grounding, Environmental, and Physical Design Requirements.

1.2. Equipment Layout Requirements

1.2.1 The AT&T floor plan serves as the official record for equipment floor location and layout. The Detail Engineer shall not deviate from the floor plan unless the deviation is communicated to and authorized by the responsible AT&T Space Planner. All communications and authorization of this type shall be in writing. If the Detail Engineer is provided a TEO or marked prints that do not agree with the floor plan, the Detail Engineer shall request the AT&T Equipment Engineer to resolve discrepancies with the AT&T Space Planner.

1.2.2 The equipment installation design shall ensure that technicians have optimum access to installed equipment.

1.2.3 Equipment layouts, including AIC Technical Space, shall be in accordance with the Company's standards for technical equipment environments (refer to ATT-TELCO-IS-812-000-003), and in compliance with published equipment manufacturer's requirements/restrictions relative to actual placement of equipment.

2. EQUIPMENT FRAMES

2.1. Introduction

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

2.1.2 Free standing, floor anchored 7'-0" equipment frames shall be the standard configuration in AT&T Legacy Technical Space 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 designed for zone 4 duty floor anchored as per ATT-TP-76300 & ATT-812-000-713.

2.2. Equipment Frame Requirements

2.2.1 All equipment frames shall be in compliance with AT&T Equipment Framework and Cabinet Design Requirements document ATT-812-000-715.

2.2.2 Cabinets used in VHO, SHO and NTC space 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 frameworks shall be designed and constructed for Zone 4 service.

2.2.4 Nineteen-inch wide relay racks are not commonly used and shall not to be applied in most legacy AT&T Technical Space applications.

2.2.5 Frames equipped for nineteen-inch wide relay racks may be used in SHO, VHO and NTC space but should not be mixed with twenty-three-inch wide relay racks without the expressed authorization of AT&T Equipment Engineer.

2.2.6 The current AT&T policy is for equipment frames to be 84-inches in maximum height for all new equipment frame installations located within an AT&T Technical Space. When new 7'-0" equipment frames are being installed within existing Legacy 9'-0", 9'-6", or 11'-6" Technical Space environments it should be determined if the environment can tolerate leaving the newly installed 7'-0" standard height frame in that space without the use of a frame extender. A frame extender maybe used within a Legacy Technical space due to any of the following environmental constraint:

a) Completing out the last bay or two of an existing established 9'-0", 9'-6", or 11'-6" equipment lineup.

b) Adding a new 7'-0" equipment frame to a new equipment lineup when it is located between two existing 9'-0", 9'-6", or 11'-6" contiguous equipment lineups and it is not feasible or practical to lower the superstructure accordingly.

c) When adding a new 7'-0" equipment frame into a small office where the designated equipment area has been configured as a 9'-0", 9'-6", or 11'-6" equipment environment supported entirely by the equipment framework (non-ceiling supported superstructure).

d) When the existing ceiling supported 9'-0", 9'-6", or 11'-6" equipment lineup superstructure requires additional support from the equipment frame.

A bay extender may be used for mounting equipment if the location has floor space management issues or floor space conservation requirements.

2.2.7 The Detail Engineer shall specify a 1 3/4 or 2 inch drill hole pattern on miscellaneous equipment frame uprights. Exception: In SHO, VHO and NTC space the standard hole spacing shall be EIA 310D 5/8" 5/8" ½" spacing. Mounting holes shall be drilled and tapped for 12-24 mounting screw diameter.

2.2.8 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.

2.2.9 An equipment frame spacer and associated base filler are to be used when spacers are required between adjacent equipment frames. Spacer requirements:

a) The front spacer guard box shall align with the guard box of the adjoining equipment frames.

b) The depth of the rear spacer guard box does not have to align with the adjoining equipment frame unless there is an existing track type rolling ladder located behind the equipment lineup.

c) The frame spacer shall be a minimum of 7 feet in height.

d) The AT&T custom spacer design which incorporates vertical cable management is to be used in all AT&T Technical Spaces. Refer to ATT-E-00447-E-00 for more details.

e) When a vertical cable glide assembly is required in lieu of a spacer unit a guard box is not required. Exceptions:

1. There is a need for maintenance AC Service down the front of the equipment lineup.

2. There is an existing rolling ladder located at the rear of the equipment lineup.

f) All spacers and base fillers are to be installed as per manufactures guidelines).

2.2.10 The base filler shall be secured to the adjoining equipment frames or end guard and not the office floor, per manufacturer's guidelines. Guard box units that are not designed to secure to adjoining equipment frames shall be secured to the building floor with similar floor anchor hardware as used for equipment frame installation.

2.2.11 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.

2.2.12 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.

2.2.13 Equipment frames installed on concrete floors shall be supported and anchored per ATT-TP-76305 and ATT-812-000-713.

2.2.14 Equipment frames placed on a raised floor system shall be secured to building concrete floor unless access floor system at site is designed to permit securing of equipment frames direct to floor panel. Securing of cabinets to building floor shall conform to requirements in ATT-TP-76402. Only access floors constructed with pedestal head positively secured against lift from pedestal tube and floor panel's corner locked to pedestal head shall permit through bolting of frames direct to floor panels.

2.2.15 Stiffening plates are required in high seismic areas (Zones 3, 4). Stiffening plates are not required in low seismic areas (Zone 0, 1, 2). For frame deployments in high seismic areas to meet structural load and seismic guidelines, stiffening plates shall be deployed when the unequipped vertical area between relay rack uprights exceeds 3 feet. For example, if the open vertical area is:

3 ½ FT - 1 plate would be required
6 FT - 1 plate would be required (31.5" open space above, 33" open space below)
7 FT - 2 plates would be required

These plate(s) shall be spaced evenly in the open area so the 36" maximum open space limit either above or below the plate is met. As new equipment is added the plate(s) need not be re-positioned until it begins to interfere with the placement of equipment. For equipment records in TABdb, stiffening plate placement shall be recorded on the TAB/db FEV.

Refer to ATT-E-00447-E-00 for specific part numbers and product sizing.

2.2.16 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.

2.2.17 The location of the ESD jacks shall be at a height between 36” and 60”.

2.2.18 The ESD socket shall be a nominal 4mm (0.160 inches) in diameter to accommodate standard wrist-strap plugs.

2.2.19 Any legacy AT&T Technical Space 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.

2.2.20 All frames shall comply with the following requirements to ensure the 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 or guard rails of all cabinets and frames in a common lineup shall be aligned.

Exceptions:

1. Frames and cabinets that are shown on the floor plan to be out of alignment with the other frames and cabinets in the lineup.

2. Vertical cable management glide assemblies that do not require maintenance AC service cabling routed via their guard box, and/or have a track type rolling ladder located in front or back of:

c) No part of any equipment framework, nor attached equipment chassis or apparatus, shall extend beyond said equipment framework footprint

d) The fronts of the base or guard rails of all cabinets and frames in a common lineup shall be aligned. An exception to this requirement is permitted for frames and cabinets that are shown on the floor plan to be out of alignment with the other frames and cabinets in the lineup. Exceptions should only be made on an as-needed basis and framework extension beyond existing cabinets or racks in the lineup into the front or maintenance aisle shall not exceed 3inches.

e) In Legacy Technical Space lineups utilizing two-post equipment framework with track type rolling ladders a transition device shall be used when the equipment framework are of different depths.

f) The width of aisles between equipment lineups shall meet the following requirements:

1. In legacy AT&T Carrier Communication space rear aisle clearance should allow for ladder access to all bays and conform to space planning objectives of 3’-0”. Minimum rear aisle width is 2’-0”.

2. Rear aisle clearance in VHO, SHO, and NTC space shall not be less than 3’-0”.

3. In equipment space utilizing a “cold aisle – hot aisle” configuration per paragraph 2.2.25 of this document the minimum “hot” aisle width is 3’-0”; the minimum “cold” aisle width is 4’-0”.

g) Raised floor installations must maintain a minimum of 1 full tile access in the rear aisle.

h) An end guard or end panel shall be provided on all frame uprights located at the end of a common equipment lineup.

i) End guards, end panels or end shields located within an equipment lineup:

1. An end guard shall be installed on all frame uprights that are not junctioned to another adjacent frame when personnel/cable protection, equipment bay stability, AC service conduit, etc. is a requirement.

2. An end shield may be installed on all frame uprights that are not junctioned to another adjacent frame when personnel/cable protection is the only requirement.

3. An end guard / end shield is not a requirement for frame uprights that are not junctioned to another adjacent frame when the separation between the equipment frames is less than 12 inches in width and there is no need for personnel/cable protection, equipment bay stability, AC service conduit, etc.

4. End guards for equipment frames shall be as wide as the depth of the adjacent equipment frame cable ducts. All cable in the adjacent frame shall be covered. Cabinets shall have a side panel installed for all units located at end of aisles.

5. End guards shall be a minimum of seven feet tall. For legacy frames less than 7 feet tall the end guards shall be the same height as the legacy frame.

6. End guards, end panels or end shields that do not match the same depth or overall foot print of the adjacent bay framework shall require a transition device (guard rail closing detail) in equipment lineups with track type rolling ladders. This transition device shall be required either on the front, rear or both sides of the end guard, end panel or end shield, whichever is appropriate.

7. End guards or side panels shall be provided at the end of each lineup.

2.2.21 The floor load within legacy AT&T Technical Space from equipment cabinets and cabinets, 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 Detail Engineer shall coordinate with the AT&T Equipment Engineer to ensure equipment cabinets do not exceed floor load capacity.

2.2.22 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.

2.2.23 Equipment layouts in technical equipment buildings may utilize a “cold aisle” and “hot aisle” configuration to manage the heat dissipation of high heat equipment. The “cold aisle” shall be the aisle where cool room air will be drawn into equipment intake (usually termed front or

maintenance aisle) and the "hot aisle**"** shall be aisle where warm exhaust air from equipment is discharged (usually termed rear or wiring aisle). The equipment should be configured so that all equipment in opposing lineups sharing the common aisle shall all be intake facing or exhaust facing to avoid mixing intake and exhaust flows in an aisle. This would result in every other aisle being either a "cold aisle" or "hot aisle".

a) Minimum width of cold aisle shall be 4 feet. Minimum width of hot aisle shall be 3 feet.

b) In the raised floor environment, the front edge of the equipment framework shall be positioned at the edge of one full floor panel in the cold aisle allowing that aisle floor panel to be removed. At minimum two full floor panels in front of each equipment framework across the width of the cold aisle shall be removable. The hot aisle shall have at minimum one full floor panel to the rear of each equipment framework that can be removed. Hot aisles may have partial floor panels in addition to the one full panel when equipment framework depths exceed 24 inches.

2.2.24 The below conditions and interactions shall be incorporated into the floor plan drawings developed by AT&T Space Planners. These conditions and interactions are intended to ensure initial equipment layouts are appropriately sized and configured, and that the integration of new technology into existing equipment environments can be accomplished in a manner most appropriate to floor and overhead cabling space utilization and network equipment interconnectivity.

a) Equipment layouts shall be in accordance with standards per ATT-TELCO-IS-812-000-003 for technical equipment environments.

b) Equipment layouts shall be in compliance with published equipment manufacturer's requirements/restrictions relative to actual placement of equipment.

c) Equipment layouts shall be reviewed by an AT&T Site or Field Operations representative(s) to ensure the physical relationship of network elements is appropriate and efficient from an equipment operations and maintenance perspective.

d) Equipment layouts shall be reviewed by a person familiar with equipment environment cable management and superstructure engineering to ensure those matters is appropriately incorporated into equipment layouts.

e) Equipment layouts shall be reviewed by a power engineer or person familiar with DC power distribution to ensure equipment power distribution has been sufficiently planned for and accommodated.

2.2.25 The locations of equipment frames/cabinets and guards are shown on the floor plan. Neither the Detail Engineer not the Installation Supplier shall deviate from the floor plan and job documentation unless the deviation is communicated to and authorized by the appropriate AT&T Space Planner. All communications and authorization of this type shall be in writing. Discrepancies between floor plans and job documentation shall be referred to the AT&T Equipment Engineer for resolution with the Space Planner.

3. COLLOCATION

3.1. General

3.1.1 Cages and other floor space arrangements for collocation shall be in accordance with the AT&T Collocation Provisioning Guidelines M&P (refer to ATT-TELCO-002-316-002).

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

[END OF SECTION]

SECTION 6--CARRIER COMMUNICATIONS SPACE EQUIPMENT BUILDING ENVIRONMENT REQUIREMENTS

CONTENTS PAGE

TABLE 6-1 – SUMMARY OF CHANGES IN SECTION 6

Revision Date	Item	Action	Requirements Change Notification
06/04/2018	6.1.1	Modification	ATT-TP-76400-213
04/01/2019	2.1.2	Modification	ATT-TP-76400-236

1. INTRODUCTION

1.1. General

1.1.1 This section outlines environmental requirements for Central Offices (COs). Included are such considerations as temperature, humidity, and air quality. Specifically excluded are those considerations that fall under the control of the Environmental Protection Agency (EPA); i.e., air and ground pollution that results from network area 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 Design Engineer 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 Equipment Engineer

2.1.2 The operating ambient temperature[1] will be maintained by CRE to the levels in Table 6-2 to the following temperature ranges:

- Narrow Band: 65ºF to 75ºF
- Wide Band: 72ºF to 85ºF
- Extended Wide Band: 50ºF – 85ºF

2.1.3 Prior to moving the ambient temperature in an equipment space between the temperatures ranges given in 2.1.2, an audit of the facility must be performed by CRE per the Wide Band checklist. See ATT-812-000-705 for details. The temperature range established per Table 6-2 for any given network area location shall be permanent while valid for the technology and application. Temperature set points shall not be cycled on a regular basis (e.g., daily, weekly, monthly, etc.) to account for temporary fluctuations in occupation.

[1] Operating ambient temperature indicates the Carrier Communications Space 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.

2.1.4 When there is data that demonstrate that equipment in COs with Wide Band or extended Wide Band temperature protocol are experiencing significant elevated equipment failures attributed to high heat, CRE should be contacted to audit the equipment space to validate that the space meets the Wide Band checklist requirements per ATT-812-000-705. If the equipment area is not in compliance with the Wide Band checklist, the temperature shall be returned to Narrow Band ranges until compliance is attained. For equipment areas currently at Wide Band or Extended Wide Band that are not experiencing significant elevated equipment failures attributed to high heat, no further action or audit is required.

2.1.5 The operating ambient temperature for equipment areas containing temperature sensitive equipment identified in this document shall be operated in the Narrow Band range.

Identified temperature sensitive equipment:

- 1AESS Switches
- 4ESS Switches

2.1.6 Details on Power Room thermal maintenance and upgrades are located in ATT 812-000-705.

2.1.7 Humidification of facilities should be considered on a case-by-case basis. Telcordia (Bellcore) studies show that it is economically advantageous to humidify up to 15% when existing humidification equipment is present. In Carrier Communications Spaces that have existing humidification equipment and the RH values drops below 15% for periods longer than short-term durations, the humidification equipment shall be activated such that the relative humidity levels will not fall below 15%. Telcordia studies also state that humidification should be considered for mission critical equipment, in unhumidified spaces where Tandems, 911 Routers, or STPs are located. Design considerations should be supported by environmental load analysis. Installation of humidification should be considered with levels set at 15% RH.

2.1.8 Legacy carrier central offices are typically designed and built to deliver a cooling capacity of between 30 – 50 W/sq.ft. Per Telcordia GR-63-CORE, equipment space areas may be populated to 100W/sq.ft for thermal management considerations. Equipment deployed in legacy carrier central offices shall be configured not to exceed 100W/sq.ft unless approved alternative cooling technologies such as supplemental cooling are used.

2.1.9 Humidification should be considered for mission critical equipment. Design considerations should be supported by environmental load analysis. Installation of humidification should be considered with levels set at 15% RH.

TABLE 6-2 – OPERATING TEMPERATURE & HUMIDITY LEVELS
For Communications Equipment Areas, Huts & CEV

Equipment	Temperature Occupied	Temperature Un-Occupied	Humidity
Technical Equipment Space (including Transport, IS) [3]	72 – 85°F	50 - 85°F	8 - 80%
Switch Area (general)	60 - 78°F	60 - 78°F	20 - 55%
Switch Area – 1A, 4E, & Exceptions per 2.1.4	65 - 75°F	65 - 75°F	20 - 55%
Power Room/Batteries (76400)	65 - 77°F	50 - 77°F	5 - 55%
Power Room W/O Batteries	65 - 77°F	50 - 85°F	5 - 55%

Note:
1. Supply temperature readings used to determine compliance with Table 1 are to be measured at 59” above floor level and 15.8” from the face of the equipment. System set point readings shall not be used as a substitute for supply temperature readings at the indicated test point.
2. When spaces are shared by technologies, the most conservative criteria will be used.
3. Rate of change for controlled temperature change within the space shall not exceed 15°F per hour.
4. VHO/SHO deployments threshold limits may currently be set below the limits identified for Network Equipment Space. These limits were initially established in support of extended network reliability. All VHO/SHO deployments shall transition toward the standard threshold limits identified for Network Equipment Space utilizing the VHO/SHO Thermal Transition Checklist (See 812-000-705)
5. See also 8.2.6 DRC relative Humidity limit

3. FIRE RESISTANCE

3.1. General

3.1.1 Data processing interconnecting cables and connecting cables run through an air plenum do not require a plenum rating if the plenum meets the criteria of the National Fire Protection Association (NFPA) 70-465, and the plenum has a smoke detection system.

3.1.2 Building or Carrier Communications Space equipment that does not meet, or has not been tested to, ATT-TP-76200 fire resistance standards shall be compartmentalized with no less than a one hour fire rated wall and sectionalized air handling. The DESP shall coordinate this with AT&T Engineer.

4. FIRE AVOIDANCE AND CONTAINMENT

4.1. General

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

4.2. Products

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

4.3. Cable Openings

4.3.1 All openings in floors, fire rated walls and partitions shall be fire stopped to an equivalent structure fire rating, per ATT-TP-76300. This includes openings for building-related services, house telephone equipment service, openings for power (AC and DC), switchboard and other cables. Openings in a raised floor panel on a concrete floor do not require additional fire stopping.

4.4. Fuel Containment

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

5. BATTERY ROOM VENTILATION

5.1. General

5.1.1 In shared spaces, where batteries are not compartmentalized from other equipment, the DESP shall follow the most stringent of the following ventilation alternatives:

a) One air change every four hours;

b) Two cubic feet per minute per string;

c) Twenty cubic feet per minute per person (when occupied);

d) Applicable codes.

5.1.2 In separate battery rooms, an outside air ventilation of two cubic feet per minute per string is required with a minimum of one air change every twelve hours.

5.1.3 Battery room air shall not be exhausted through any other equipment or administrative space, but shall be exhausted directly outdoors away from any building intake.

6. SEISMIC AND OFFICE VIBRATION

6.1. General

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

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

b) ATT-TP-76409, Network Facility Cable Rack Requirements

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

d) ATT-812-000-713, Network Equipment Anchoring Requirements

e) ATT-812-000-715, Equipment Framework and Cabinet Design Requirements

f) ATT-TP-76200, Network Equipment and Power Grounding, Environmental, and Physical Design Requirement

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. Under the International Building Code, earthquake designs for structures are designated as Seismic Design Categories with more severe categories as D.E or F.

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. All network equipment frames and DC power equipment shall be secured to building floor in all locations.

Note: 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 General Recommendation for Building HVAC Air Filtration are as follows:

If filter rack space permits and/or initial costs are not negatively impacted, a MERV 13 (equal to 85% dust spot efficiency rating) is required for use in Urban Central Offices, and all Data centers, and a MERV 11 (equal to 65% minimum dust spot efficiency rating) is required for all rural Central Offices. Urban and Rural CO's are defined as follows:

a) **Urban** – Highly cosmopolitan area, traffic, highly commercialized and major growth possibilities, heavy construction area in vicinity with high pollution.

b) **Rural –** Less-populated non-urban areas, residential or moderately developed. May include agricultural and insignificantly less outdoor pollution

7.1.2 CRE will assure that minimum building filtration of "65% ASHRAE dust spot rating" or equivalent MERV 11 shall be provided. Some local regulations are more stringent and shall supercede this stated requirement. Filter efficiency may be defined based on the new Minimum Efficiency Reporting Value (MERV).

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 Light emitting diode (LED) lighting shall be used to illuminate Carrier Communications Space equipment, power, and maintenance areas in most cases. An exception would be that when adding to an existing lineup of fluorescent fixtures, it is recommended that fluorescent fixtures be added. Equipment lighting for network equipment frames and equipment related work areas shall be appropriate for the performance of routine network administration functions. Lighting for the performance of detailed equipment installation and circuit/service management activity shall be provided by the use of portable light fixtures appropriate for the activity being performed. Unless otherwise specified for a particular network element or technology, equipment lighting shall be provided above equipment maintenance (front) aisles only.

8.2.2 In all new installations, T8 LED lamp/driver combinations shall be used in equipment and operating areas due to their efficiency. The drivers for LED fixtures have a shorter life span than the LED tubes. The drivers are small and inexpensive; however, it is imperative that the driver matches the tube.

8.2.3 Minimum levels of illumination shall be maintained in Carrier Communications space equipment areas. New lighting systems shall provide initial illumination levels as least 25 percent higher (to account for losses due to lamp lumen depreciation and dirt accumulation in the lighting system), but no more than 50 percent higher than the levels listed in Table 6-3, “Maintained” column.

8.2.4 Motion Sensor technology is the default method for controlling equipment area lighting fixtures and shall be used unless other methods are given for specific installations within this document. Motion Sensor switching has been determined to be an appropriate and effective means of ensuring equipment lighting is turned on when and where needed and only for the duration of time needed for a specific work activity. For the purpose of this practice, a Motion Sensor refers to a devise that uses Passive Infrared technology (not dual technology) to detect motion and switch the lights on in place of traditional toggle switches.

8.2.5 Light fixtures shall not be placed directly over batteries.

8.2.6 Additional frame and aisle lighting requirements are given in Section 8 of TP 76400MP. Illumination

8.3. Building Lighting

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

8.3.2 General building lighting shall be on Essential Power.

9. EMERGENCY LIGHTING

9.1. General

9.1.1 Emergency lighting for central offices 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 6-3--MINIMUM MAINTAINED ILLUMINATION LEVEL

AREA	LEVEL (Maintained) (FOOT CANDLES)
EQUIPMENT FRAME AREA	
Maintenance aisle	15 (Note 1)
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 (BDB)'s (Measure at center of board)	20
CABLE ENTRANCE AREA	
Aisles and open spaces (Use portable lighting units during maintenance)	5 (Note 2)
CONTROL, TEST, AND MAINTENANCE AREAS	
Control center or test frame (measure on shelf)	50
Print display board (measure at center of board)	50
Desk top (measure on writing surface Computers	50-70 20-30

Note:

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.

[END OF SECTION]

SECTION 7 – WIRE, CABLE AND FIBER REQUIREMENTS

CONTENTS PAGE

Table 7-1 – summary of changes in section 7

Revision Date	Item	Action	Requirements Change Notification
03/11/2016	Entire Document	Modification	N/A; March 2016 TP76400 Rewrite
06/04/2018	5.1.1	Modification	ATT-TP-76400-214
07/24/2018	5.1.1	Modification	ATT-TP-76400-218
05/01/2020	1.2.2	Modification	ATT-TP-76400-240

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 Telephone Equipment Order (TEO) and ATT-TP-76400.

1.2. Cable Holes

1.2.1 The addition of new cable hole penetrations shall be coordinated with the AT&T 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-TELCO-IS-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) Design new cable rack paths utilizing transition cable racks or devices to change levels except at points of termination (I.E equipment frames). Refer to Figure 7-1. Existing non-standard transitions created under legacy company policies may be used until the feeding and receiving cable paths reach their designed fill capacities.

1.3.2 If specified by the equipment manufacturer or the AT&T Equipment Engineer, power and switchboard cables shall be run on separate cable racks. Unless otherwise specified by the AT&T 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 AT&T except for CAT-5, RS232 and TIA/EIA (568B) categorized cables. .

2.2.3 Tip and ring conductors shall always be paired. Single leads and split pairs are not acceptable for tip and ring applications.

2.3. Distributing Frames

2.3.1 Horizontal Side - The leads from one cable may be spread over a maximum of five consecutive, physical terminal blocks in each direction

2.3.2 Vertical Side - A cable may be formed over an entire vertical or any portion of it, as required.

2.4. Synchronization Cable

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

2.5. Relay Racks

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

3. AC WIRING REQUIREMENTS

3.1. General

3.1.1 See TP76400 Section 12 and TP76300 Section M for AC wiring and conduit requirements.

4. DC POWER CABLE AND WIRE

4.1. General

4.1.1 See TP76400 Section 12 and TP76300 Section M for DC power cable and wiring requirements.

5. RIBBON CABLE

5.1. General

5.1.1 Fiber jumper/patch cord type cable shall not be installed on cable rack; wire basket tray or a Fiber Protection System shall be used (interbay cable routing).

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. Coaxial cables used under raised floor shall be plenum fire rated.

6.1.3 When 734 and 735 type soft dielectric coax cable is terminated, clear heat shrink is NOT required. These 734 and 735 coax cables shall have a UL-flammability rating of CMR.

6.1.4 Only 735C and 734C coaxial cable is approved for use in AT&T's network per ATT-E-00067-E note 12. In addition, ATT IS has been authorized to use 1855A, 1505A, and 1694A type coaxial cables.

Note: AT&T will not require the Switch Manufacturer to use 734C/735C cable in place of 734D/735A cable on Switch jobs. However, the Switch Manufacturer's coaxial cable stripping tools and coaxial connector crimping tools must meet the approval standards of AT&T Common Systems on all Switch jobs in which 734D and/or 735A cable is to be installed. Furthermore, the Switch Manufacturer must continue to use only those connectors approved by AT&T on such jobs.

Note: 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. Also, shielded cable shall be used when recommended by equipment manufacturer or when EMI issues are of concern.

7.1.3 Shielding requirements for timing cable are in TP76400 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:

8.1.3 Green - general wiring (except battery and ground wires): Not applicable to Legacy AT&T and Bell South.
Red - battery wires.
Black - battery return wires.

8.1.4 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&T.

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 ATT-TP-76400 section 12 and ATT-TP-76300 section M.

9.2. AC Circuits

9.2.1 All AC connections shall be made in accordance with the NEC. See ATT-TP-76400 section 12 and ATT-TP-76300 section M for additional requirements.

9.3. Coaxial Connections

9.3.1 Coaxial cable connections shall be 75 ohm type connections.

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, such as the T&B STA-KON, Burndy VINYLUG, Lucent Technologies WP91412 or Panduit nylon insulated.

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

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

Yellow/Amber terminal #26-#24 wire*

Red terminal #22-#18 wire

Blue terminal	#16-#14 wire
Yellow terminal	#12-#10 wire

*Not NRTL rated or listed

10. ETHERNET CABLE

10.1. Ordering Ethernet Cable

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

11. UNSHIELDED TWISTED PAIR (UTP) CABLE

11.1. General

11.1.1 All references are to EIA/TIA 568 and EIA/TIA 569 standards. This is not, nor is it intended to be, a complete disclosure of all information regarding the installation and testing of UTP CAT 5E / CAT 6(A) cable. All requirements are, by definition, minimum in nature. Reasonable effort to exceed these standards should be exerted. In no case will the minimum standards be compromised.

11.1.2 The Unshielded Twisted Pair (UTP) media specifications are based on EIA/TIA-568 specifications for 100 □ UTP CAT 5E / CAT 6(A) cable.

11.1.3 Horizontal cables shall be terminated with connecting hardware of the same category or higher.

11.1.4 Patch cables shall be of the same performance category or higher as the horizontal cables to which they connect.

11.1.5 Following are general requirements for patch panels:

a) Should be located as close as possible to the core of the area it is serving.

b) Should be used for communications equipment only.

c) Quantities of panels placed should equate to the number of terminations or ports required plus projected growth

d) Patch panels shall be installed at both ends of the horizontal cabling system (i.e. tie cable).

11.1.6 The cable length from the termination point in the VHO / ISP POP to the work area shall not exceed 90 meters (295 feet) independent of the media type.

Note: In establishing maximum distance, an allowance was made for 5 additional meters (16.4 ft.) at the work area and an additional 5 meters (16.4 ft.) from the patch panel to active or passive equipment in the VHO / ISP POP.

11.1.7 Each of the eight conductors contained within each four-pair cable should be color-coded and terminated in accordance with EIA/TIA T568B polarization sequence as listed below:

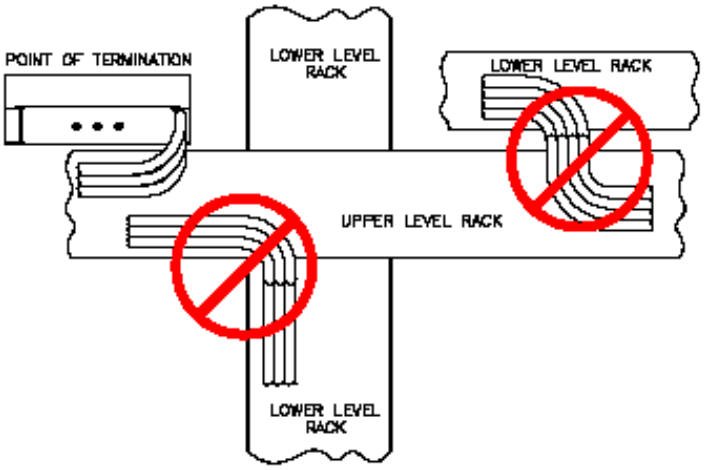
Conductor ID♦	RJ-45 Pin ID♦	RJ-45 Pin ID♦	UTP Color Code
	T568A	**T568B**	
Pair 1 Tip	5	5	White/Blue♦♦
Pair 1 Ring	4	4	Blue/White♦♦♦
Pair 2 Tip	3	1	White/Orange♦♦
Pair 2 Ring	6	2	Orange/White♦♦♦
Pair 3 Tip	1	3	White/Green♦♦
Pair 3 Ring	2	6	Green/White♦♦♦
Pair 4 Tip	7	7	White/Brown♦♦
Pair 4 Ring	8	8	Brown/White♦♦♦

♦ The pin-pair positions are identical to those contained in the IEEE 10BASE-T standard and the AT&T 258A specification.

♦♦ Wire insulation is white, and a colored tracer is added for identification.

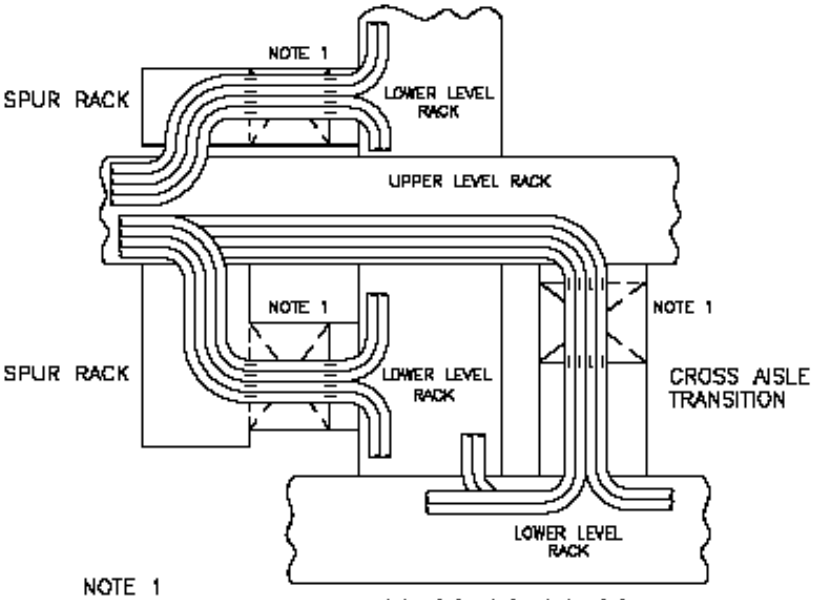
♦♦♦ Wire insulation has a solid color (stated first) with an optional white tracer.

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

Revision Date	Item	Action	Requirements Change Notification
05/02/2018	4.3.4	Modification	ATT-TP-76400-211
06/04/2018	5.2.18	Modification	ATT-TP-76400-215
06/04/2018	5.2.19	Deletion	ATT-TP-76400-216
06/04/2018	4.3	Modification	ATT-TP-76400-217
11/02/2018	1.3.4	Addition	ATT-TP-76400-226
11/02/2018	2.1.9	Addition	ATT-TP-76400-227
11/02/2018	4.3	Modification	ATT-TP-76400-228
11/02/2018	4.4	Modification	ATT-TP-76400-229
11/02/2018	4.5.3	Modification	ATT-TP-76400-230
04/07/2022	TOC, 4.4.4	Modification	ATT-TP-76400-245
03/01/2023	Subsection 3	Deletion	ATT-TP-76400-249
03/01/2023	4.5.3	Modification	ATT-TP-76400-250
08/03/2023	1.2.3	Modification	ATT-TP-76400-254
02/21/2024	4.4.1, 4.4.8, 4.4.10 & 4.4.11	Modification	ATT-TP-76400-255

1. CABLE RACK

1.1. General

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

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

1.1.3 This section covers apparatus requirements for cable rack deployed within AT&T Technical Space areas.

1.1.4 Changes in this issue of Section 8 are summarized in Table 8-1.

1.1.5 ATT-TP-76409 provides additional Technical Space cable rack requirements.

1.1.6 Anchoring requirements shall be in accordance with ATT-812-000-713.

1.1.7 Engineering of cable rack supports shall conform to the seismic risk level of the specific office,

1.1.8 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 Technical Space 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 painted finish, while its assembly hardware (bolts, nuts, washers, clips, etc.) shall have a non-corrosive plated finish. Refer to ATT-TP-76201 for approved painted and electroplated finishes.

1.2.3 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.

a) Provide enough cable retaining horns to allow the installer to locate the horns on both sides of the cable rack on 24-inch centers, except at cable rack intersections where they shall be omitted/removed. When this spacing interferes with the cable rack rung the horn is to be located just before/or after said rung.

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) The height of the cable horn shall not exceed the cable rack’s maximum allowable cable pile up per Section J of ATT-TP-76300.

e) Do not engineer or instruct the installer to place cable rack pans on inclined racks.

f) Cable rack divider horns/brackets may be attached to cable rack cross-straps to separate single runs of cable on a wide rack.

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

1.2.5 Panning material for new work and cable rack additions shall be plastic. Plastic panning shall be minimally 28% oxygen rated. Plastic panning shall be permanently marked or embossed with identification information. Legacy metal panning may remain in place until cable racks are removed or significantly modified.

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

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

1.2.8 Cable supporting brackets may be used for limited applications of dedicated cable runs.

1.2.9 Existing old style cable racks (C sided or Hollow) within legacy locations may be used to their original design fill limits.

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 Figures 8-18 to 8-21 may be used as examples of cable rack configurations located above new equipment areas. The design of the cable distribution system is dependent on environmental and equipment requirements.

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.

1.3.4 Cable rack height shall be the measurement between the top of the cable rack side bar down to the finished floor.

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 compression type 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 within Legacy Technical Space.

1.4.8 The DESIGN ENGINEER shall engineer all cable mining activities to comply with ATT-TP-76300, Section Q.

1.4.9 The maximum width of horizontal and vertical dedicated power cable racks shall be limited to 1 foot 8 inches.

1.4.10 Safe loads for steel beam clamps, ceiling inserts, threaded rods, and lag screws, for the purpose of determining the spacing of supports other than normal are shown in ATT-TP-76409.

1.4.11 Cable leaving the cable rack shall not be unsupported for a distance greater than three feet for equipment bays and four feet for conventional distributing frames.

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 may be supported by means of power cable support brackets in certain applications (see Section 12 for permitted power cable applications). Conditions that apply to their use:

a) Power cable brackets shall be supported from the main or end aisle cable rack stringers. Where there are no main or end aisle cable racks, the power cable brackets may be supported from auxiliary framing or strut.

b) Power cable brackets shall utilize a bolt to affix the bracket to the cable rack. Clip on type brackets, which are typically intended to support small gauge signal wire, are prohibited for this application.

c) Power cable brackets shall not be overloaded beyond the manufacturer’s recommendations, and the weight of the cables placed on them must be included in the limit calculations for the cable rack that is supporting them.

d) Dedicated power cable brackets can be used to support unfused or secondary (fused) power cable. Mixing unfused or secondary (fused) power cables on the same bracket with grounding conductors, alarm wiring, voltage sensing leads, timing leads, or fiber riser cable is prohibited. Mixing unfused power cable with any other type of cable is prohibited.

e) Power cable ran on power cable brackets shall be secured at every bracket.

f) In all grounding conductor applications, brackets shall be placed at a maximum interval of 20 inches. In all power cable applications, brackets shall be placed at a maximum interval of 12 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 Ceiling hanger suspended auxiliary framing shall be provided to support cable racks over equipment frames. Where ceiling hangers cannot be provided because of ceiling inadequacies or access problems, the cable rack may be supported from building floor by floor stanchions or equipment framework. Floor stanchion supported cable rack shall conform to requirements of ATT-TP-76408. Five inch diameter circular or five inch square floor stanchions shall be used for permanent stanchions. Two inch diameter “pipe stand” may be used when the stand will be replaced in the future by an equipment frame due to line up growth. Refer to ATT-TP-76409 for approved methods of wall supported cable rack.

1.5.5 Vertical cable rack used to support cables in shafts shall be supported at each floor and ceiling level at the cable rack supporting framework.

1.5.6 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.

1.6.2 Fire detection and grounding cables shall be run separate from transmission cables.

1.6.3 Primary power cables shall be located on and secured to cable rack.

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

1.6.5 To prevent mixing of primary power cables with any other cable type cable cross aisle bridges shall be used.

2. AUXILIARY FRAMING

2.1. General

2.1.1 Figures 8-18 to 8-21 may be used as examples of auxiliary channel configurations located above new equipment areas. The design of the cable distribution system is dependent on environmental and equipment requirements.

2.1.2 The following Practices provide additional information on auxiliary framing and bracing requirements

ATT-TP-76408 “Common Systems Network Facility Auxiliary Framing and Bracing Requirements”

ATT-812-000-713 “ Network Equipment Anchoring Requirements”

2.1.3 Auxiliary framing shall be provided in longest sections and largest increments possible to minimize splice joints and provide greatest continuity in performance.

2.1.4 Compression type splices of horizontal runs of auxiliary framing shall be staggered at alternate runs and limited to no more than one splice between supports.

2.1.5 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.

2.1.6 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.

2.1.7 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.

2.1.8 The protruding ends of lower level auxiliary framing shall be protected with an approved finishing cap.

2.1.9 Auxiliary framing heights shall be measured from the floor to the bottom of the paired channels.

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 structural column, beam, wall, etc.

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, placement of low type auxiliary framing over main or end aisles of an equipment area shall be avoided except as required for support of rolling ladder track or cable racking feeding non-continuous equipment areas.

2.2.10 Equipment frames taller than seven feet shall be secured to auxiliary framing in accordance with ATT-TP-76300, Section I.

2.2.11 Seven foot frames shall not be secured to auxiliary framing which is suspended from the ceiling. Refer to ATT-TP-76400, Section 5, for approved exceptions to this rule.

2.2.12 Auxiliary framing over power boards shall be installed only where required for the support of bus bars or 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. [DELETED]

4. CABLE DISTRIBUTION SYSTEMS

4.1. General

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

4.1.2 Cable distribution systems are a cable management system which provides a means for cable separation.

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

4.2. Applications

4.2.1 Cable distribution systems are provided over line-ups of equipment frames and are fastened to adjacent line-ups by cross-aisle racks, which are considered to provide a unitized top support for associated frames.

4.2.2 Where frames are not provided under cable distribution systems, support stanchions shall be provided at five foot, not to exceed six foot intervals and at junctions of cable distribution system sections. Sufficient clearances shall be maintained to allow for future addition of frames.

4.2.3 Cable distribution systems shall be provided for the ultimate growth of an individual line-up whenever possible to allow for proper distribution of cabling and top support.

4.2.4 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.

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

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

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

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

4.3. Fiber Optic Cable Distribution Systems

4.3.1 Fiber optic jumper/patch cord cable shall be installed using its own identified dedicated fiber path (Fiber Protection System or Wire Basket Tray).

4.3.2 Fiber optic trunk type cable should be installed using its own identified dedicated fiber path (cable rack), but may be routed via switch board racking if approved by the office Implementation Engineer due to cost, environmental restrictions, etc. If switch board and fiber trunk cable are to utilize the same routing system they should be bundled and separated as much as feasible.

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

4.3.4 Excessive fiber optic tie cable slack shall be routed and secured on dedicated fiber slack storage racking sized to accommodate minimum bending radius.

4.3.5 On fiber cable runs of less than 300ft, allowable slack shall be no more than 10% of the overall length of the run or rounded up to the next 10ft increment.

4.3.6 Example: Required cable length = 96’

Allowable slack = 9.6’

Cable length + slack = 105.6’

Next 10’ cable increment = 110’ cable total allowable length

On fiber cable runs greater than 300ft, allowable slack shall be no more than 30ft.

Excess fiber equipment cord slack shall be stored at either the network element cable management system or the FDF cable management system, depending on space availability, while maintaining the minimum fiber bend.

4.3.7 OSP Fiber optic cable service loops terminating to fiber distribution frame must maintain minimum bending radius.

4.4. Fiber Protection System (FPS) and Wire Basket Tray (WBT)

4.4.1 The WBT or FPS represents a separate and unique fiber optic protection cable routing system used only for fiber optic equipment cords that are run between two independent equipment termination points or an equipment termination point and the office FDF.

The WBT or FPS will provide:

- protection of fiber optic patch cords from installation activities
- an additional means of providing fiber separation and protection from other types of cabling
- both primary and secondary fiber optic equipment patch cord routing capability.

The FPS ductwork shall be ‘Yellow’ in color; the WBT ‘Pre-Galvanized’ or ‘Electro Zinc’.

WBT is the ‘Approved’ fiber optic protection jumper routing system to be utilized within the AT&T network. Existing FPS can be utilized for jumper routing but not expanded upon nor used for a ‘new’ build. Refer to ATT-C-50003-E-00 for more details.

4.4.2 The use of covers on horizontal FPS runs only is NOT required. This applies to all FPS within AT&T Facilities and includes both overhead and under floor applications. All transitional sections of FPS, i.e. those going from one level to another including vertical or diagonal runs, shall be required to have covers. All vertical FPS runs shall be required to have covers as well as all FPS transitional turndowns, downspouts, express exits, etc. End Caps shall be required at the ends of all horizontal and vertical straight sections of FPS where those ends are not connected to an additional section of FPS.

4.4.3 When placing WBT or FPS, enough vacant space is to remain between the top of the duct and any obstruction (e.g. ceiling, racks) to allow for the safe and easily installation of fiber equipment cord by the office technician.

4.4.4 FPS and WBT maximum allowable unsupported routing system overhang, measured from last support, shall not exceed 18-inches for two-, four-, and six-inch FPS and all approved WBT widths; and spacing of the routing system supports shall be placed every four to six feet.

4.4.5 The WBT or FPS shall be placed in a horizontal matrix configuration. Its actual design shall allow efficient routing of fiber equipment cords between Network Elements. A WBT drop out or FPS downspout should be installed for each equipment bay requiring access to the routing system.

4.4.6 The WBT or FPS shall be designed according to fiber equipment cord cabling needs. The design shall take the current and future equipment/FDF fiber equipment cord needs into consideration. The WBT or FPS over an FDF designated lineup should be provisioned with a minimum of 12” wide horizontal duct and 4” wide vertical dropouts.

4.4.7 The minimum duct size for overhead horizontal FPS is 4 inches, and for WBT it is 6 inches.

4.4.8 FPS (12” or larger) located within equipment environments that utilizes auxiliary channel for superstructure support shall be 5/8” threaded rod.

4.4.9 Straight sections of 12” FPS shall be supported on both sides of each junction within 6” to 12” of the junction. A maximum distance of 5’ between supports shall be required.

4.4.10 Twelve-inch FPS fittings (T’s, elbows, crosses, downspouts etc.) shall have support brackets placed directly beneath each fitting. When it wasn’t practical to place the support bracket directly beneath the fitting the support bracket was to be placed beneath the FPS straight section as close to the fitting as feasible. Refer to paragraph 4.4.1 for use of FPS.

4.4.11 When twelve-inch FPS fittings were placed, whenever possible, support brackets were to be attached to the underside of the fitting with the self-drilling screws supplied by the manufacturer. If support brackets couldn’t be attached to the underside of the fitting using the self-drilling screws, variable fitting support locators were to be used. Refer to paragraph 4.4.1 for use of FPS.

4.4.12 A FPS shall be considered at capacity when equipment fiber cords come within ½ (one half) inch of the top of the FPS. WBT tray is at capacity when equipment fiber cords reach 50% of basket fill. Fiber equipment cords shall not be placed within the WBT or FPS with excessive slack.

4.4.13 Fiber trunk cable shall not be placed in the WBT or FPS routing system.

4.4.14 In cases where space is limited and there is no room for dedicated fiber racking, cable rack horns that mount on the sides of cable racks and include an integral means of providing cable support/separation may be used where necessary for the support of fiber optic cabling. Such horns are generally referred to as compartment horns and shall be installed on racks no more than 12 inches apart. Compartment horns shall not be mounted on vertically oriented cable rack below the 7-foot height level.

4.4.15 On all new builds “L” brackets, ”J” hooks, or cable rack horns shall not be used.

Exceptions:

a) In smaller offices like Huts the use of compartment horns is permitted where installing cable racking is cost prohibitive.

b) In those locations, such as Legacy-T offices, that do not have any dedicated fiber cable racking and use compartment horns exclusively for their routing needs.

c) In locations where there are pre-existing cable runs utilizing compartment horns it is permissible to use these runs until they become exhausted.

4.5. Fiber Diversity

4.5.1 Definitions

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

Note: Diversity is applicable between FDF’s and NE’s or between two NE’s.

4.5.2 There is no physical diversity requirements for any SPEED or OC rate unless that requirement is requested by the customer, engineer or the equipment OEM.

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

Refer to appropriate AT&T document for specific diversity requirement.

4.5.3 The FDF will be treated as the common cable entrance and cross-connect point. 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 FDP on that other floor or distant location. This will be accomplished in one of the following methods:

a) Preferred method: Placement of an FDP within the appropriate equipment framework at both the ‘A’ and ‘Z’ ends of the desired fiber tie cable. Then the use of a pre-connectorized tie cable of the appropriate cable length routed between and terminated at the appropriate FDP. Refer to figure 8-32a.

b) Preferred alternate method: Placement of an FDP within the appropriate equipment framework at both the ‘A’ and ‘Z’ ends of the desired fiber tie cable. Then the use of a pre-terminated (one end only) tie cable of the appropriate cable length terminated at the FDF. The non-connectorized stubbed end of the tie cable is to be field spliced with the appropriate connectors and then terminated on the satellite FDP. Refer to figure 8-32b.

c) Alternate method: Placement of an FDP within the appropriate equipment framework at both the ‘A’ and ‘Z’ ends of the desired fiber cable tie. Then the use of a pre-terminated (one end only) tie cable of the appropriate cable length terminated at the FDF. The non-connectorized stubbed end of the fiber cable is to be field spliced with the appropriate connector pigtail assembly within a fiber splice tray located at the satellite fiber frame location. The connector pigtail assemblies are to be terminated on the satellite FDP. This method should only be used when necessary. Refer to figure 8-32c.

Note-1: New FDP equipped with fiber tail described as being installed within the FDF for explanation purposes only. This panel maybe installed at either the near or far end of the fiber tie depending on installation needs.

Note-2: The Detail Engineering Service Provider (DESP) shall insure that all fiber optic tie cables terminating at either an FDF or FDP shall secure the fiber cable end points utilizing an AT&T approved supporting/securing method i.e., cable clamp/grommet, Hook and Loop strap, etc.

Figure 8-32a

(Note: New FDP and associated fiber trunk cable shown installed within FDF only for explanatory purposes. This panel maybe installed at either the near or far end depending on installation needs.)

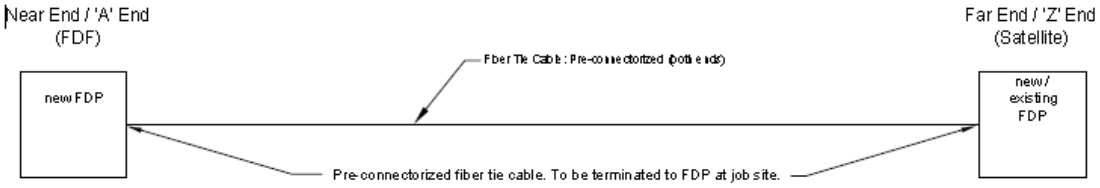


Figure 8-32b

(Note: New FDP and associated fiber trunk shown installed within FDF only for explanatory purposes. This panel maybe installed at either the near or far end depending on installation needs.)

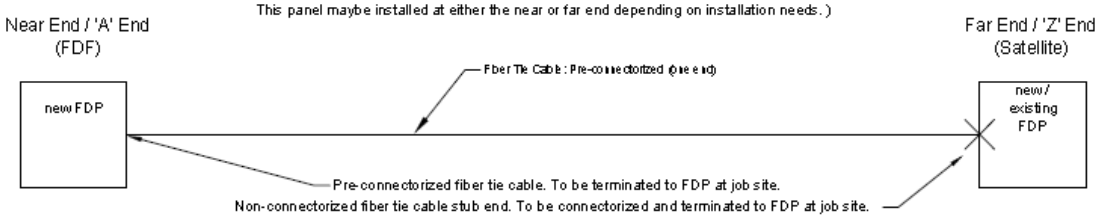
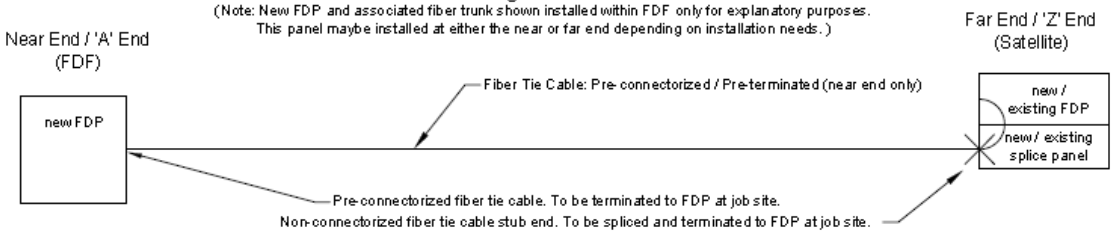


Figure 8-32c

(Note: New FDP and associated fiber trunk shown installed within FDF only for explanatory purposes. This panel maybe installed at either the near or far end depending on installation needs.)



4.6. FDF Panel Diversity (OSP)

4.6.1 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 fiber shelves are being used then there could be a situation where both cables will be running on the same side of the bay. This is allowed as long as the cables take diverse routes after leaving the bay.

5. FRAME AND AISLE LIGHTING – LIGHT EMITTING DIODE (LED)

5.1. General

5.1.1 This section outlines engineering requirements for framework supported lighting systems employing LED fixtures. See Section 6 of ATT-TP-76400 for emergency lighting and general building lighting.

5.1.2 In some Processor Logic Control (PLC) systems LED lighting is provided as an integral part of the equipment. In such cases, the manufacturer's specifications for lighting shall be followed.

5.1.3 All wiring, conduit and fixtures installed in Non-Regulate/Non-Utility locations shall meet the requirements of the National Electrical Code (NEC), local building code and shall be Listed.

5.1.4 For lumen levels see Section 6 of ATT-TP-76400.

5.1.5 See Section 13 of ATT-TP-76400 for grounding of equipment in the conduit system.

5.1.6 AC lighting in battery, power and engine rooms shall utilize fixtures with protective covers that will reasonably prevent the dislodging or shattering of the light due to activity (e.g., "egg crate" grill or cage assemblies).

5.1.7 All LED light fixtures shall be equipped with positively fixed lamp guards.

5.1.8 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 LED fixtures shall be calculated by multiplying the lamps wattage by 1.25 (this will compensate for LED Driver).

5.1.9 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 AT&T.

5.1.10 See ATT-TP-76400, Section 6.8.2**,** for additional information on equipment lighting.

5.2. Engineering Requirements

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

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

Note: specific products are required by organizations within AT&T. Follow specific fixture requirements as directed by the AT&T Engineer. All fixtures shall be installed per the manufactures guidelines.

5.2.3 Conduits should be securely fastened at 5'-0" intervals, and shall not exceed 6'-0".

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

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

5.2.6 Conduit shall not be run on cable racks.

5.2.7 See ATT-TP-76400, Section 12**,** for approved conduit types.

5.2.8 The conduit system for a light fixture shall support only that fixture. The conduit fittings shall be compression style. Screw type couplings are not acceptable.

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

5.2.10 Lighting equipment and appliance outlet circuits shall not be supplied by the same branch circuit.

5.2.11 Wiring for both shall be run in the same conduit wherever possible.

5.2.12 Motor wiring shall be run in a separate conduit.

5.2.13 No more than ten trolley-type appliance outlets shall be assigned in a single-branch circuit.

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

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

5.2.16 Light fixtures in equipment areas shall be connected to PDSC lighting panels dedicated to network lighting and supplied by essential AC Power.

5.2.17 Light fixtures in equipment areas shall be installed such that the lowest part of the fixture is at a minimum height of 7’-3” when installed in a line-up of 7’-0” equipment frames. When the existing auxiliary framing height prevents achieving the 7’-3” requirement, the installer shall insure that the fixture is secured directly to the bottom of the low level framing.

5.2.18 All new aisle line ups shall have motion sensors installed to control the lighting system. A Physical Switch in the bay end guard is not required and should be avoided unless a physical restriction does not allow the proper functionality of the motion sensor.

5.2.19 When 3-way switches for controlling equipment aisle fixtures are located in the endguard, the switches shall be located at each end of the aisle.

5.2.20 When adding to an existing lineup of fluorescent fixtures, it is recommended that fluorescent fixtures be added.

5.2.21 When a new lineup is being added, LED fixtures shall be used, even when the existing fluorescent fixtures in other lineups have not been retrofitted.

5.3. Lighting Control

5.3.1 Motion Sensors shall be used for controlling lighting fixtures unless otherwise directed within this document. Motion Sensor switching of equipment area lighting has been determined to be appropriate and effective.

5.3.2 Lighting extensions of existing line-ups may be installed using switched lighting rather than motion sensors.

5.3.3 The DESP shall survey the area of installation and shall determine if motion sensors or switched lighting shall be used.

5.3.4 Motion sensors having a 360º throw pattern usually come with optional lens covers or masking so the sensors' field of view can be restricted to a narrower pattern. The throw pattern shall be adjusted to completely cover the work area.

5.3.5 The minimum time delay setting on switches and/or sensors shall be 10 minutes. Local Management may request a longer delay, not to exceed 20 minutes..

5.3.6 Lighting fixtures controlled by Motion Sensors shall not also have switches.

5.3.7 Emergency egress lighting shall not be controlled by Motion Sensors.

5.3.8 The use of sensors utilizing line voltage power sources (120/277 VAC) are preferred because they generally require less apparatus being added into equipment overhead arrangements. The following motion sensing products have been approved for use in AT&T facilities. Also listed are the applications considered appropriate for each product.

Manufacture	Model	Voltage	Applications
Airey-Thompson	5511-S1	Line	Equipment aisles with Sentinel fixtures
Sensor Switch	CMRB series	Line	Side/end of box type fixtures
Wattstopper	CI-355-1	Line	Short aisles and entry doors
Wattstopper	CX-100-4	24 Volts	Equipment Aisles
Leviton	OSFHU	Line	Equipment Aisles
Airey-Thompson	551179S1	Line	Fixture w/ sensors or equipment aisles
Airey-Thompson	551329S1	Line	Fixture w/ sensors or equipment aisles
Airey-Thompson	552329S1	Line	Fixture w/ sensors or equipment aisles
Airey-Thompson	55LED1WWT841K9S1	Line	1 Lamp Fixture w/ sensors for equipment aisles (Where "WW" = lamp wattage)
Airey-Thompson	55LED2WWT841K9S1	Line	2 Lamp Fixture w/ sensors for equipment aisles (Where "WW" = lamp wattage)

The above list will be updated as similar products are evaluated and deemed appropriate and have the same functionality.

5.3.9 For illustration on motion sensors layout and installation refer to Figures 8-31a and 8-31b.

5.3.10 Motion Sensors shall be positioned such that every part of the aisle is within the "view" of a sensor and no point shall exceed 25' from the "view" side of a sensor.

5.4. Lamps and Ballast

5.4.1 T-8 LED lamps shall be used.

5.4.2 T8 LED electric drivers shall be used.

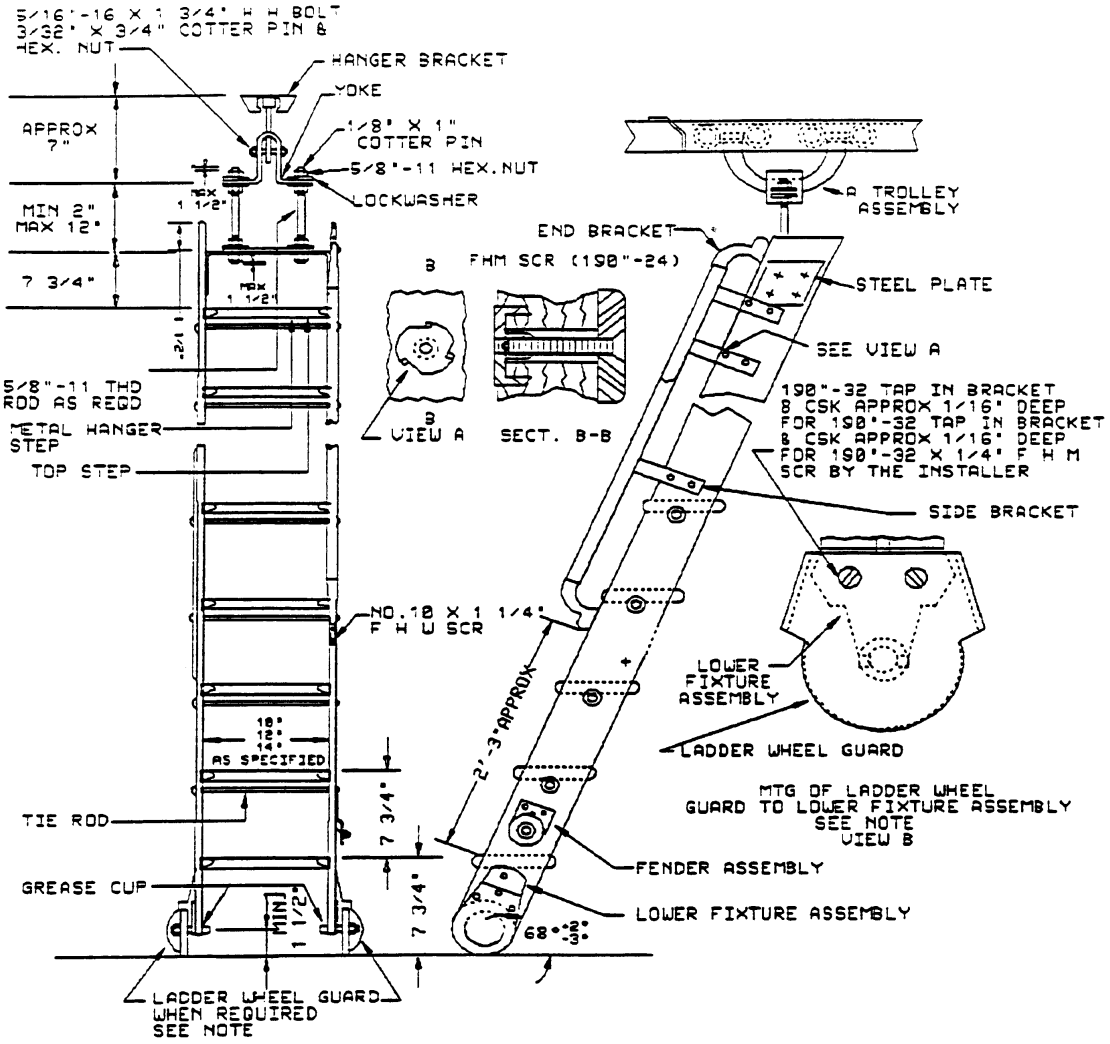
5.5. Lighting Parts

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

a) For equipment Technical Spaces other than VHO/SHOs, Airey-Thompson shall be used. See Common Systems Minor Materials List for ordering information. See Figure 8-30 for typical installation.

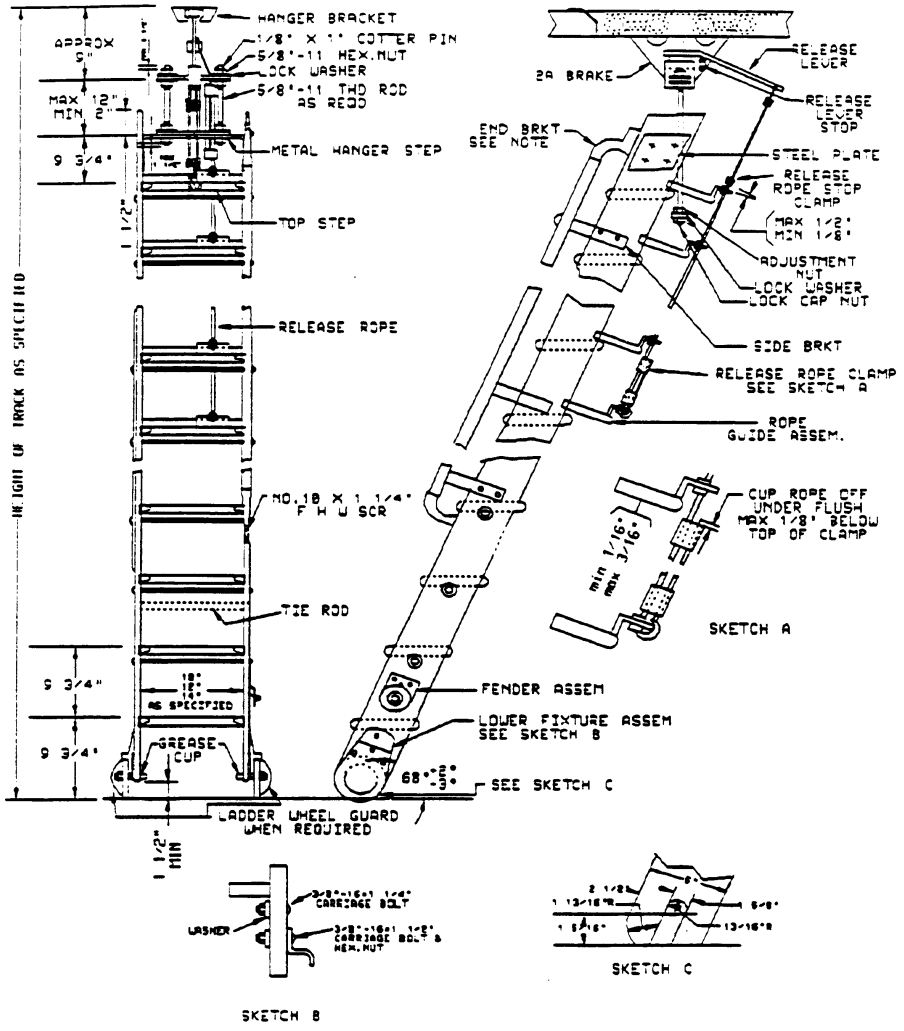
b) For VHO, SHO and other non-traditional Technical Spaces, ceiling or wall mounted wrap around fixture from H.E. Williams, Inc. may be used. For installation and ordering information contact www.hew.com or call 417-358-4065.

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



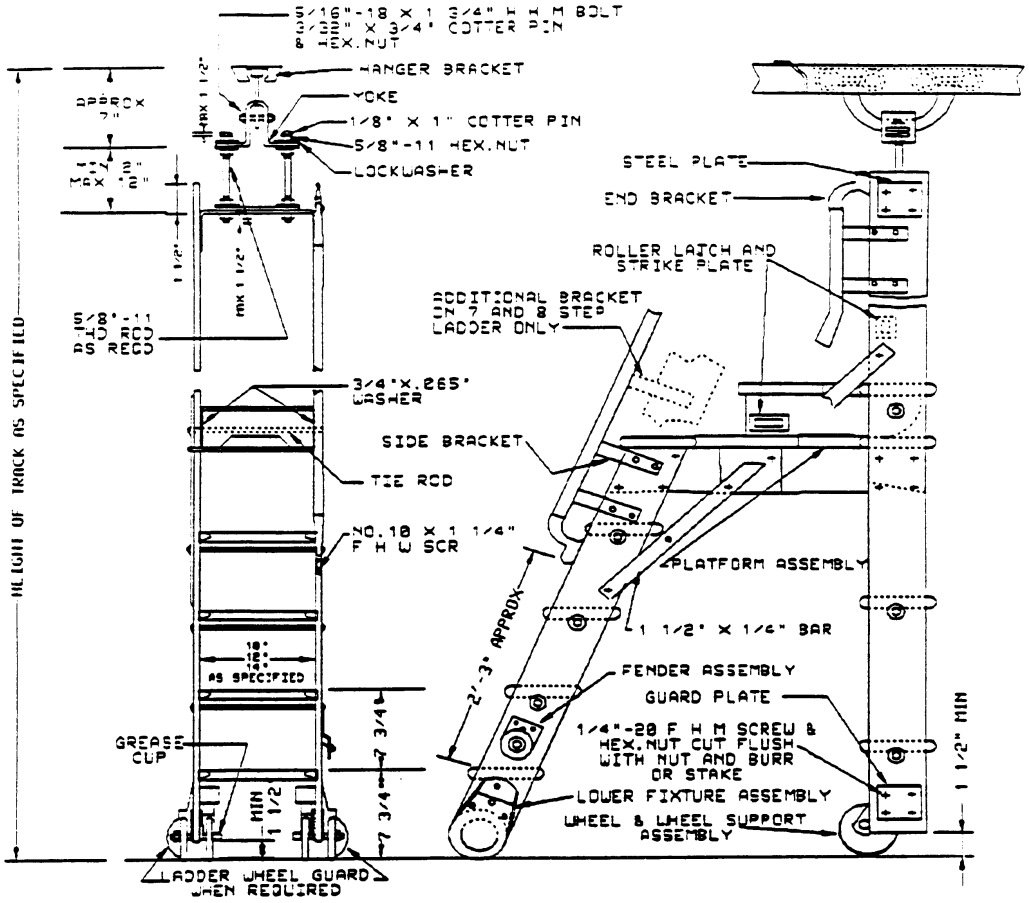
NOTE - Lower fixture assemblies are to be tapped to mount wheelguard when guard is required on lower fixture assembly; the fixture shall be drilled and tapped by the installer.

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



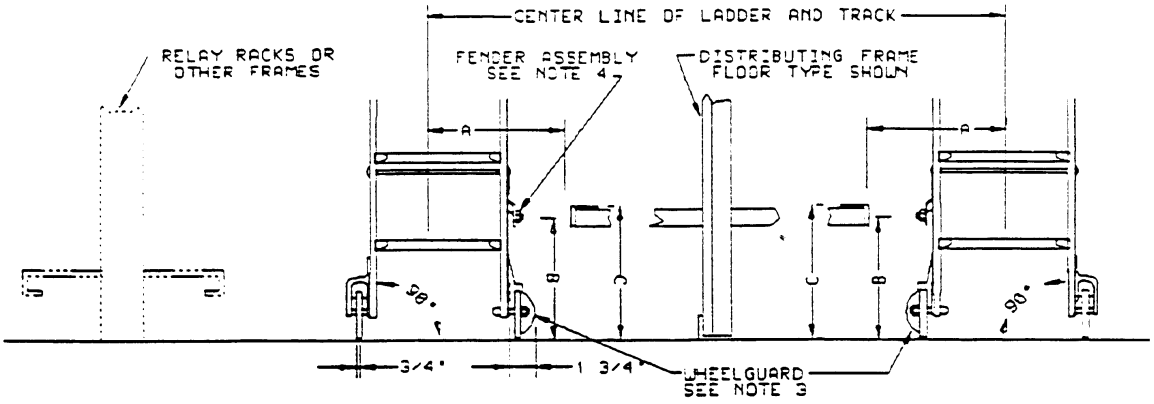
NOTE - When handrail is assembled to the siderail, the end brackets shall be so located that the handrail is tight between the two end brackets.

FIGURE 8-3--PLATFORM-TYPE ROLLING LADDER ASSEMBLY



NUMBER OF STEPS FOR LADDERS OF THE SAME HEIGHT	
STRAIGHT LADDER	EQUIVALENT PLATFORM LADDER
11	4
12	5
13	6
14	7
15	8

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



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

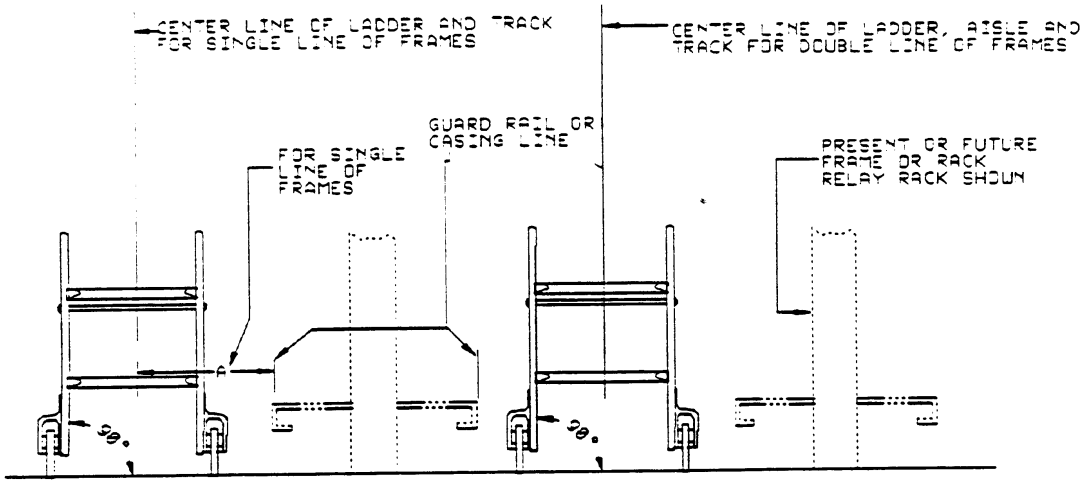
LADDER	A	
	USUAL	MIN.
10"	8"	7 1/4"
12"	9"	8 1/4"
14"	10"	9 1/4"

(SEE NOTE 2)

NOTES:

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

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

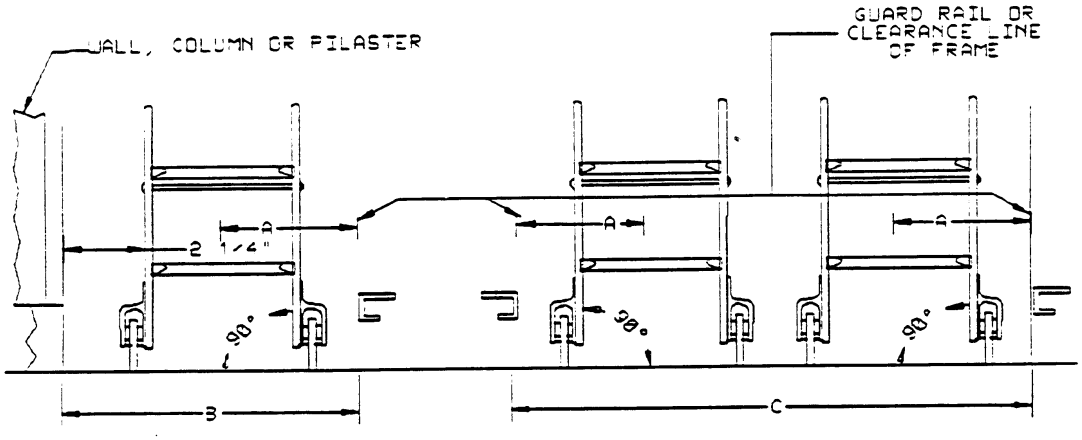


NOTES:

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

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

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



NOTE:

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

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

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

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

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

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

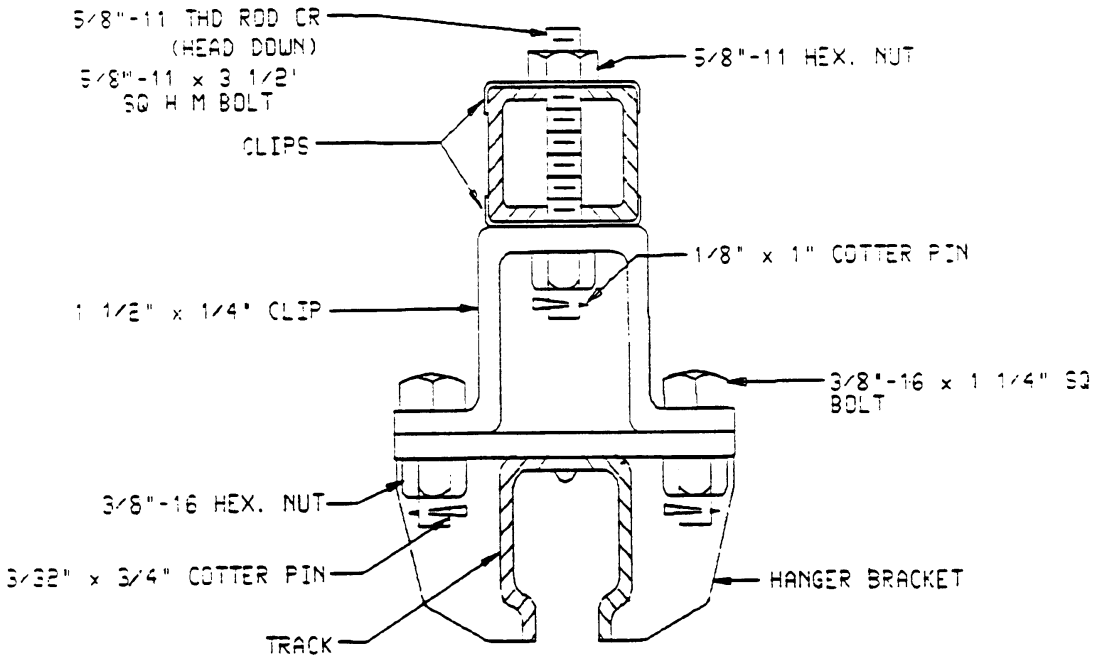


FIGURE 8-9--TRACK SUPPORTED DIRECTLY FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING

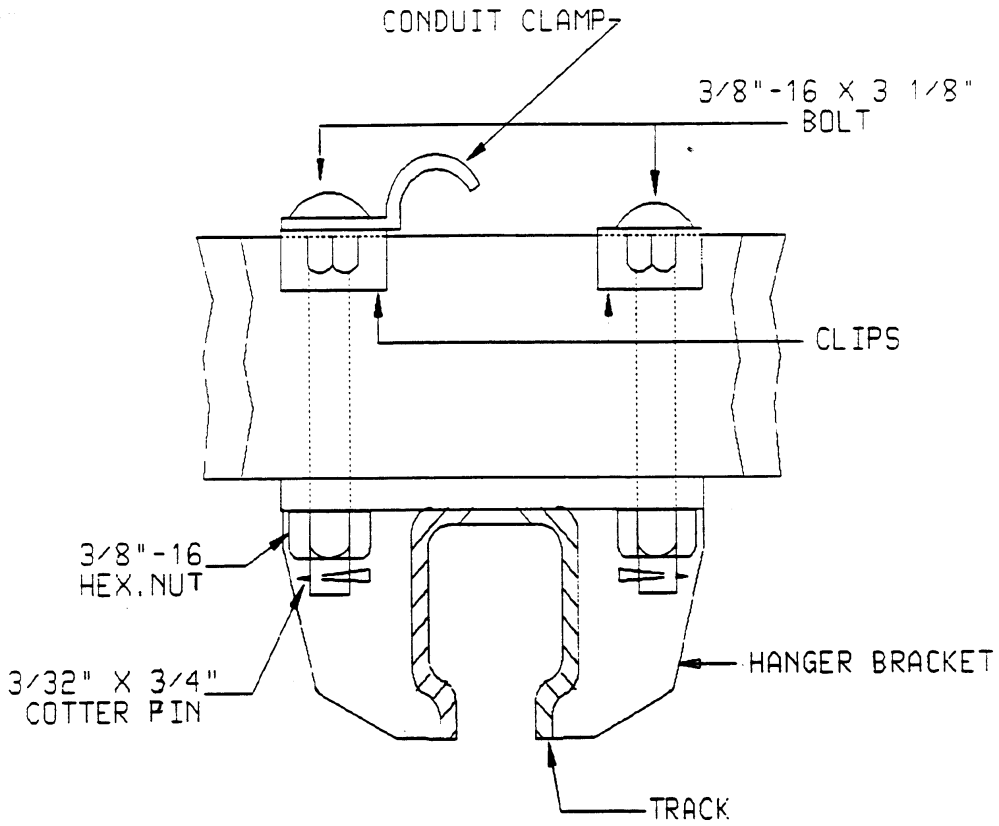


FIGURE 8-10--TRACK SUPPORTED FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING - SLOPING TRACK - 2 INCH DIFFERENCE IN AUXILIARY FRAMING LEVEL

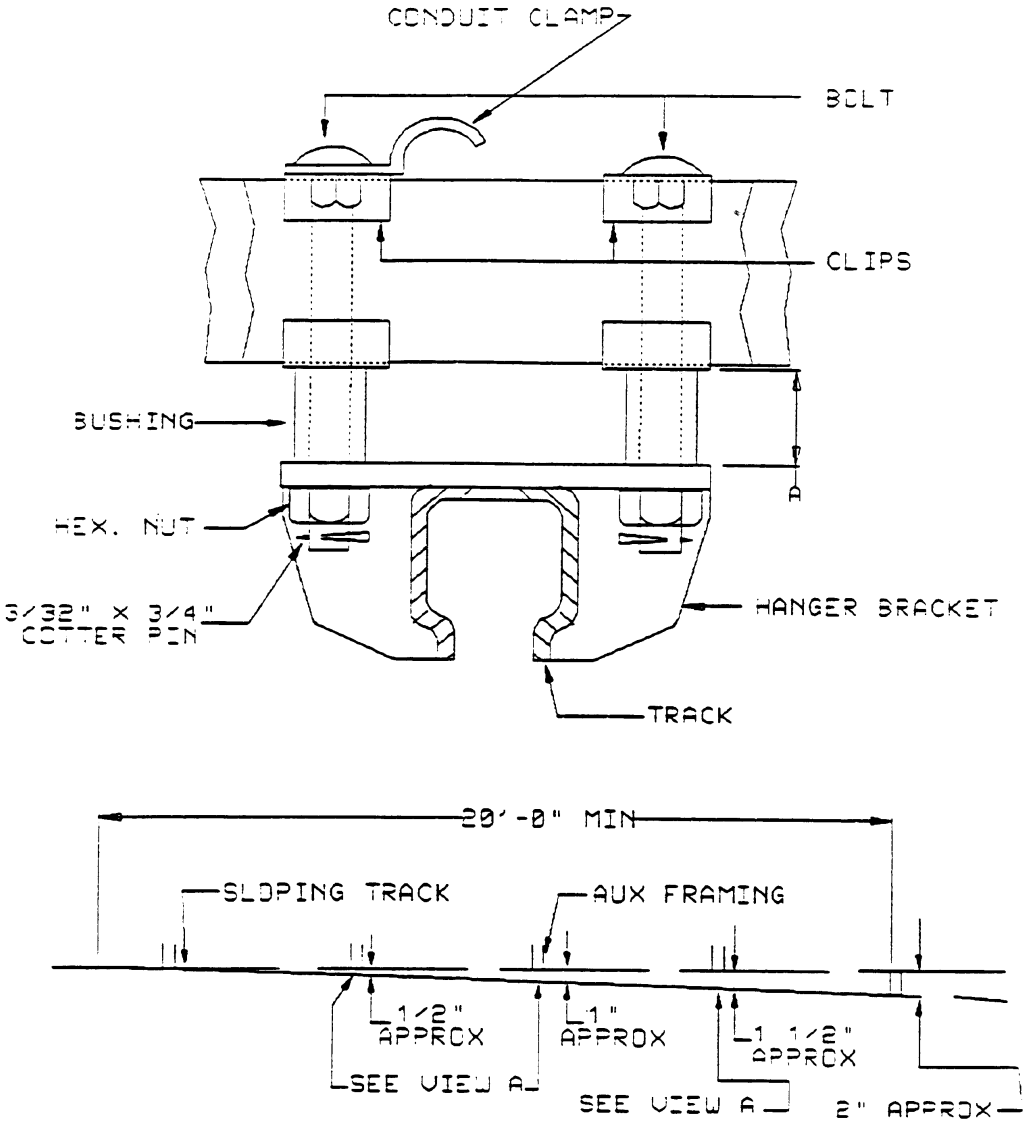


FIGURE 8-11--TRACK SUPPORTED FROM AUXILIARY FRAMING WITH EXTENSION ROD

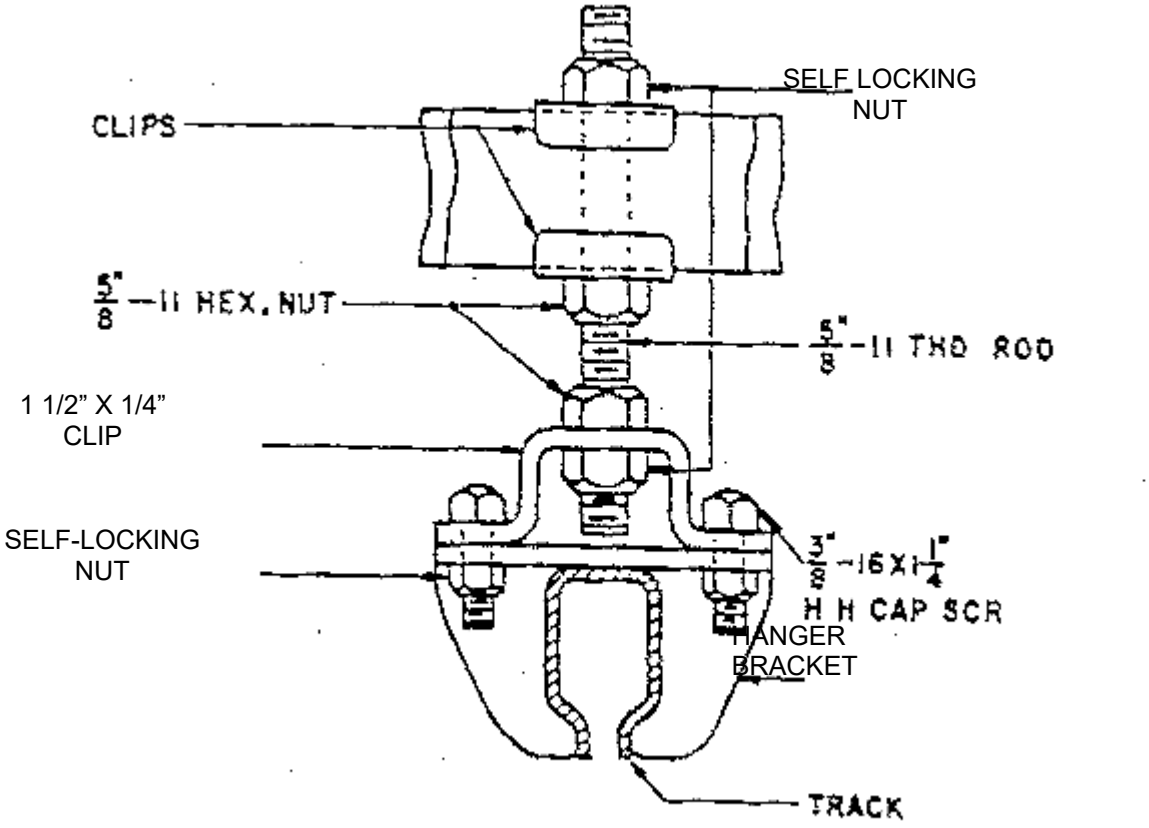


FIGURE 8-12--TRACK SUPPORTED WITH EXTENSION RODS FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE - TRACK AND PARALLEL WITH CABLE RACK

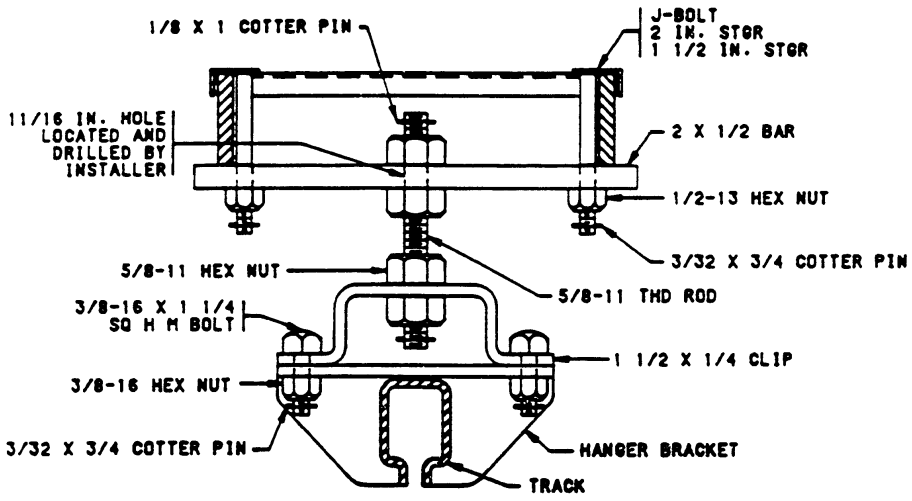


FIGURE 8-13--TRACK SUPPORTED WITH EXTENSION ROD AND CABLE RACK MORE THAN 2 FEET 1 INCH IN WIDTH

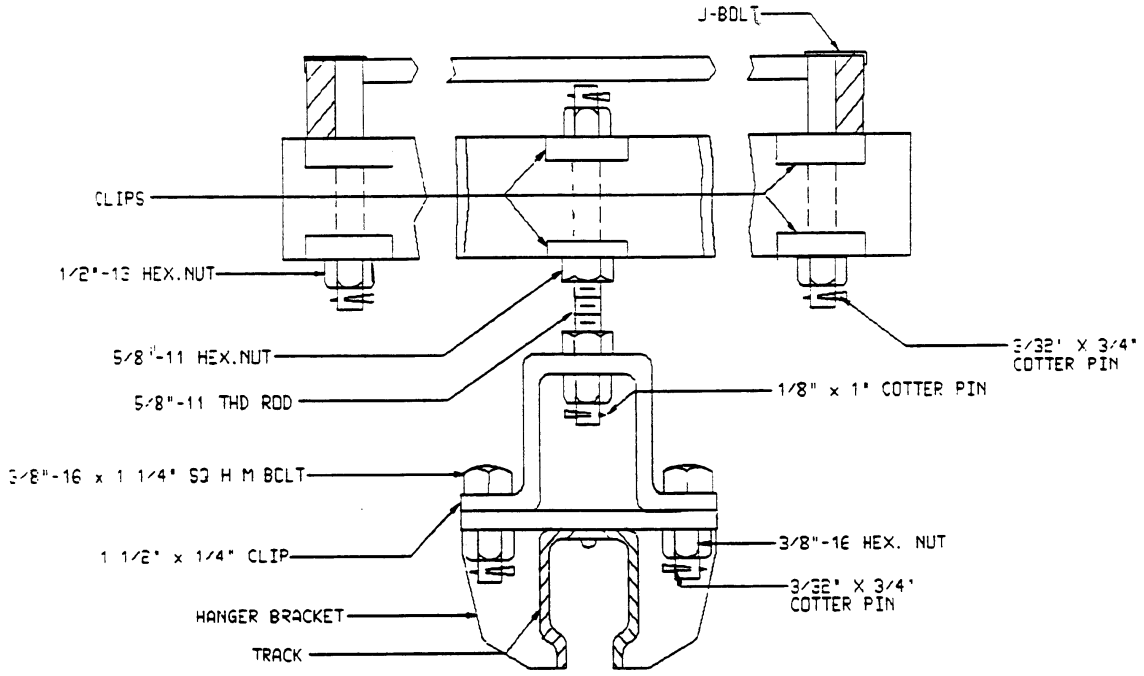


FIGURE 8-14--TRACK SUPPORTED WITH SINGLE BAR DIRECTLY FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE

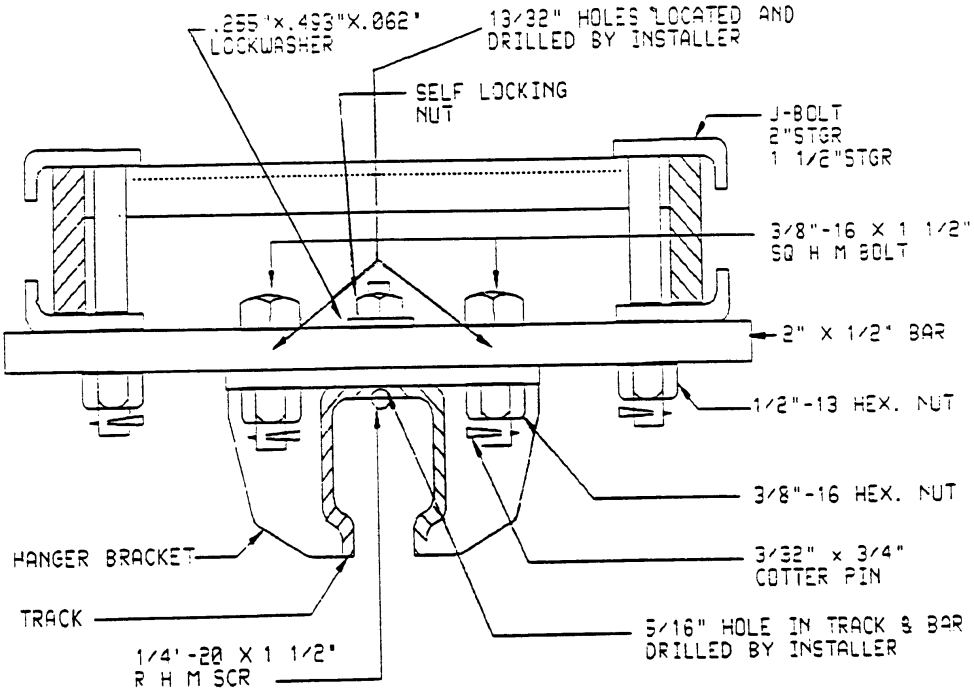
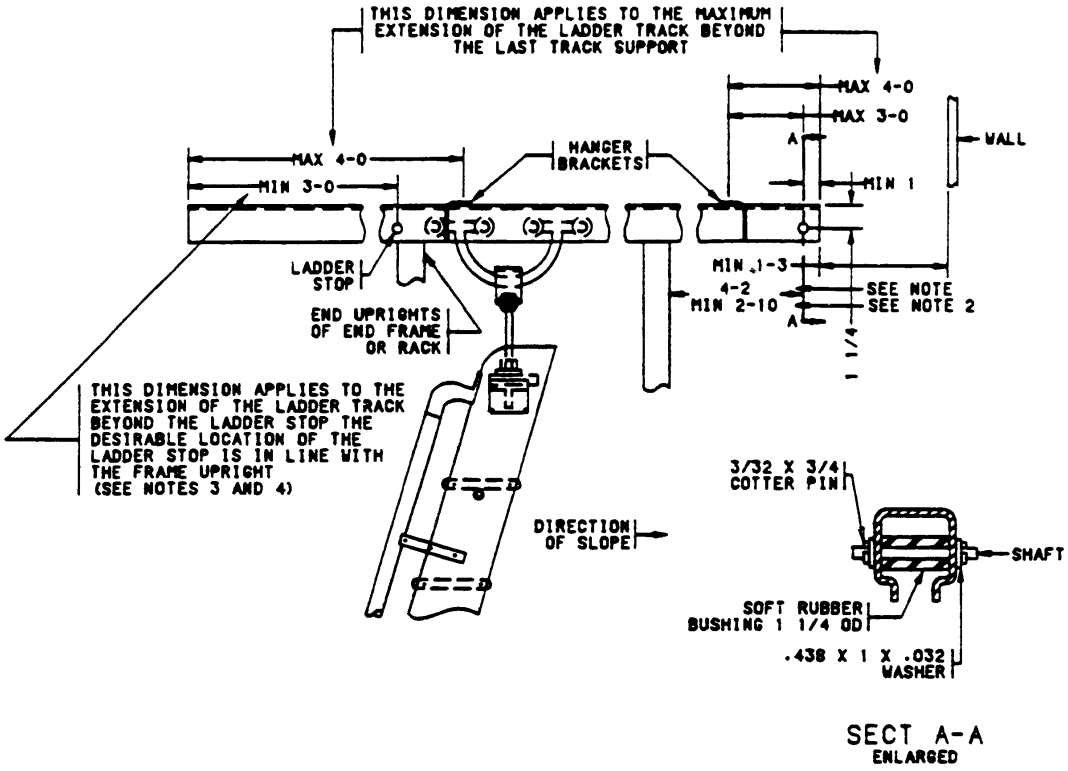


FIGURE 8-15--LOCATION OF END SUPPORTS AND LADDER STOPS IN TRACK



NOTES:

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

FIGURE 8-16--LADDER STOP AT SUPPORT BRACKET

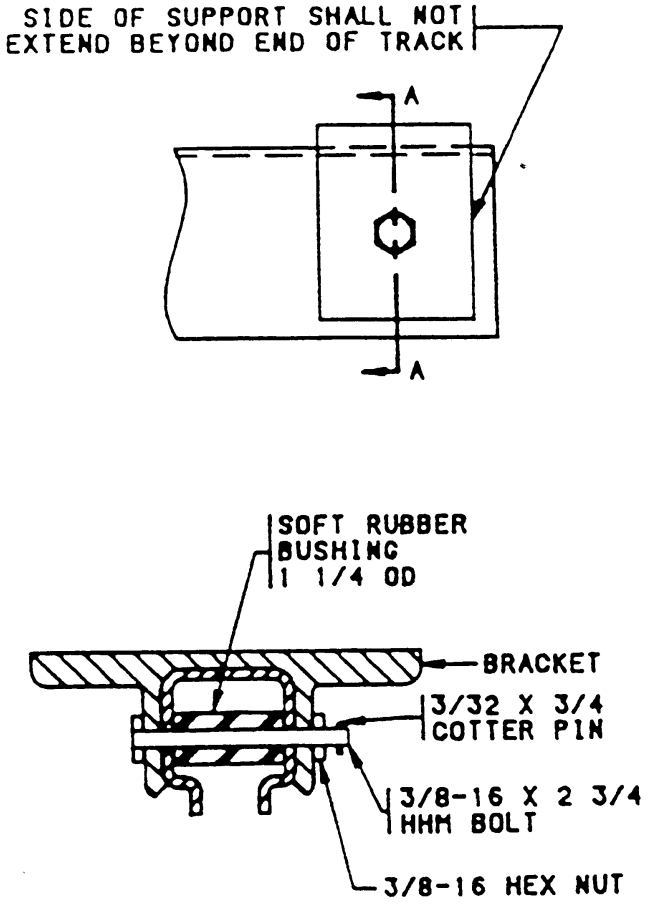


FIGURE 8-17--LADDER TRACK PLUG

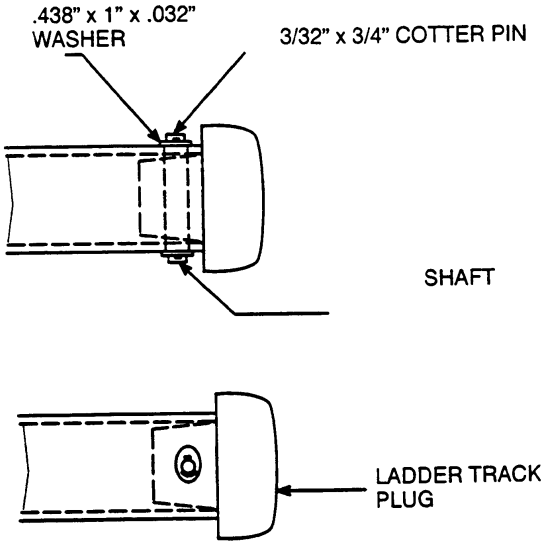


FIGURE 8-18A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

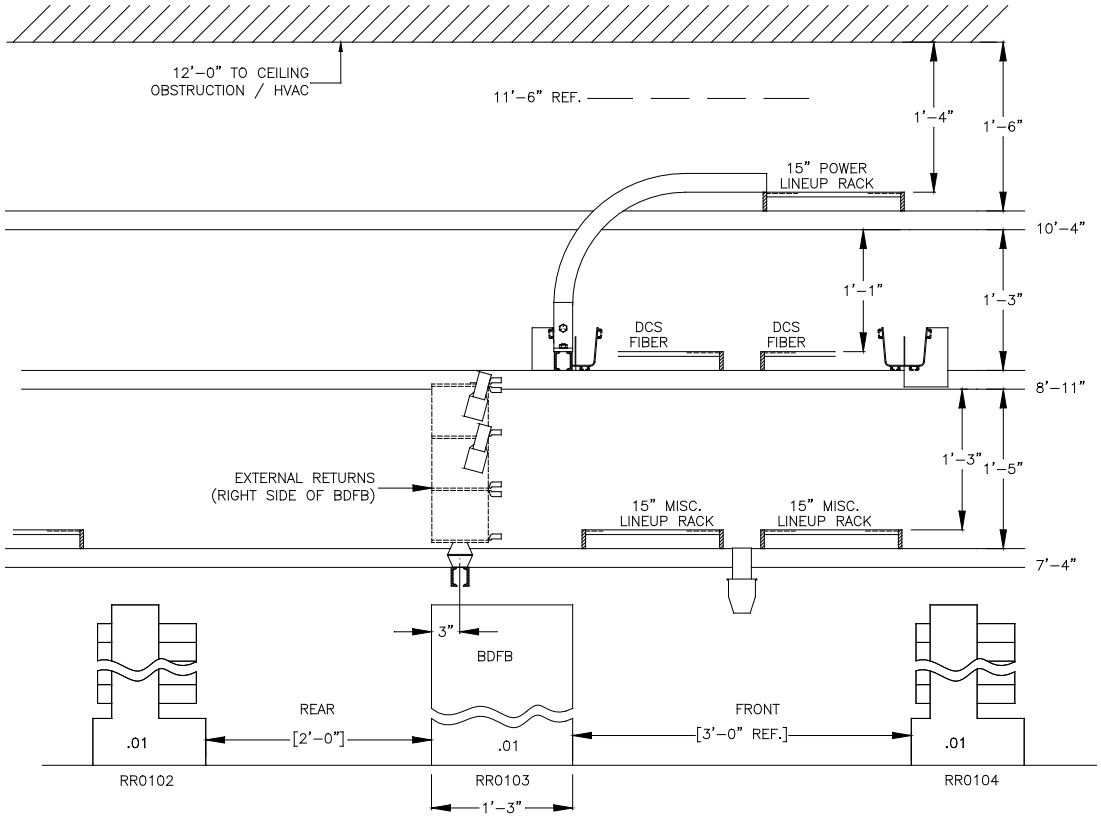


FIGURE 8-18B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

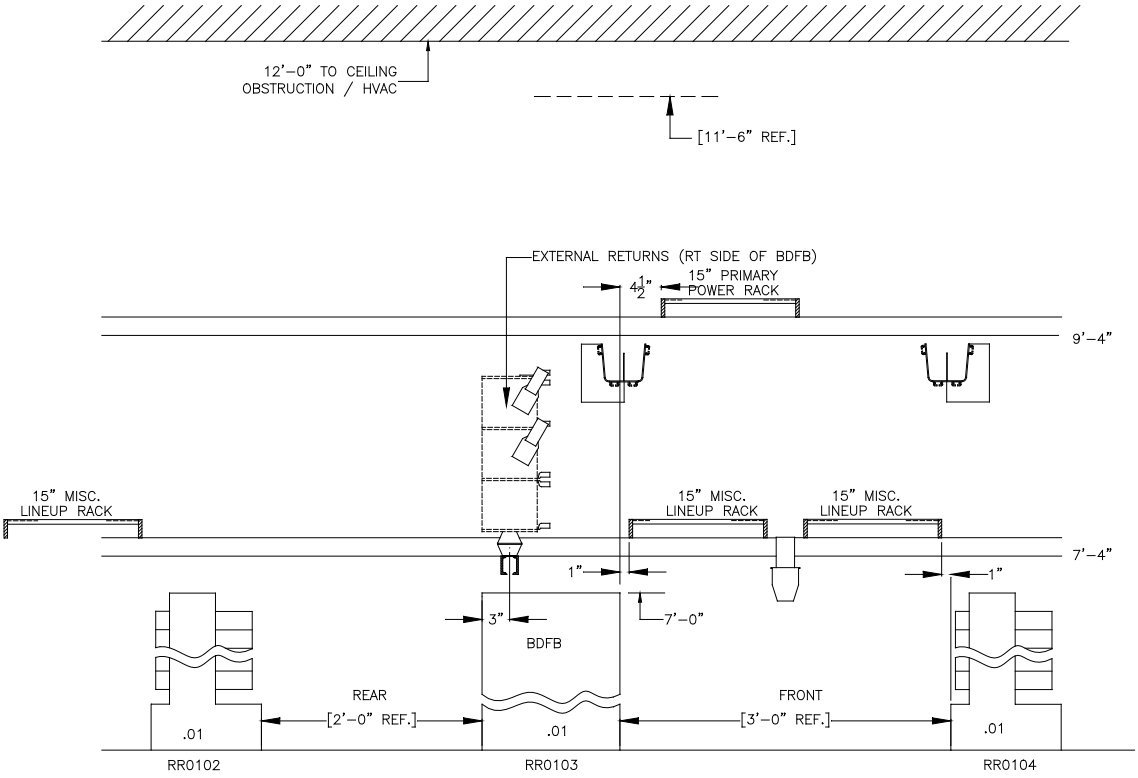


FIGURE 8-19A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

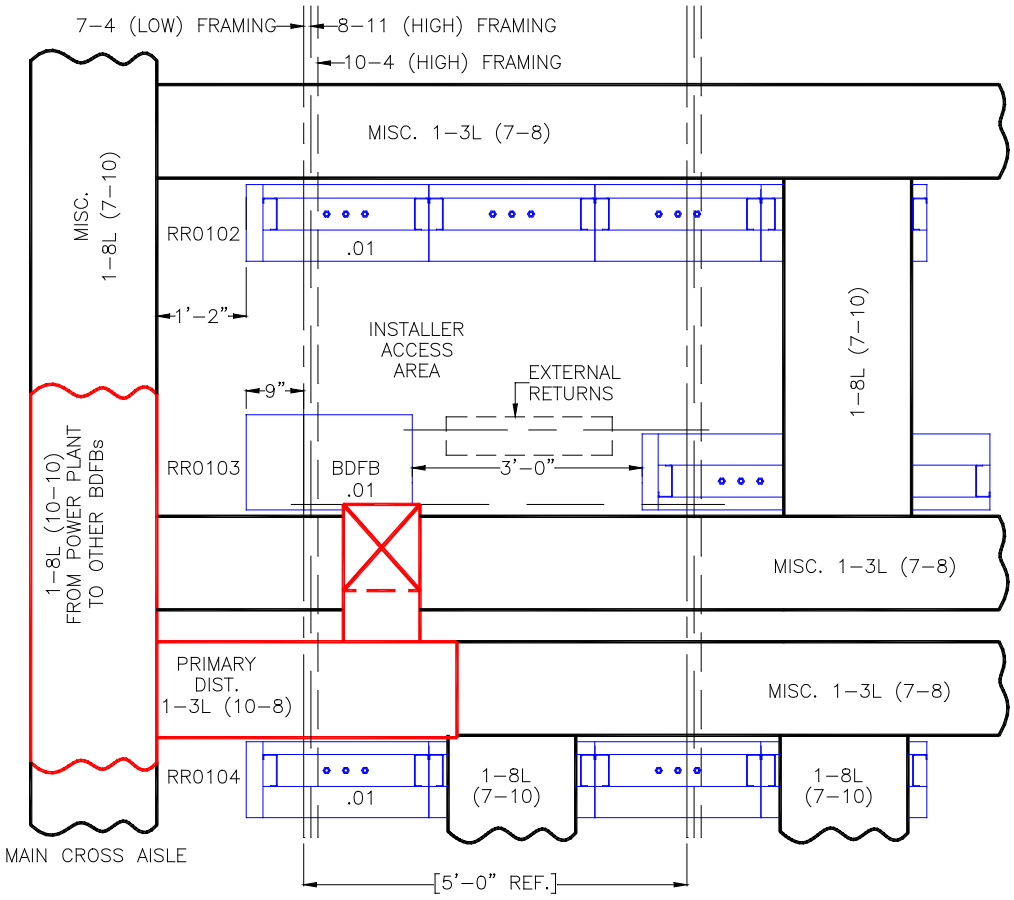


FIGURE 8-19B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING INTERNAL RETURNS AND EXTERNAL RETURNS AT SIDE OF BDFBs

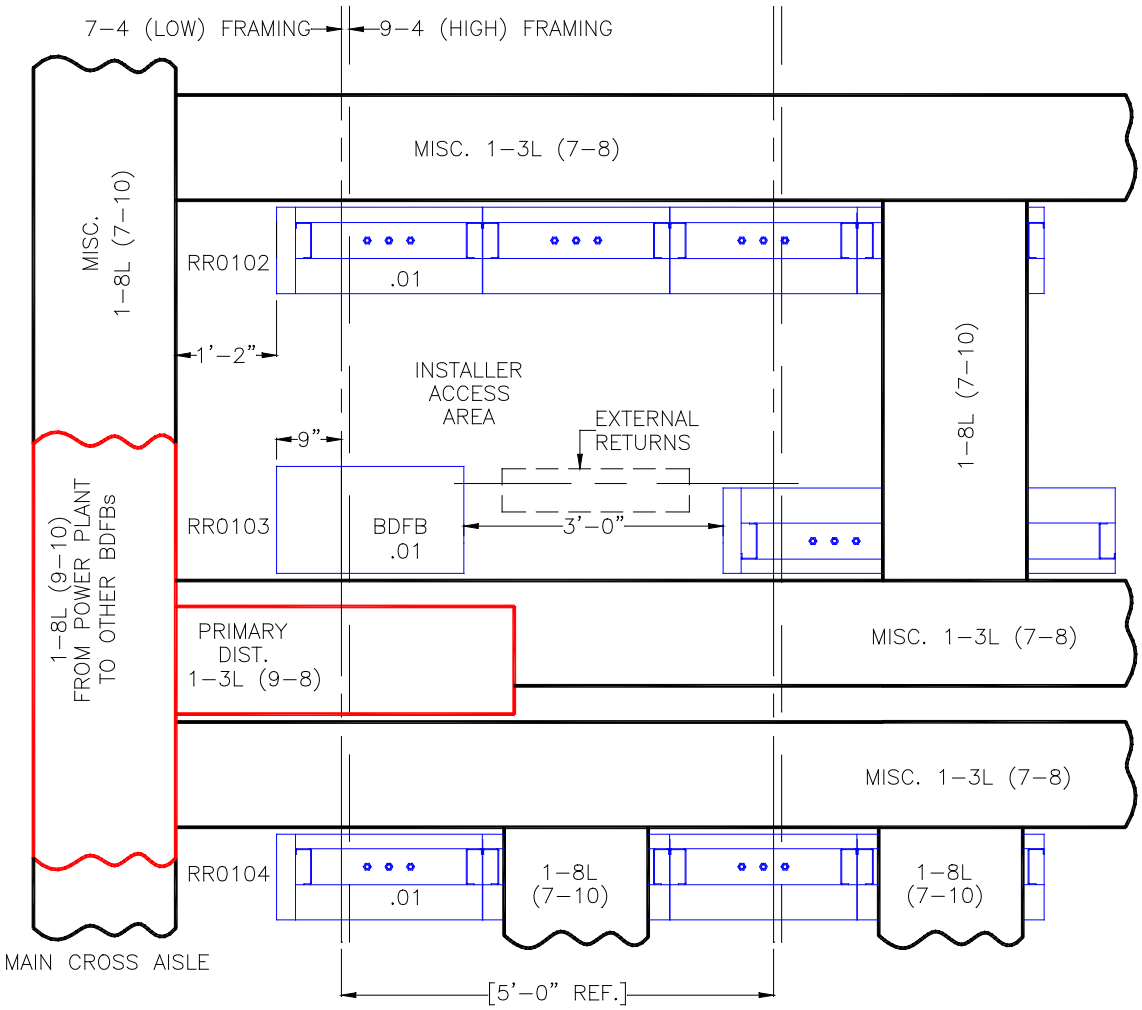


FIGURE 8-20A – TYPICAL CROSS SECTION OF NEW AREA WITH 3-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

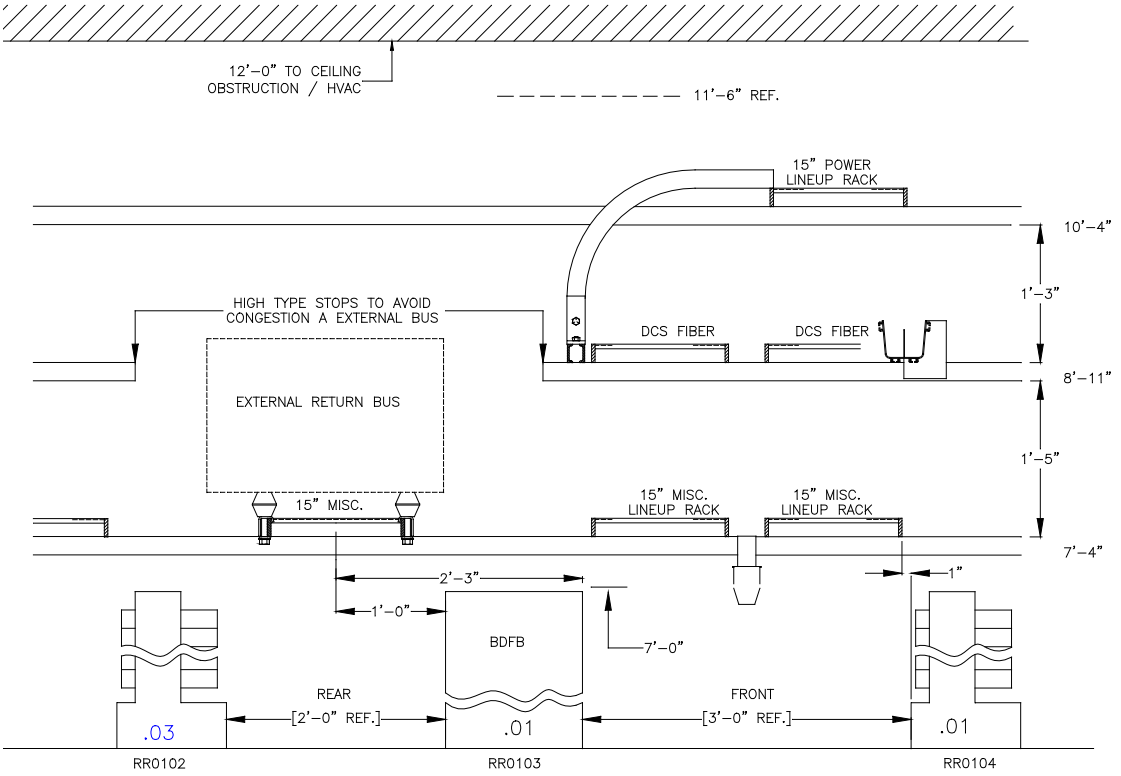


FIGURE 8-20B – TYPICAL CROSS SECTION OF NEW AREA WITH 2-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

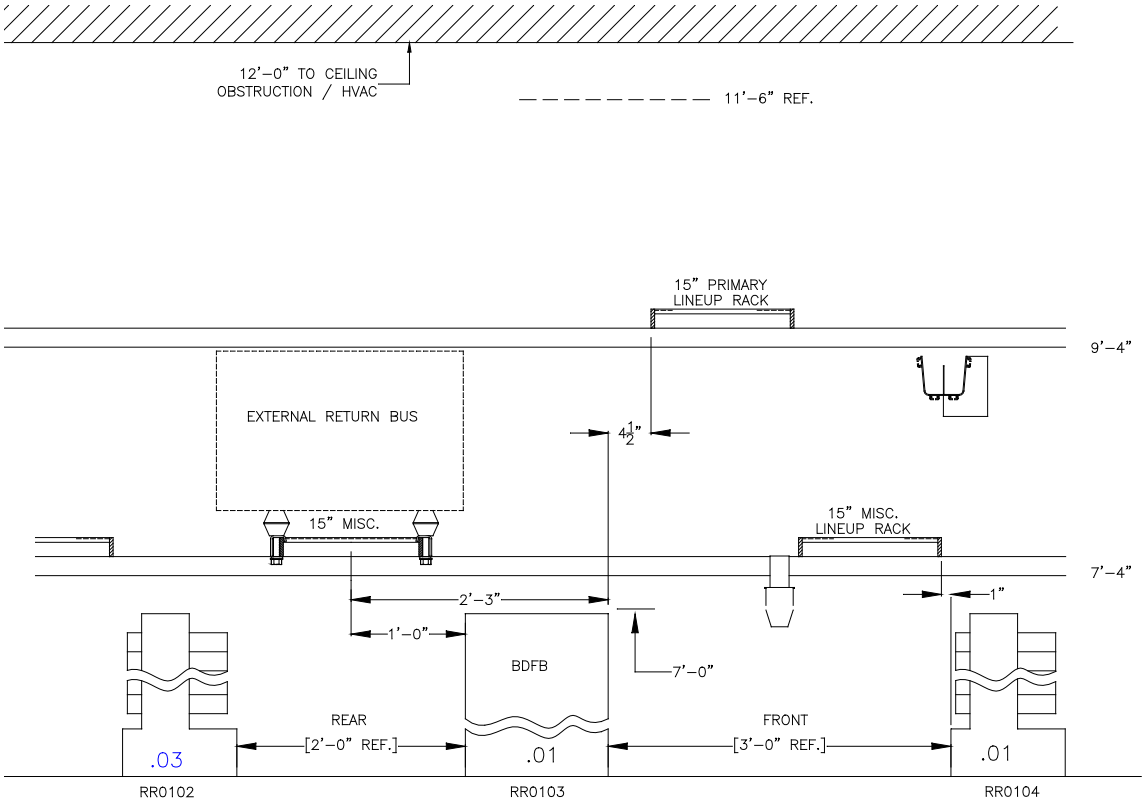


FIGURE 8-21A – TYPICAL PLAN VIEW OF NEW AREA WITH 3-TIERED CABLE RACKING EXTERNAL RETURNS AT REAR OF BDFBs

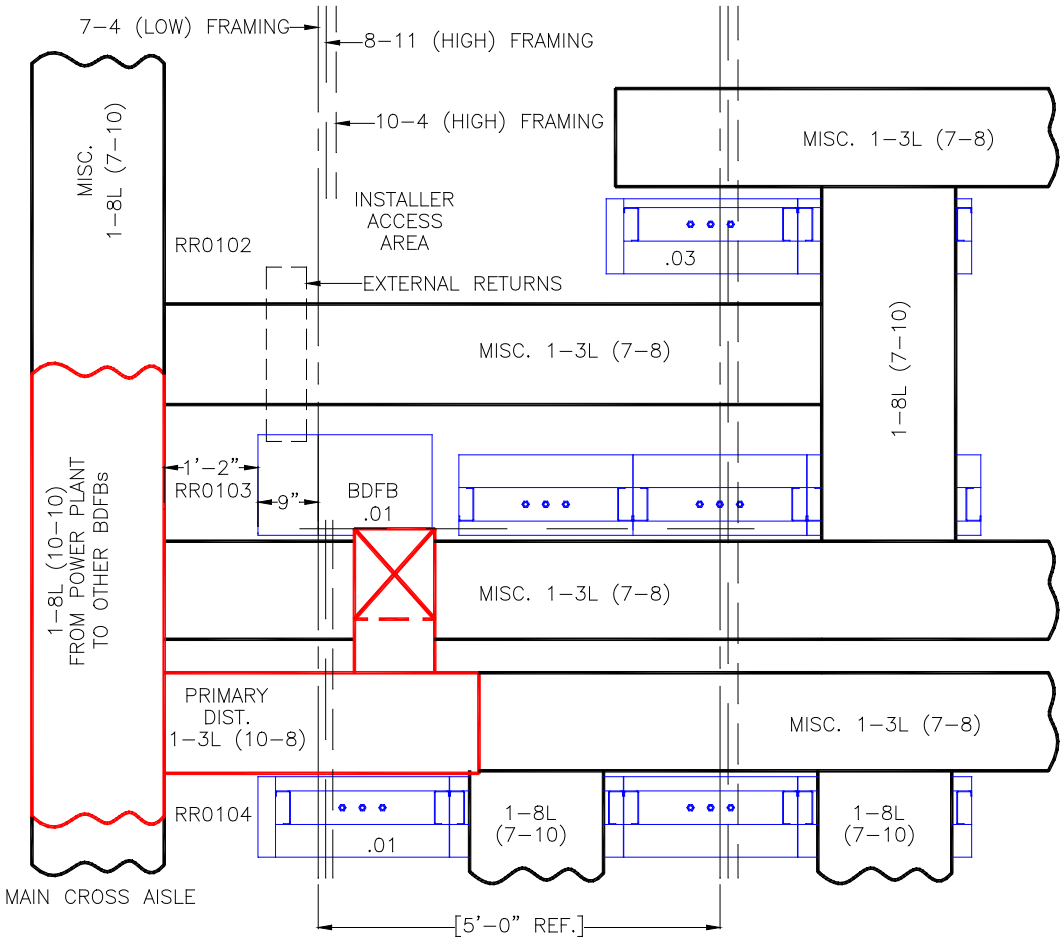


FIGURE 8-21B – TYPICAL PLAN VIEW OF NEW AREA WITH 2-TIERED CABLE RACKING EXTERNAL RETURNS AT SIDE OF BDFBs

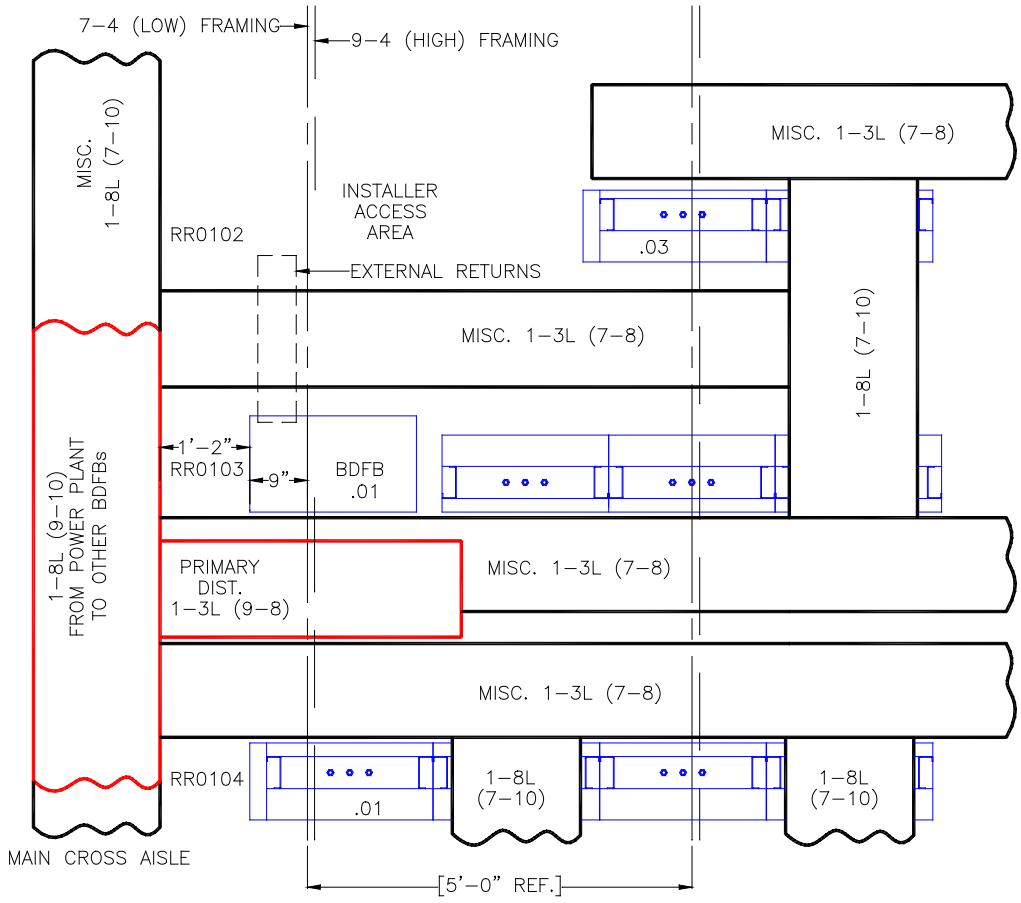
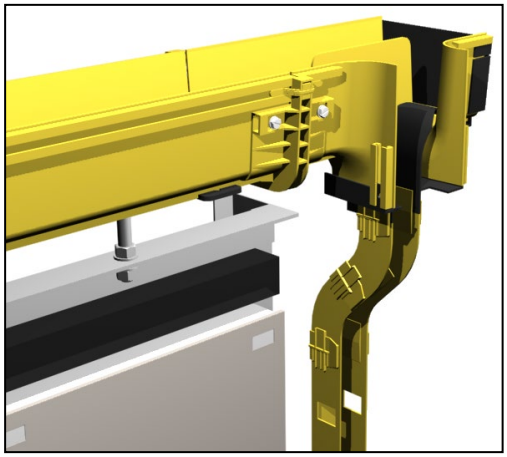


FIGURE 8-28 – DOWNSPOUT DROP OPTIONS



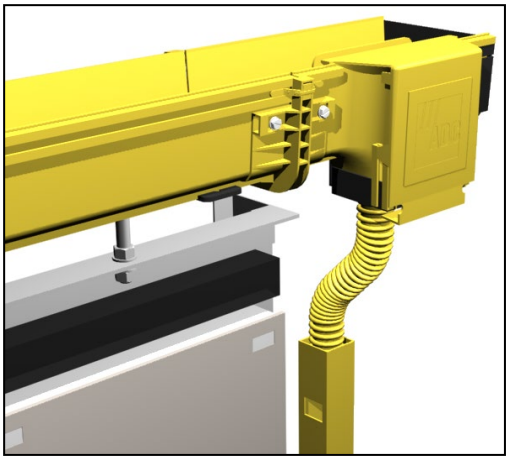
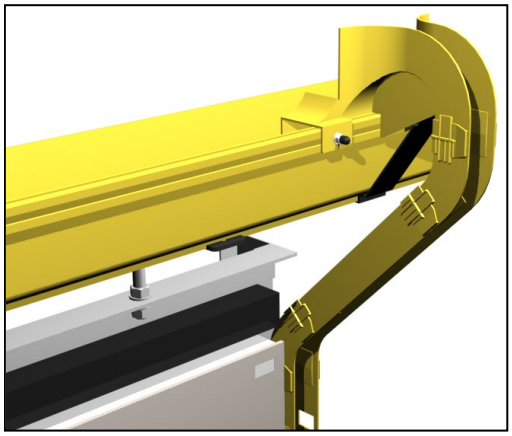


FIGURE 8-29 – EXPRESS EXIT DROP OPTIONS



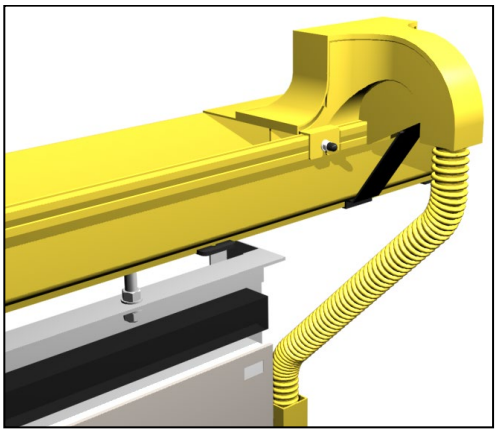


FIGURE 8-30 – AIREY-THOMPSON MOTION SENSOR INSTALLATION.

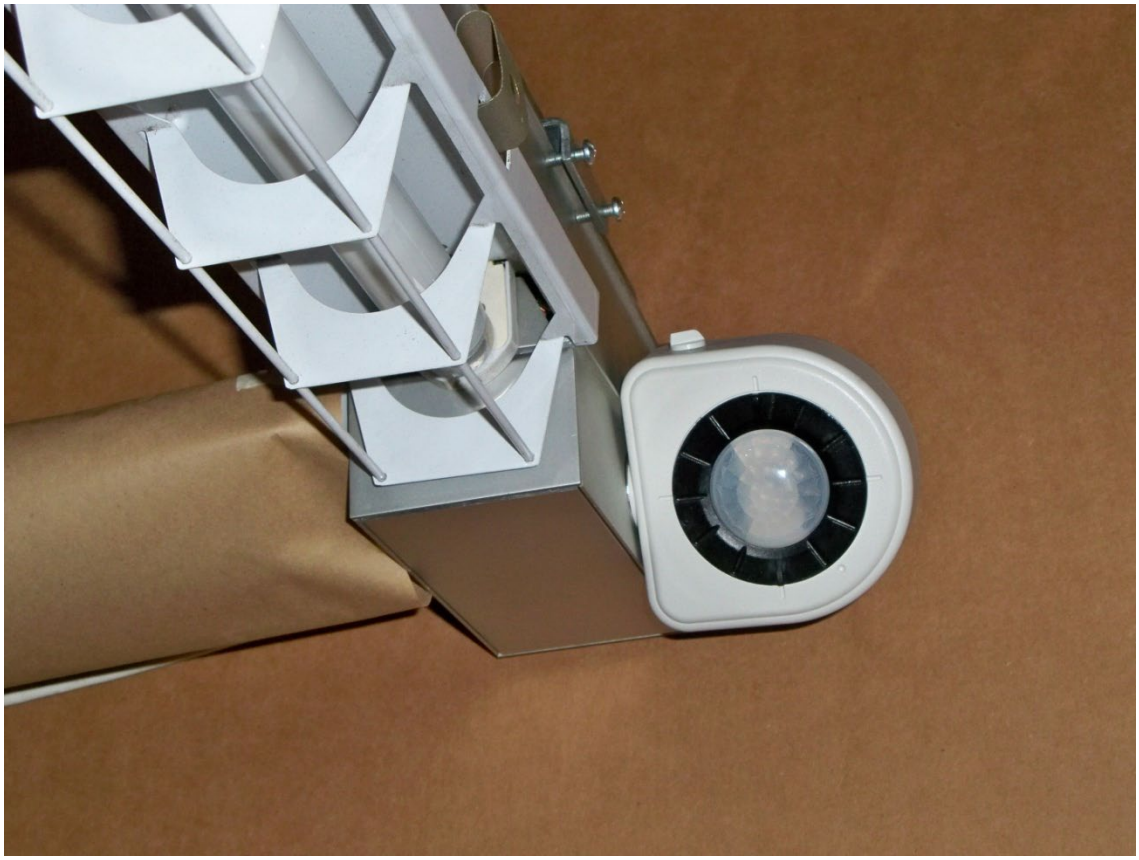


FIGURE 8-31a - TYPICAL DYNAMIC SWITCH LAYOUT (EXAMPLE)

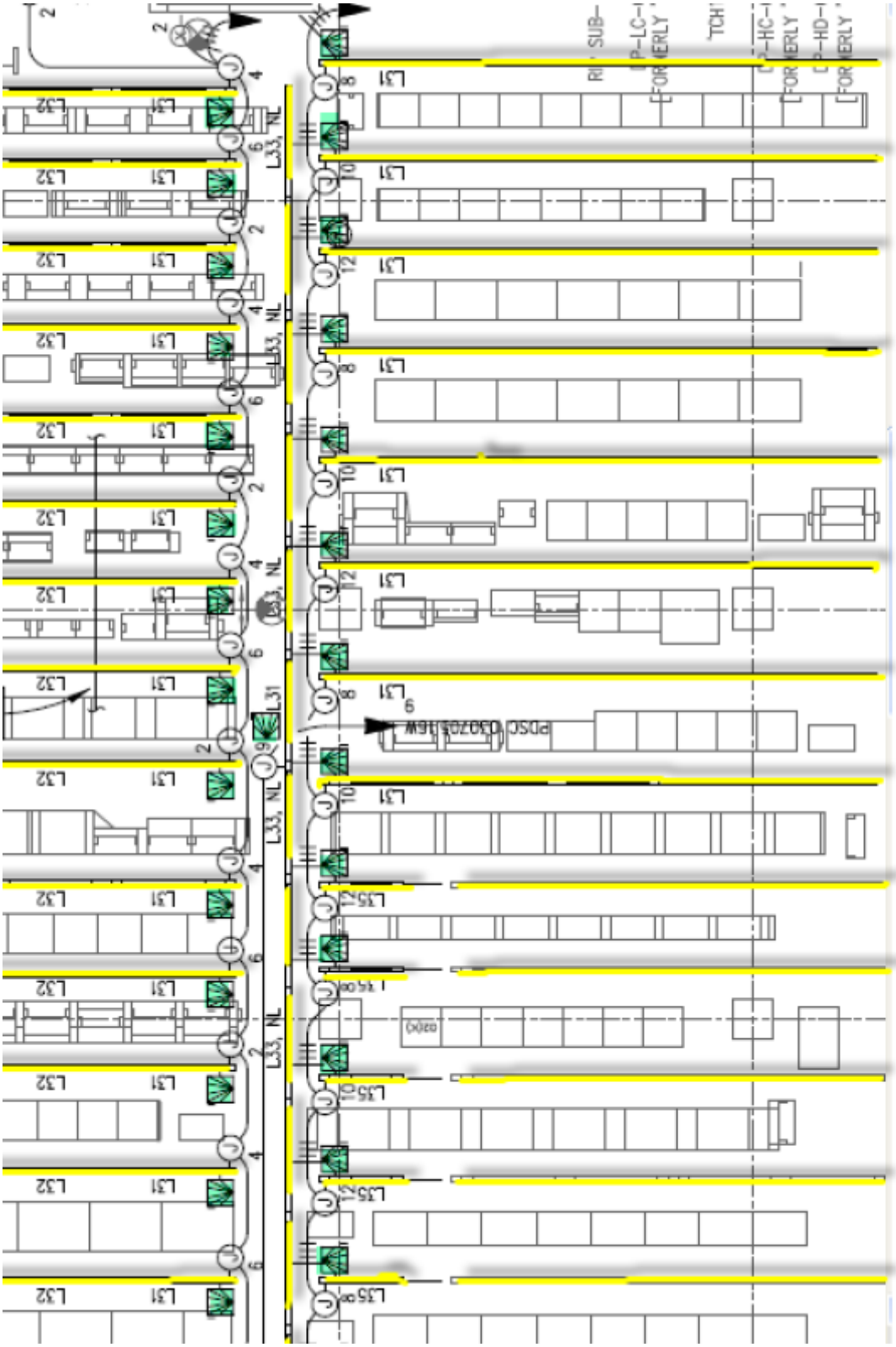
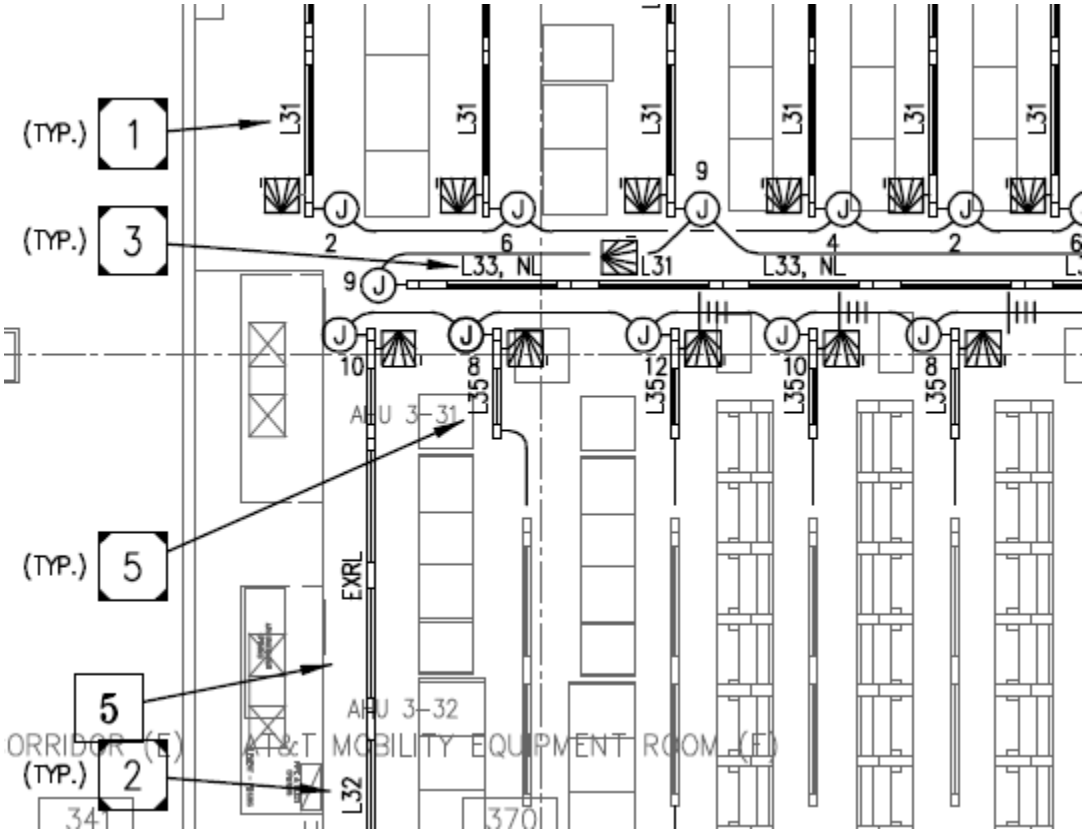


FIGURE 8-30b – DETAILS OF DYNAMIC SWITCH AND WIRING LAYOUT



Below provides general construction notes:

1. COORDINATE FIXTURE LOCATION WITHIN AISLE ON AN AISLE-BY-ASILE BASIS WITH AT&T MOBILITY PRIOR TO ROUGH-IN AND MOUNT FROM EXISTING AUXILLIARY FRAMING. COORDINATE WITH AIREY-THOMPSON FOR APPROPRIATE MOUNTING HARDWARE.
2. INDICATES LUMINAIRE WITH INTEGRAL MOTION SENSOR.
3. INDICATES AN UNSWITCHED LUMINAIRE (BASED ON MODEL SPECIFIED AND WIRING SHOWN).
4. INTEGRATE CEILING MOUTNED OCCUPANCY SENSOR (WATTSTOPPER UT-355-1) WITH EXISTING LIGHTING IN THIS ROOM.
5. REPLACE LAMPS AND BALLAST IN EXISTING LUMINAIRE WITH NEW TO MATCH THAT SPECIFIED FOR SIMILAR NEW LUMINAIRE TYPE 'L36'.
6. EXISTING INVERTER CONDUIT INSTALLED LOW IN THIS AREA AREA SHALL BE RELOCATED TO A HIGHER ELEVATION. TRACE CIRCUIT AND COORDINATE CUT-OVER WITH AT&T MOBILITY. FOR BID PURPOSES ASSUME THAT COMPLETELY NEW CONDUIT/WIRING WILL BE INSTALLED FOR SHORT DURATION CUT-OVER AT THE TERMINATION POINTS.

[END OF SECTION]

SECTION 9 – CROSS-CONNECT SYSTEMS

CONTENTS PAGE

TABLE 9-1 – SUMMARY OF CHANGES IN SECTION 9

Revision Date	Item	Action	Requirements Change Notification
03/11/2016	Entire Document	Modification	N/A; March 2016 TP76400 Rewrite
09/04/2018	6.1.8	Modification	ATT-TP-76400-220
06/09/2022	6.1.8	Modification	ATT-TP-76400-246

1. GENERAL

1.1 Introduction

1.1.1 Changes in this issue of Section 9 are summarized in Table 9-1.

2. DISTRIBUTING FRAMES (DF)

2.1 Zoning and Spread Complete

2.1.1 All MDF's shall be zoned. Zoning refers to the practice of logically dividing the frame, where practical, into multiple vertical sections, or zones. The vertical and horizontal sides of an MDF are zoned independently of each other. Zoning is utilized to exploit the short jumper concept, in which an assignment algorithm is used to ensure the shortest possible jumper lengths.

2.1.2 Spreading is defined as the placement of related equipment in several locations on the frame, e.g. rather than placing all OE in a concentrated location on the DF, it is spread across the frame. This is done in conjunction with the corresponding spread of OSP terminations on the vertical side of the frame. This keeps the jumper wires that are run on the frame shorter, the frame less congested, and prevents premature exhaustion of the frame hardwire.

2.2 Distributing Frame Functions

2.2.1 Main and Intermediate Distributing Frames. The primary copper facility frame is known as the Main Distributing Frame (MDF). The MDF is the frame that has the standard terminations of the local indigenous switch OE/LEN facilities, cable pairs to the customers and tie pairs to other frames and equipment.

2.2.2 In multiple conventional frame central offices, it is recommended that transport and CLEC terminations be placed on the IDF unless the MDF has sufficient space to support these terminations and still allow for ILEC growth. COSMIC MDF's are typically associated with switch terminations. Therefore, Transport and CLEC terminations shall not be placed on a COSMIC MDF.

2.2.3 Transport, CLEC and other miscellaneous terminations, located on the Intermediate Distributing Frame (IDF) shall be connected via Inter-Frame Tie cables to the MDF.

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

2.2.5 The primary functions of distributing frames are:

a) Termination of Facilities/Equipment.

b) Equipment cross-connect point.

c) Electrical Protection.

d) Test and Cable Access

3. DISTRIBUTING FRAME TYPES

3.1 Conventional Distributing Frames

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

3.1.2 Horizontals shall be spaced on 8-inch centers. Older frames may have 10-inch spacing. Current standards call for 8 inch centers for both verticals and horizontals.

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

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

3.1.5 Horizontal levels shall be identified by letter designations starting with the letter A at the bottom, omitting letters I and O. Individual blocks/terminal strips on the horizontal level shall be identified by the associated vertical number. Designation instructions shall be provided to the installer via the engineering spec.

3.1.6 Designations shall be provided at various points to identify the vertical number on both sides of the conventional frame. See Section L of ATT-TP-76300 for details. Designation instructions shall be provided to the installer via the engineering spec.

4. FRAME BLOCKS

4.1 General

4.1.1 Frame assignments shall be provided by the authorized AT&T Engineer, commonly the Frame Planner/COLD (Central Office Layout Design) Planner.

4.1.2 All blocks on the frames shall have wire wrap terminations, unless the embedded base of existing blocks on the frame is made up of Quick-Clip/punch down, type blocks. In that case the quick clip blocks will be allowed.

4.1.3 Bifurcated pins are required for connecting blocks used for line equipment and CLEC CFA terminations. This facilitates half taps for cutovers, cable throws and “from/to” service orders.

4.1.4 Only AT&T approved frame blocks shall be used per drawing ATT-E-00087-E.

4.2 Connector/Connecting Blocks

4.2.1 The standard connecting block for conventional frames is the non-connectorized 89-type block or equivelant.

4.2.2 Only AT&T approved frame blocks shall be used per drawing ATT-E-00087-E.

4.3 Protected Connectors

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

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

5. MANUAL DIGITAL SIGNAL CROSS-CONNECT (DSX)

5.1 DSX-1 CONSIDERATIONS

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

5.1.2 The length of a continuous DSX 1 lineup shall follow the AT&T requirements as defined in ATT-TELCO-IS-812-000-003, Section 6.

5.2 Interbay Patch Panels

5.2.1 DSX1 and DSX3 lineups shall reserve (1) panel position space at top of bay for an inter-bay patch panel appearance every fifth bay.

5.3 Cross-Aisle Tie Pair Panels & Bridges

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

5.4 DSX-1 Cross-Connect Rules

5.4.1 In order to maintain flexibility, planning of the office size is of primary importance and determines the ultimate size and layout of the DSX1and should be made according to AT&T requirements.

5.4.2 To alleviate cable congestion between adjacent DSX 1 equipment frames proper spacing requirements shall adhere to appropriate AT&T equipment drawing.

5.4.3 A complete set of rings and troughs shall be required with newly installed DSX 1 bays.

5.4.4 DSX-1 panels shall be located in 7 foot bays for new deployments. Existing line ups with embedded DSX-1 panels placed above the 7 foot level may be completed to the end of the line up, but all new line ups shall have new deployment of DSX-1 panels located only in 7 foot bays.

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

5.4.6 For new DSX-1 lineups in central offices, bantam type jack panels shall be provided.

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

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

5.5 DSX-3 Considerations

5.5.1 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. Use of 734C coaxial cable is required in IXC offices unless written approval for use of 735C coaxial cable is obtained from AT&T Standards.

5.5.2 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 standard cross-connect cord (735 type) used between two (2) DSX-3 panels will be limited to 45 feet in length, while the longer-range cross-connect cord (734 type) used between two (2) DSX-3 panels will be limited to 88 feet.

The following are length limitations for 735C coaxial cable (from Active Element to Active Element with and without DSX-3 panels.)

1. From Network Element to DACS using direct cabling between the Network Element and DACS – 500 feet (if intermediate DSX-3 panels are placed within this circuit, the length limitation is reduced from 500 feet to 455 feet)
2. From DACS to DACS using direct cabling between the two(2) DACS – 500 feet (if intermediate DSX-3 panels are placed within this circuit, the length limitation is reduced from 500 feet to 455 feet)

5.5.3 To alleviate cable congestion between adjacent DSX 1 equipment frames proper spacing requirements shall adhere to appropriate AT&T equipment drawing.

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

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

5.5.6 The hardwired cables from the connecting equipment to the DSX-3, or from the connecting equipment directly cabled to the DCS, shall be provided in one of the following two ways:

a) One end factory crimped and the OTHER end field crimped, within an AT&T central office, by an AT&T approved Installation Supplier. This is the preferred method.

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

5.5.7 In large offices, DCS equipment shall be terminated on different DSX-3 bays to provide an even spread of equipment. If multiple line-ups are present at that location an even distribution of terminations shall be provided.

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

5.5.9 The length of a continuous DSX 3 lineup shall follow the AT&T requirements as defined in ATT-TELCO-IS-812-000-003, Section 6.

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

6. FIBER DISTRIBUTING FRAMES (FDF)

6.1 General

6.1.1 A FDF architecture shall serve as the primary interface between outside plant (OSP) fiber optic facilities entering and leaving a building and the fiber optic equipment installed within a building. 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 re-arrangeable connections between any two terminations or appearance.

6.1.2 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.

6.1.3 Interbay LAN connections (typically multimode) may be run NE to NE without the use of a FDF.

6.1.4 Connectivity from one Network Element to another within the same Network Equipment footprint shall only be permitted as a permanent arrangement for connectivity of equipment issues.

6.1.5 Passive devices such as Optical Splitters and WDM technologies shall fit within modules developed for use within specified approved modular chassis.

6.1.6 There is no physical diversity requirements for any SPEED or OC rate unless that requirement is requested by the customer, engineer or the equipment OEM. More stringent Levels of diversity may be required due to specific customer requests, marketing product requirements or specific network requirements. Refer to appropriate AT&T document for specific diversity requirement.

6.1.7 Fiber cabling within a Network Element system using one or multiple bays within the same footprint may be cabled directly without termination on a FDF.

6.1.8 Fiber Distribution Frame (FDF) to Network Equipment (NE) fiber routing systems (expansion of existing or newly constructed) located within AT&T Technical Space shall utilize one of the following product line designs:

a) Wire Basket Tray (WBT): utilized for routing of soft jacketed array Simplex and Duplex fiber jumpers

b) Ladder type cable racking: utilized for routing of hard jacketed trunk OFNR fiber cables

c) WBT or ladder type cable racking: utilized for routing of rigid array/trunk type fiber cables

Note-1: A ruggedized array cable would be any combination of 12 Fiber MPO connectorized cable (could be MPO to MPO or MPO to LC/SC/ST, etc.) that comes from Commscope or Cablcon.

Note-2: A ruggedized trunk cable would be a 20-fiber cable connectorized on both ends with duplex uniboot LC connectors that comes from Commscope or Cablcon.

Wire Basket Tray routing systems shall be contained on the same floor and not separated by a firewall, floor or ceiling.

6.1.9 Only AT&T approved connector types shall be used for FDF terminations.

6.1.10 The full cross-connect architecture provided by the FDF shall be used in the AT&T network.

6.1.11 Fiber cables terminating at the FDF within AT&T Equipment Space intended for OSP use shall adhere to one the following options:

a) Utilization of Preterminated FDF panel equipped with either OFNR cable or indoor/outdoor cable intended for splicing in the cable vault, cable entrance facility or first manhole.

b) Utilization of a single ended preconnectorized OFNR cable or indoor/outdoor cable in conjunction with an FDF panel intended for splicing in the cable vault, cable entrance facility or first manhole.

c) Utilization of a non-connectorized OFNR or indoor/outdoor cable to be spliced within the FDF using an approved splice panel.

6.1.12 Black jacketed outside plant cable shall not exceed 50’ within the building unless enclosed in a fire retardent conduit.

6.1.13 Fiber optic connections between network elements shall utilize pre-connectorized cables and terminate at an FDF on the rear of an FOT pane.

6.1.14 OSP and FOT bay placement shall be arranged/staggard in an attempt to minimize fiber jumper length.

Note: Since the NG4 is intended to be a combination bay this rule does not apply.

6.1.15 The FDF shall always utilize the cross-connect methodology. No network element shall be directly terminated on an OSP panel.

6.2 Satellite Fiber Distributing Frame

6.2.1 When an FDF is required to be placed on a different floor or in a non-contiguous equipment area from the primary office FDF, it shall be considered a remote or satellite FDF. This remote or satellite FDF shall be required to be connected back to the primary office FDF via a fiber optic tie cable.

6.2.2 When Satellite FDF's are placed, FPS shall be placed to allow easy access to support each Network Element.

6.2.3 Placement of the overhead FPS shall be relative to the cable management of the terminating equipment.

6.3 The FDF

6.3.1 All passive devices shall conform to the AT&T Company’s standard.

6.3.2 New FDF line-ups shall be limited to a 7 foot environment.

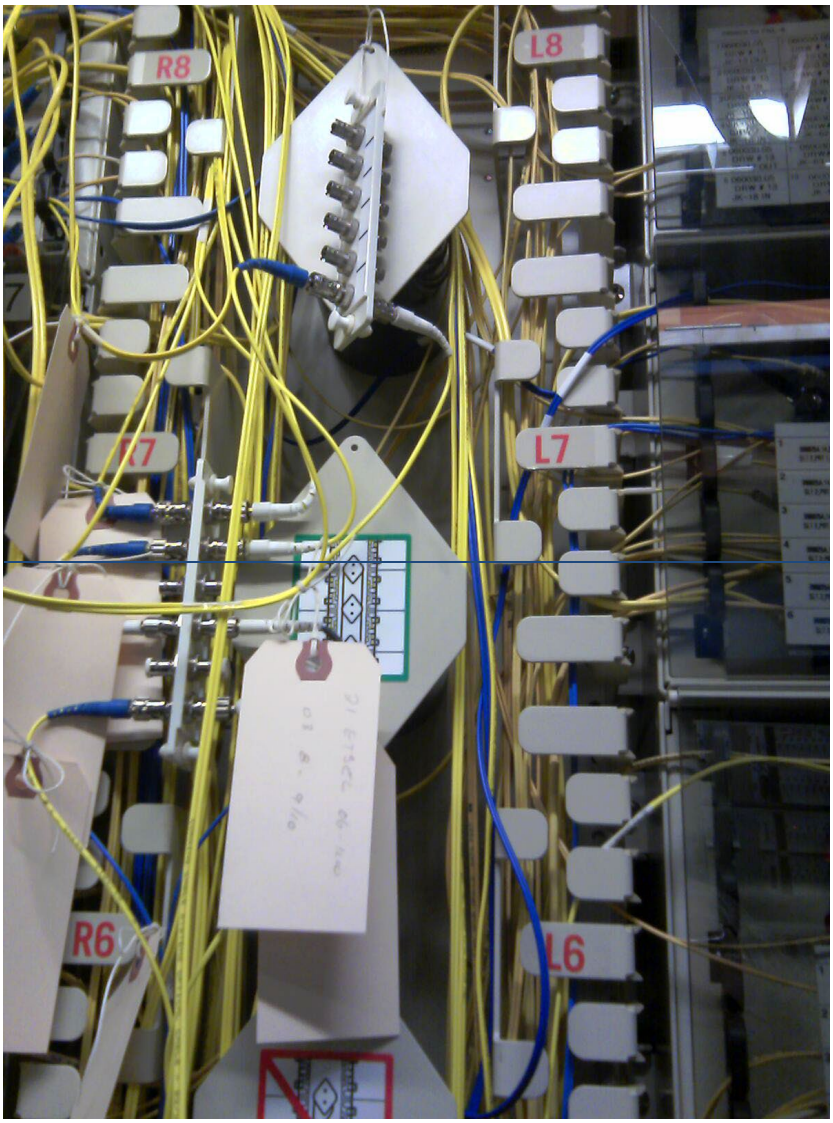
6.3.3 The FDF shall be ordered to include storage of excess jumper slack between bays.

6.3.4 In locations with limited FDF line-up growth, the utilization of combination OSP/FOT bays is permitted.

6.3.5 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 full 36-inches between parallel lineups on both front and rear. If a new lineup is started using the Generation III bays after an embedded Generation II (standard bay) arrangement is already in service, strive to place the new lineup adjacent to the Generation II lineup, or within the closest proximity. A transition bay from the NGF to the NG3 will be required to migrate from these two Generation III systems.

6.3.6 Fiber optic patch cords shall be ordered in the near correct lengths in order to interconnect between FDF panels and network elements.

6.3.7 In locations where there is an existing lineup of the old style LGX bays and that lineup still has room to grow it is permitted to continue the lineup with the same style bay until that lineup is maxed out without the need for a waiver.



6.4 Fiber Splitters

6.4.1 Fiber Optic Splitters shall not be directly connected to one another.

6.4.2 No more than three fiber optic splitters shall be placed in the overall circuit path.

6.5 Optical Terminations and Connectors

6.5.1 Fusion splicing is the standard in AT&T and shall be used when required.

6.5.2 For immediate service restoration mechanical splices are allowed but shall not remain in place longer than 30 days.

6.6 Attenuators

6.6.1 Fiber optic attenuators shall only be placed at the receive side of either the network element or the FDF.

7. ETHERNET DISTRIBUTING FRAMES (EDF)

7.1 General

7.1.1 All Operation/Administration/Maintenance (OA&M) connections shall be direct connected to one another and will not utilize the cross-connect architecture/design of the Fiber and Copper Distributing Frames unless otherwise noted in this document, an associated GES Application Drawing or as outlined in ATT-TELCO-IS-002-316-076 Common Systems: Ethernet Architecture Standards

Note: The OAM Direct Connect Application may not apply in all locations due to existing network architecture designs. (i.e. Mobility Network Technology Centers (NTC's) where the cross-connect architecture is common place and should be maintained)

7.2 Electrical Ethernet Distributing Frames

7.2.1 Ethernet interconnection between network transmission equipment and the EDF will be terminated on the rear of an Ethernet Termination shelf (Patch Panel). This connection will be made using RJ-45 type connectors and Category 5E minimally conforming type cable and shall adhere to AT&T length limitations.

7.2.2 The full cross-connect architecture provided by the EDF shall be used in the AT&T network.

7.2.3 The EDF shall always utilize the cross-connect methodology. No network element shall be directly terminated on the front of the Ethernet patch panel.

7.3 Electrical EDF Components for the C.O.

7.3.1 For detailed information refer to the following drawings:

- ATT-C-20010-E
- ATT-E-01885
- ATT-E-00053-E

[END OF SECTION]

SECTION 10 -- ALARMS

CONTENTS PAGE

TABLE 10-1 – SUMMARY OF CHANGES IN SECTION 10

Revision Date	Item	Action	Requirements Change Notification

1. GENERAL

1.1 Introduction

1.1.1 This section provides alarm requirements for equipment deployed within the AT&T network of central offices.

1.1.2 Changes in this issue of Section 10 are summarized in Table 10-1.

1.1.3 ATT 801-601-900 (Alarm Standards Practice) is the official repository of standard alarm information for all network elements, except switch equipment, deployed within the AT&T network and is available to all authorized AT&T employees and approved vendors. All unauthorized employees and vendors should refer to ATT-TP-76450 for alarm detail requirements. ATT 801-601-900 includes but is not limited to transport equipment, digital loop carrier, power equipment, and building or environmental standard alarms, as well as alarm systems and equipment. This document shall be the primary reference for engineering network element alarms.

1.1.4 Office alarms (audible and visual), as well as, remote surveillance alarm and controls shall be engineered for the equipment being added or as exempted by ATT 801-601-900 or ATT-TP-76450. Additional details, regarding the provisioning of telemetry alarms and local office alarms, may be found in ATT 801-601-900 or ATT-TP-76450.

1.1.5 The DESP (building) shall engineer standard building/environmental alarms in accordance with the specification provided by the AT&T Real Estate Project Manager. The DESP (building) shall ensure that building/environmental alarms are connected to the office alarm

system, as well as to the remote alarm telemetry device. Specific environmental alarm requirements may be found in ATT 801-601-900 or ATT-TP-76450.

1.1.6 Alarm testing requirements for all newly provisioned telemetry alarms are specified in ATT-TP-76900, ATT-TP-76450 and ATT 801-601-900.

1.1.7 When the added network element provides only audible and/or visual local office alarms, the office alarm visual leads (typically, CRV, MJV, and MNV) shall be used to initiate both telemetry alarm indications and office alarm indications. An approved splitter circuit shall be used to create telemetry alarms from local office alarms and vice versa. Additional details on splitter circuits may be found in ATT 801-601-900 or ATT-TP-76450.

1.2 Carrier Communications Space Switches

1.2.1 Remote telemetry capability shall be provided for the surveillance of voice switches. This remote alarm telemetry device shall be unique and separate from alarm collection devices associated with other network elements.

1.2.2 Switch scan points shall be used only for voice switch alarm surveillance, except as noted in ATT 801-601-900, for “Battery on Discharge” and “Fire” alarms.

[END OF SECTION]

SECTION 11 -- SYNCHRONIZATION

CONTENTS PAGE

TABLE 11-1 – SUMMARY OF CHANGES IN SECTION 11

Revision Date	Item	Action	Requirements Change Notification
11/07/2014	2.7	Modification	ATT-TP-76400-127
06/01/2021	2.3.2	Modification	ATT-TP-76400-243
06/01/2021	2.5.1	Modification	ATT-TP-76400-244

1. GENERAL

1.1. Introduction

1.1.1 This section has been prepared to provide general guidelines necessary to assure compliance with the AT&T 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&T'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 Carrier Communications Space that houses the redundant ST3E/ST2 (E) master oscillators, is redundantly DS-1 signal fed has PRS-traceability, New shelves placed as office master shall also have TL1 interoperability.

2.1.2 Each Carrier Communications Space 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-Carrier Communications Space locations (i.e., mini/maxi huts, CEVs, etc.) there may be the need for a BITS clock to provide timing signals to: interconnecting rings; locations with three independent pieces of timing capable digital equipment; and locations with multiple synchronous elements. Contact the AT&T sync equipment planner 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 Effective 1-1-2012, there are no diversity requirements for routing timing cables on overhead cable racks, under raised floor installations, or for routing PTP/NTP fiber jumpers in fiber troughs.

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.

a) Distributed synchronization systems that provide timing to a dedicated system or arrangement, shall not be required to use a dedicated bay; shall be placed within their supporting system.

2.3.3 DS1 and composite clock timing leads from BITS clock OUTPUT ports to a network element shall be run using the approved 1175A red-jacketed shielded cable. Red jacketed 735C coaxial cable shall be used for 2048 kHz analog sync signals. Single mode fiber jumpers or category 5e (or higher) unshielded Ethernet cable shall be used for Precision Time Protocol and Network Time Protocol timing signals as specified by the sync equipment planner.

2.3.4 Timing signal leads from the BITS clock OUTPUT ports to network element inputs shall NOT be run through DSX jacks unless instructed to do so by the AT&T sync equipment planner.

2.3.5 The 1175A timing cable 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. The shield 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 shelf that are equipped with Remote Track and Hold Cards (RTHC) or oscillators capable of phase holdover. The AT&T sync equipment planner 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&T sync equipment planner 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& sync equipment planner.

2.3.8 BITS record books shall be maintained only where they currently exist. BITS record books shall not be created for locations for which they do not currently exist. Where BITS record books are maintained, the DESP shall provide the BITS record book, record book holder and assure all assignments accurately match in the regionally approved record keeping system (ex. TAB/dB, SyncTrac, or GeoLink).

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&T sync equipment planner will provide for timing reference input signals. Wiring of the input timing reference shall be in accordance with the appropriate ATT-CO Wiring interconnection drawing. Mini-DSX will be placed only for new master systems that employ SONET Derived DS1 signals as the input timing reference as directed by the sync equipment planner.

2.5. 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.

a) Distributed synchronization systems that provide timing to a dedicated system or arrangement, shall not be required to use a dedicated fuse panel.

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 that originate directly at the Power Plant shall be fused on different rows.

2.5.4 “A” and “B” battery outputs of the fuse panel shall correspond to the “A” and “B” battery inputs of the BITS equipment.

2.5.5 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&T 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. Network Elements

2.7.1 Network element equipment configurations requiring BITS timing shall be individually timed from the office BITS, with primary and secondary reference signals from adjacent output cards, with odd-even or alternate group slot assignments per AT&T interconnect drawings. Timing connections at the network element shall be made per the AT&T interconnect drawings.

2.7.2 In the event of output card exhaustion, daisy-chaining to enable cascading of digital (DS1, CC, E1) synchronization reference signals to multiple network elements is NOT an AT&T option and shall not be permitted. Arrangements must be made with the AT&T synchronization planner to provide additional BITS outputs. This requirement does not apply to serial Time of Day connections when cabled as shown in AT&T interconnect drawings.

2.7.3 Each network element shall have the digital (DS1, CC, E1) “CLOCK IN” connections (PRIMARY and SECONDARY) cabled via 1175A red jacketed timing cable to the BITS. Red jacketed 735C coaxial cable shall be used for analog (2048 kHz) timing signals. Shield lead conductors of all 1175A timing input cables shall be DC-grounded at the BITS shelf wire wrap panel only and left insulated and un-terminated at the network element.

2.7.4 Network element “CLOCK OUT” connections (PRIMARY and SECONDARY) shall not be cabled, except when required for office BITS clock reference input as specified by the AT&T sync equipment planner.

2.8. 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, and assure all updates match and are reflected in the regionally approved record keeping system (ex. TAB/db, SyncTrac, or GeoLink). For sites where a BITS record book is maintained, the record book must be updated to match the regionally approved record keeping system.

[END OF SECTION]

SECTION 12 -- POWER SYSTEMS

CONTENTS PAGE

TABLE 12-1 – SUMMARY OF CHANGES IN SECTION 12

Revision Date	Item	Action	Requirements Change Notification
3/4/2019	2.4.1, 2.5.1, 2.8.2	Modification	ATT-TP-76400-233
3/4/2019	3.1.1	Modification	ATT-TP-76400-234
10/1/2019	8.6	Modification	ATT-TP-76400-237
11/5/2019	4.3.14	Modification	ATT-TP-76400-238
2/3/2020	4.3.14	Modification	ATT-TP-76400-239
12/8/2020	2.8.2	Modification	ATT-TP-76400-241
6/9/2022	1.1.7	Modification	ATT-TP-76400-247
11/14/2022	8.4.5 & 8.5.4 Fig 12-9	Modification	ATT-TP-76400-248
05/19/2023	2.10.2 & 2.10.3	Modification	ATT-TP-76400-252
05/19/2023	7.2.2 & 7.2.3	Modification	ATT-TP-76400-253

1. GENERAL

1.1. Introduction

1.1.1 This section covers the general requirements for engineering of DC Power Plants (battery/rectifiers (AC/DC)), converters (DC/DC), inverters (DC/AC), Uninterruptible Power Systems (UPS), power systems monitor/controllers, AC and DC power distribution, and ring, tone and cadence plants. See Section 16 for standby AC Plant (engine-alternator set) requirements.

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 Engineer for the provisioning of the manufacturer's recommended spare parts for each type of power equipment. The AT&T Engineer will work closely with GNFO in provisioning adequate spare parts based on the geographic response area.

1.1.5 The DESP shall provision alarms for all new power equipment in accordance with ATT-P-05010-E "Power Equipment Alarm Standards" drawing, and ATT-TELCO-801-601-900 "AT&T Alarm Standards Practice". If the DESP discovers a discrepancy, contact the AT&T Engineer for resolution.

1.1.6 When adding equipment on waterproof floors, the DESP shall determine the method of securing equipment frames to the floor in accordance with TP76300, Section G: Floor Drilling.

1.1.7 All materials and parts comprising power equipment installation shall be new and unused, of current manufacture, and of the highest grade, free from defects and imperfections, unless reuse of equipment is authorized by the AT&T Engineer.

1.2. Definitions

1.2.1 **Advanced Technical Support (ATS):** Local GNFO technical support for power issues, aka Maintenance Engineer.

1.2.2 **Alternating Current (AC):** A form of electric power where the electric charge periodically reverses direction. Typical waveform is sinusoidal with a frequency of 60 Hz in the U.S.

1.2.3 **Authority Having Jurisdiction (AHJ):** As defined in the NEC, typically local government Electrical Inspector or Fire Marshal.

1.2.4 **AT&T Engineer:** The term "AT&T Engineer" will be used in this section to refer to the AT&T representative who is responsible for approving the order to engineer and install the equipment, regardless of organizational structure and job titles - aka, MEI.

1.2.5 **AT&T Standard Drawings** are equipment bay layout and wiring drawings and are maintained on WoodDuck.

1.2.6 **American Wire Gauge (AWG):** Wire size standard commonly used in the U.S.

1.2.7 **Central Office (CO):** Carrier Communications Space containing switching and transport equipment.

1.2.8 **Direct Current (DC):** A form of electric power where the electric charge flows in one direction only.

1.2.9 **DESP:** Detail Engineering Service Provider. In this section, DESP refers to the provider of power detail engineering services, including DC power plant, UPS, inverter, and standby generator detail engineering service providers.

1.2.10 **Emergency Power Off (EPO):** EPO is a means to disconnect power to all electronic equipment, HVAC systems, batteries, and shall cause all required fire/smoke dampers to close in Non-Network Space under certain conditions by the AHJ.

1.2.11 **GES** – Global Engineering Support

1.2.12 **Global Network Field Operations (GNFO):** Local Electronic Technicians, Supervisors, etc.

1.2.13 **IDC** – Internet Data Center

1.2.14 **Installation Supplier** – provider of equipment installation services.

1.2.15 **IS** – Internet Services

1.2.16 **IS POP** is an Internet Services POP. Primary distinction between an IS POP and a general POP is that typically an IS POP is AT&T Partitioned Network Space located in a facility controlled by AT&T that is predominantly used for Carrier Communications Space. See also **POP**.

1.2.17 **Listed:** Per the NEC, “Listed” refers to equipment, materials, or services included in a list published by an organization – typically a Nationally Recognized Testing Laboratory (NRTL) - that is acceptable to the Authority Having Jurisdiction (AHJ) and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose. The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. In this section, “listed on the MML” will also be used to refer to AT&T approved minor materials.

1.2.18 **Manager – Engineering Implementation (MEI):** AT&T Engineer.

1.2.19 **Minor Materials List (MML):** Minor material approved products list found on the WoodDuck server. There are two lists applicable to power: AC Power MML, and DC Power and Grounding MML. The term MML will be used in this section to apply to both lists.

1.2.20 **Mobile Telephony Switching Office (MTSO):** Traditional wireless telecommunications equipment building containing switching and transport equipment.

1.2.21 **Nationally Recognized Testing Laboratory (NRTL):** Evaluates products or services and states that the equipment, material, or service either meets appropriate designated standards or has been tested and found suitable for a specified purpose. Underwriters Laboratory (UL) is an example of a NRTL.

1.2.22 **NEC**: National Electric Code, aka NFPA 70.

1.2.23 **NiCad**: Nickel – Cadmium, a type of battery technology.

1.2.24 **NTC** – National Technology Center.

1.2.25 **PBD** – Power Board. The Power Board is the primary distribution point of a DC power plant.

1.2.26 **POP** – Point of Presence. A point-of-presence (POP) is an artificial demarcation point or interface point between communications entities. The term, as used in this section, typically refers to AT&T Network Equipment Space in a facility controlled by another communications provider. It can also refer to AT&T Network Equipment Space in a facility controlled by a different legacy AT&T affiliate. See also **IS POP**.

1.2.27 **Secondary Power Distribution Unit (SPDU).** SPDU includes Battery Distribution Fuse Board (BDFB), Battery Distribution Circuit Breaker Board (BDCBB), mini-BDFB, micro-BDFB, Power Distribution Cabinet (commonly found in switching systems), Power Distribution Unit (PDU), and Fuse and Alarm Panel (FAP). In this section, "BDFB" will be used to refer to SPDUs that are designed to serve multiple bays of equipment and are typically sourced at a Power Board. "Bay mounted SPDU" will be used to refer to SPDUs typically designed to serve a single bay of equipment and are typically sourced from a BDFB.

1.2.28 **Uninterrupted Power Supply (UPS):** A standby plant typically consisting of rectifier(s), battery, inverter(s), isolation transformer, and AC distribution used to serve AC powered equipment.

1.2.29 **VHO** – Video Hub Office is a building containing video services equipment in Non-Network Space.

1.2.30 **VRLA:** Valve Regulated Lead Acid, a type of battery technology.

1.2.31 **WoodDuck:** AT&T server that is accessible to approved DESPs that houses AT&T Standard Drawings, Job Aids, and Approved Product Minor Material Lists.

1.3. Working Space

1.3.1 The following Working Space requirements shall be adhered to for all new AC panels, UPS, Inverters, and DC Power Plants, including battery stands. Measured at floor level, a minimum working space distance per Table 12-2 shall be maintained:

TABLE 12-2 – WORKING SPACE

150V or less		
From	To	Minimum Distance
AC Panels, UPS, Inverters, Battery Stands, Rectifier Bays, PBDs, Converters	Equipment Racks, columns, or walls	36 inches
151 – 600V		
From	To	Minimum Distance

AC Panels, UPS, Inverters, Battery Stands, Converters	Equipment Racks, columns, or walls	48 inches

1.3.2 Common AC electrical supply systems covered in the 0 to 150 volts to ground group include 120/240-volt, single-phase, 3-wire and 208Y/120-volt, 3-phase, 4-wire. Common AC electrical supply systems covered in the 151 to 600 volts to ground group include 240-volt, 3-phase, 3-wire; 480Y/277-volt, 3-phase, 4-wire; and 480-volt, 3-phase, 3-wire.

1.3.3 Working space does not include the rear or side(s) when the equipment is not built for rear or side access. Power equipment built for both front and rear access must adhere to the working space requirement for both the front and rear.

1.3.4 A single row battery stand parallel to a wall may have one side designated as non-working and be a minimum of 8 inches from the wall. Reference Figure 12-7.

1.3.5 The non-serviceable end of either a single row or double row battery stand may be placed perpendicular to the wall within 8 inches. Both the non-serviceable end and side of the single row rack parallel to the wall are considered non-working space. Reference Figure 12-7.

2. DC POWER PLANTS

2.1. General

2.1.1 This section covers requirements for battery / rectifier systems commonly referred to as DC power plants designed to primarily serve DC powered equipment. DC power plants may also be equipped with an inverter to serve protected AC powered equipment. The combination of rectifiers, batteries, and inverters into a packaged UPS to serve AC powered equipment is covered in sub-section 7 of section 12.

2.1.2 The major components of the DC power plant (see Figure 12-1) 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 (PBD) that houses the first overcurrent protection devices and the downstream power distribution network that feeds the secondary distribution.

2. Secondary Distribution is a collection of intermediate distribution circuits between primary distribution and the load equipment. It originates at a Secondary Power

Distribution Unit (SPDU, i.e., BDFB or other similar distribution points) and terminates at a specific equipment location.

2.1.3 **CONTROL VOLTAGE -** 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.

2.1.4 **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. Single Power Plant Architecture

2.2.1 The use of Single DC Power Plant is standard. Reference Figures 12-3 and 12-5.

2.2.2 Large single DC Power Plants are typically located at network sites with more than 1200 square feet of floor space. Small single DC Power Plants are typically located at network sites with less than 1200 square feet of floor space, or when deployed as a distributed architecture close to the equipment.

2.2.3 Primary distribution served via single power plants shall be designated gray.

2.2.4 Secondary distribution served via a single power plant shall be designated gray and powered from diverse primary distribution bays (preferred and required when available) or diverse primary distribution panels (permitted when diverse bays are not available).

2.2.5 Dual PDSCs are recommended for both large and small single DC power plants and are required for DC Power Plants with main plant shunts 5,000A or larger.

2.2.6 A single power plant serving red and blue BDFBs is no longer recognized as a "dual power plant" or "2N" architecture in AT&T. New BDFBs added to these single power plants shall be designated gray.

2.3. Dual Power Plant Architecture

2.3.1 The use of "2N" Dual DC Power Plants is not standard. Reference Figure 12-4.

2.3.2 Large Dual DC Power Plants are typically located at very large network sites.

2.3.3 Primary distribution shall be designated red or blue.

2.3.4 Secondary distribution shall be designated red or blue and powered from diverse primary distribution bays (preferred and required when available) or diverse primary distribution panels (permitted when diverse bays are not available).

2.3.5 Dual PDSCs per power plant are required for all dual power plants, as shown in Figure 12-4.

2.3.6 New Dual DC Power Plants may only be added upon approval of a waiver requesting "authorization to exceed the power standards." This waiver follows the standard waiver and escalation processes and can be filled out by the AT&T Power Planner at http://www.geolink.att.com/. This process documents the concrete economic and strategic data necessary to justify the placement of new Dual DC Power Plants.

2.3.7 Existing Dual DC Power Plants may continue to operate and grow until their capacity is exhausted.

a) On a going forward basis, the method of growing dual power plants shall be to serve the equipment A & B redundant loads from either a red BDFB, or blue BDFB, but not both, as shown in Figure 12-4.

1. SS7 equipment is exempt from this requirement and shall be powered from both red and blue BDFBs where dual power plants have been installed.

2.3.8 Dual power plants serving a single BDFB simultaneously is no longer recognized as a “dual power plant” or “2N” architecture in AT&T.

a) New BDFBs shall be added to either the red plant only, or the blue plant only, but not both simultaneously. New BDFBs shall not be powered from multiple power plants.

b) Existing BDFBs that are served via dual power plants simultaneously may be grown to exhaust. However, they shall not be used to serve any common return bus bar equipment. When these BDFBs are used to serve new equipment, the DESP must verify that the equipment A & B return bus bars are not common.

2.4. Rectifiers

2.4.1 Modern high density rectifier bays can horizontally exhaust significant heat. New power plant floor plan layouts and modernization of older technology rectifiers shall take into account location of flooded lead acid or VRLA batteries in relation to rectifier heat exhaust and general power room air flow. Whenever possible, rectifier bays shall be located to vent away from flooded lead acid or VRLA batteries.

a) When high density rectifier bays must be exhausted toward flooded lead acid or VRLA batteries, 48 inches of clearance must be provided. Sodium Nickel Chloride, NiCad and Lithium battery strings are exempt from this requirement.

2.5. Batteries

2.5.1 Flooded lead acid, Sodium Nickel Chloride, NiCad, or VRLA batteries are the preferred AT&T standard. Alternative battery technologies not listed on the AT&T Approved Products List shall require a one-time approval (OTA).

2.5.2 The DESP shall provide inter-cell connectors and associated hardware recommended by the battery manufacturer.

2.5.3 When engineering new battery plants, the DESP shall provide approved spill kits applicable for the battery technology deployed. NiCad spill kits are labeled bright orange and Lead Acid spill kits are labeled bright yellow. Sodium Nickel Chloride and Lithium batteries do not require spill kits.

DESP shall include a Specific Installation Supplier Note to ensure spill kits are left on-site.

2.5.4 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.

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

2.5.6 Cells of different manufacturers shall not be placed in the same string.

2.5.7 Battery strings of the same technology and float voltage, but of different manufacturers, may be placed in parallel.

2.5.8 Battery strings of different technologies and manufacturers, but the same float voltage, may be placed in parallel in one case only:

a) Flooded lead acid and lithium.

b) Due to temperature compensation / current limiting requirements, VRLA shall not be placed in parallel with any other technology, regardless of float voltage.

2.5.9 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.

2.5.10 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:

a) In zone 0 areas, a zone 0, 2, or 4 stand/cabinet is permitted.

b) In zones 1 or 2, a zone 2 or 4 stand/cabinet is permitted.

c) In zones 3 or 4, a zone 4 stand/cabinet is required.

d) Battery stands for round cell type flooded lead acid cells in low seismic risk locations (Zones 0, 1 & 2) shall be plastic composition as listed on the Approved Products List (APL). Battery stands for round type flooded lead acid cells in higher seismic risk locations (Zones 3 & 4) shall be metal construction as listed on the APL.

e) See ATT-TP76300 section I paragraph 2.5.27 for floor anchoring of battery stands.

f) Battery stands/cabinets that are reused in place may remain as is - i.e., the reused in place stand/cabinet is not required to be upgraded to the latest seismic zone requirements. Battery stands/ cabinets that are reused and moved (disassembled/reassembled) are required to be upgraded to the latest seismic zone requirements.

2.6. Flooded Lead Acid Batteries

2.6.1 Nominal -48V DC flooded lead acid battery strings contain 24 cells that shall have a string float voltage measured at 52.8V for optimum performance (2.20V per cell).

2.6.2 At the direction of local ATS, existing power plants equipped with flooded lead acid battery strings operating at a float voltage of 52.08V per string (2.17V per cell) shall be raised from 52.08V to 52.8V with the addition, removal, or replacement of battery string(s). Exception:

a) Existing power plants operating at a float voltage of 52.08V per string may continue to operate at this float voltage if authorized by local ATS.

2.6.3 Temperature compensated voltage control shall not be used for flooded lead acid battery applications.

2.6.4 The DESP shall provide a thermometer for each flooded lead acid battery string installed which may be included in a battery accessory kit.

2.7. NiCad Batteries

2.7.1 Nominal -48V DC NiCad battery strings contain 38 cells that shall have a string float voltage measured at 54.4V for optimum performance (1.43V per cell). Exception:

a) Ni-Cad float voltage may be reduced to 54.0V per string (1.42 volts per cell) if there is a conflict with high voltage alarms.

2.7.2 Recommended alarm points for the 54.4V float are: Very High Voltage – 56.0V; High Voltage – 55.5V; Low Voltage – 52.0V; Very Low Voltage – 48.0V.

2.7.3 Temperature compensated voltage control shall not be used for NiCad applications.

2.8. VRLA Batteries

2.8.1 Nominal -48V DC VRLA battery strings contain 24 cells that shall have a string float voltage measured at either 54V (2.25V per cell), or 52.8V (2.21V per cell), depending on the type of VRLA battery deployed.

2.8.2 Thermal runaway monitor and control features per Telcordia GR-1515-CORE built into the power plant controller shall be used to ensure that thermal runaway does not occur. Manufacturer recommendations shall be followed for placement and wiring of sensors.

a) Monitor feature typically measures variance of battery cell temperature from ambient. A shorted cell is a typical root cause of thermal runaway. A shorted cell does not produce a temperature rise. To ensure the shorted cell is not also the only measured cell, the temperature of two cells in every string shall be measured.

   Exception: 12V VRLA jars contain six cells; thus, only one jar per string is required to be monitored.

b) When a potential thermal runaway event is detected, the control feature typically lowers rectifier float voltage to limit current flow into the batteries, or to force a limited battery on discharge condition. Manufacturer recommended / factory default settings shall be used.

c) “Monitor Only” exception is no longer permitted for new or replacement VRLA batteries. If VRLA batteries are added to or replaced in a power plant whose controller is not GR-1515-CORE compliant, a new modern power plant controller that is GR-1515-CORE compliant is required.

d) Exception UPS systems: Many modern UPS systems mitigate thermal runaway by limiting recharge current to a value at or below that recommended by the VRLA battery manufacturer, in lieu of GR-1515-CORE methodology.

2.9. Alternative Battery Technologies

2.9.1 Alternative battery technologies deployed in trial applications shall be engineered per the manufacturer’s documentation.

2.10. Battery Cables

2.10.1 See ATT-TP76300 Section M Table M-3 for battery cable sizing per Amp-hour rating and discharge rate.

2.10.2 Where two or more new strings of flooded lead acid batteries are terminated or planned to be terminated on a centralized DC power plant, new battery strings shall be engineered with battery collector bars (aka termination or term bars), with larger conductors run back to the DC plant busbar. The dual purposes of this requirement are to 1) allow for more opportunity for cable reuse from the dc plant to the collector bars by limiting electrolyte creep to the drop cables and 2) allow for management of conductor length and resistance, to ensure equivalent voltage drop for parallel strings.

a) Exceptions:

1. Other battery chemistries (e.g., VRLA, NiCad, Sodium-Nickel, Lithium-ion).
2. When overhead busbar is run near each battery stand, where collector bars are integrated into the overhead busbar design.
3. Distributed architecture or other small DC plants, where the battery strings are located in close proximity to the plant.

b) Example: 2T2R battery stand serves (2) strings of 1680Ah flooded lead acid batteries. Without collector bars, a total of sixteen (16) #4/0 AWG cables must be run to the DC power plant charge bus (per ATT-TP-76300 Section M Table M-3, four (4) #4/0 AWG cables are required per pole per string). With a collector bar, the (4) #4/0 AWG cables are only required from the battery post to the collector bar. The cables from the bar to the discharge bus can be sized to carry the engineered discharge current per 0.25V one way voltage drop requirement set forth in paragraph 4.2.1.a).1.

2.10.3 Battery collector bar shall be properly sized for the required ampacity of the battery string(s) it serves. Battery collector bar provided for in standard build driver DP-BUS141 (ED-82025-50, Grp 3) is rated for 2600A and satisfies this requirement for all two string -48Vdc battery stands (4000Ah and below, 1 to 4 hour discharge rates, 1.84 MVPC and above).

2.10.4 Battery collector bars shall be positioned and installed in a manner where they do not obstruct the growth of the power plant. Typical location is a horizontal orientation above the beginning of the unfused cable rack over or near the battery stand.

2.10.5 When engineering the replacement of a string of batteries for a DC power plant not equipped with collector bars, the DESP shall:

a) Install new battery collector bars.

b) Install new cable drops from the battery collector bars to the batteries.

c) Reuse existing power cable from the DC power plant to the collector bar per sub-section 3.5. If the existing cable cannot be reused, then install new cable.

2.10.6 When engineering the replacement of a string of batteries equipped with collector bars, the DESP shall:

a) Install new cable drops from the battery collector bars to the batteries.

b) Reuse existing power cable from the DC power plant to the collector bars per sub-section 3.5. If the existing cable cannot be reused, then install new cable.

2.11. Battery Disconnect

2.11.1 This sub-section does not apply to Carrier Communications Space.

2.11.2 DC power plants engineered to serve Partitioned Network Space on raised floor shall include a means of disconnecting the batteries from its load.

2.11.3 As a first choice, DC power plants shall be ordered and equipped with battery disconnects for each battery string. Physical disconnection of the batteries at the power plant is considered the optimal choice.

2.11.4 Battery disconnect operation shall be alarmed as a Power Major alarm.

2.11.5 If the DC Power Plant is not capable of battery disconnection, a stand alone disconnect device may be deployed within the un-fused battery circuit. The battery string disconnect may be located at the battery stand or in a stand alone relay rack. It shall not be located in the cable rack. Refer to the MML for approved products.

2.12. Emergency Power Off (EPO)

2.12.1 This sub-section does not apply to Carrier Communications Space.

2.12.2 Partitioned Network Space in a raised floor environment installed in accordance with NFPA 75 and Article 645 of the NEC shall first consider an alternative means of selective depowering per AT&T practice CRE-50-32-02-ATP-1 *AC / DC Depowering and Emergency Power Off (EPO) Requirements and Procedures for Network and Technical Space Operations (TSO) Equipment*. Only if the AHJ rejects selective depowering should an EPO switch be considered. AT&T Engineer may contact GES - Common Systems for support.

2.12.3 When an EPO is required, all physical battery disconnects shall include the means of local and remote de-activation. The remote feature shall be engineered to collectively bring the sense leads to a common location. The EPO switch shall be placed at principle exit doors and comply with Article 645 of the NEC. Where required, EPO switches may be placed at the entrance or exits of the equipment rooms. Disconnects should be separated as much as practicable from light switches, fire alarm devices, etc.

2.12.4 Engineering and installation of the EPO switch shall be considered part of the DC Power Plant.

2.12.5 All service de-activation switches (EPO) shall be engineered and installed in a secure method.

a) The remote control leads shall be engineered in approved conduit.

b) Conduit shall be stenciled “EPO” once every 20 feet throughout the conduit run and within 5 feet of the terminations.

c) Shall be readily accessible but secure from casual or accidental shut down by including a transparent (polycarbonate) type face or door. Movement or opening or closing of the transparent door shall not have the ability to accidentally trigger the EPO. The door shall not require a key or any other locking device but may include a break away tie clasp, pull

pin or seal as a security measure. As an additional safety factor, the security door may include a local audible alarm indicating the pre-activation doors have been opened.

2.12.6 The EPO switch shall be NRTL listed.

2.12.7 The EPO switch shall be adequately labeled per NEC Article 645.

2.12.8 The EPO switch shall be a latching mechanical switch-type and must provide an indicator or lock in place to identify activation when depressed or operated.

2.12.9 The remote EPO switch only serves to disconnect the battery strings and shall not be engineered for reconnection purposes. Testing can occur during initial installation; however, no further testing shall occur once the system is activated.

2.12.10 If an AC EPO switch is part of the facility installation, full segregation between the AC and DC EPOs shall occur. Ganging or cohabitation of the AC and DC EPO's shall not occur.

2.12.11 Resetting the EPO switch shall not serve to restore the equipment but to simply restore the EPO switch itself. Battery disconnect switches will have to be manually reset using appropriate restoral methods.

3. DC POWER CONNECTIONS, BUS BAR, AND CABLE

3.1. Connections

3.1.1 All connectors, including transitional devices, shall be listed on the MML and constructed of tin plated copper.

a) Exception: Tin-Zinc coated connectors shall be used when connecting directly to posts or battery post termination plates of vented lead acid (VLA, aka "flooded") type batteries. Existing stock of lead coated connectors may be used until exhausted.

3.1.2 Connectors with inspection holes shall be used in all applications except battery posts and connector plates.

3.1.3 In-line reduction or (barrel) splices shall be used for all one-to-one power cable connections or reductions. The manufacturer provided clear heat shrink shall be installed per the manufacturer's instructions to cover the in-line reduction splice.

Exception: When a particular size of in-line reducer is not listed on the DC Minor Materials List, an H-Tap may be used.

H-Taps shall be Burndy or T&B and be a compression connector type with a clear cover that has an LOI of 28% or better and have a UL 94-V1 rating or better.

3.1.4 H-taps may be used for all one-to-many power cable transitions, such as transitioning from a single 750 MCM cable to two (2) #4/0 AWG cables.

3.1.5 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.

3.1.6 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.

3.1.7 On a going forward basis, NiCad battery connections shall be tin plated copper lugs without inspection holes for inside plant and nickel plated lugs and hardware for outside plant applications. If inspection holes were previously used, the hole shall be filled with Nox-Rust X-110.

3.1.8 The NiCad battery hardware supplied by Saft® shall be used, as standard metric threads are not compatible with Saft® NiCad battery connections.

3.1.9 All connectors #8 AWG and larger shall be two (2) hole crimp type lugs.

a) Exception: When the equipment design / specification drawing requires a single hole lug. Single hole lugs require an external tooth or split-ring lock washer between the bolt or screw head and the connector, except when connected to a fuse post where a flat washer is also required. See AT&T Standard Drawing ATT-P-05100-E on WoodDuck for assembly details.

3.1.10 When the equipment design permits #10 to #14 AWG terminations using either two (2) or single hole lugs, then they shall be used, as opposed to ring type connectors.

3.1.11 Connections made to screw type terminal blocks for #10 to #26 AWG shall be made using the correct color coded insulated ring-type connector listed on the MML. The proper size connector shall be used for the wire size being terminated as detailed in the manufacturer's specifications.

3.1.12 MML. The hardware shall be American National For all electrical connections, except for battery post connections and when the connecting hardware is not provided by the equipment manufacturer, the DESP shall provide Trivalent Chromium Plated SAE J429 - Grade 5 hardware that meets ASTM B117 & B633 specifications or Durium™ (or equivalent) silicon bronze finished bus bar joint, fastening and support bolts, nuts, washers, etc. the Coarse with a Class #2 fit.

3.1.13 Ferrous bolts, screws, nuts, washers, bus bar supports and clips shall be zinc-chromium or cadmium plated for non-electrical connections.

3.1.14 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).

3.2. Bus Bar

3.2.1 New power plant installations with plant shunt size of:

a) ≥ 6,000 amps shall use copper bus bars rather than cable,

b) < 6,000 amps may be either cabled or copper bus bar, based on the most economic solution.

3.2.2 Bus bars shall be sized per Table 12-5 (located at the end of this section) to prevent heating or exceeding the voltage drop requirement. Bus Bar ampacity listed in Table 12-5 is based

on the bus bar configured with an open space equal to the thickness of the bus bar between each bar in the assembly, and the orientation of the bus bar. The higher ampacity listed is associated with horizontal (length-wise) runs (edge facing the floor), and the lower ampacity is associated with vertical (length-wise) runs, bus bar assemblies with spacing less than the thickness of the bus bar, or orientation other than horizontal (length-wise). Bus Bar Voltage Drop 1-Way = resistance per foot @70C x amperes x feet.

3.2.3 All bus bars shall be 95% hard drawn copper, bare or tinned.

3.2.4 Existing plated or un-plated aluminum bus bars may be connected to copper bus bars. No new aluminum bars shall be used.

3.2.5 Aluminum bus bars and non-hardened copper bus bars shall not be tapped for fastening terminal lugs; through bolts shall be used.

3.2.6 When fastening bar to bar, bus bar clamps shall be used. A palnut or locknut shall be provided on each bus bar clamp bolt.

3.2.7 Exposed energized bus bar arrangements located outside of power equipment areas shall be protected with insulating polycarbonate covers. Exceptions:

a) In power rooms or in power board lineups, insulated covers are not required.

b) This requirement does not apply to battery return bus bars.

3.3. Approved Cable

3.3.1 All DC power cable (750 kcmil - #20 AWG) shall be listed on the MML.

3.3.2 Flexible class I, DC power cables listed on the MML are approved for use as follows:

a) Where sharp bends are necessary;

b) Within battery systems and rectifiers;

c) As drop cables;

d) Where equipment is subjected to shock and vibration; or

e) Where the savings in installation labor outweigh the additional material cost (e.g., due to long runs with multiple turns).

3.4. Battery and Battery Return Leads

3.4.1 The battery and battery return leads are a pair and shall be run closely coupled.

3.4.2 The battery return leads shall be approximately the length of its associated battery lead.

a) Exception: When the primary battery return lead is required to pass through the ground window, the battery return lead may be run separately.

3.4.3 Unfused battery conductors and their accompanying battery return leads shall be run on unpanned (ladder type) dedicated unfused power cable rack.

a) The rack shall be designated “UNFUSED POWER ONLY”.

3.4.4 Primary battery and battery return leads shall be run on unpanned (ladder-type) dedicated primary power cable rack.

a) Exception: Primary leads to a dedicated bay mounted high current SPDU may utilize secondary power cable rack within the equipment line-up.

3.4.5 Secondary power leads shall be run on dedicated secondary power cable racks. On the first Transport addition to a new BDFB, the DESP shall add the dedicated secondary cable rack. If dedicated secondary power cable rack is not possible:

a) Secondary power leads may be run on existing non-dedicated cable rack, which already contain transport cable. In these cases, secondary power cable shall be segregated from transport cable as best as possible.

b) Within 10 feet of an existing SPDU / BDFB that was not engineered with a dedicated secondary power cable rack, secondary power cable may be run on existing dedicated primary power cable rack.

3.4.6 Run all leads in continuous lengths. Transitional devices shall only be used when no other solutions (such as narrow tongue lugs) are applicable. Exceptions:

a) Where it is necessary to reduce cable size at the equipment ends (aka “drops”).

b) Where a manufacturer’s proprietary power cable (aka pigtail) is provided as part of the equipment assembly. When that cable is the same size as the secondary feed cable from the BDFB, a barrel (butt) splice is allowed.

c) Drop cable length shall be limited to ten (10) feet preferred, fifteen (15) feet maximum.

d) Drop cable size must satisfy ampacity requirements of Table 12-3.

3.5. DC Power Cable Reuse

3.5.1 DC power wire and cable shall only be authorized for reuse by the AT&T Engineer or ATS representative subject to the following limitations due to safety and fire hazard concerns associated with the longevity of the cable insulation:

a) DC power cable that is less than 15 years old may be reused, subject to conditions d), e), and g).

b) DC Power cable that is between 15 and 25 years old can only be reused if physically inspected, tested if necessary, and approved by the local ATS representative, and subject to conditions d), e), and g).

c) DC 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 reused.

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

e) Reused dc power cable shall not be extended via an inline splice or other transitional device in order to reach equipment farther from the power source.

Exception: A reducing splice and drop cable, within the distance limitations described in paragraph 3.4.7(b), are permitted.

f) The last fifteen (15) feet of in-service power cable (regardless of age) may be reused for a live in-service cutover. The re-used cable stubs shall have two layers of tape applied from the termination to the H-Tap.

1. The preferred method of transitioning secondary loads to a new power source is to provide new power cable end to end. De-energizing a secondary redundant load during the maintenance window should be considered. If de-energizing a secondary redundant load is deemed too great a risk to service, then 3.5.1 (f) is permitted. De-energizing a primary load is not recommended.

2. H-tap shall be placed horizontally in the cable rack.

g) Reused dc power cable shall be reused in the same AT&T facility and engineered raceway where it was originally installed. DC power cable shall not be reused from a cable mining operation or sourced from a salvaged dc power cable supplier.

3.6. DC Power Cable Ampacity

3.6.1 DC Power Cable shall be sized to satisfy the ampacity limits specified in Table 12-3.

TABLE 12-3 - CABLE AMPACITY

WIRE SIZE		AMPACITY
GAUGE	CM	(COPPER)
14	4110	15*
12	6530	20*
10	10380	30*
8	16510	55
WIRE SIZE		**AMPACITY**
GAUGE	**CM**	**(COPPER)**
6	26250	75
4	41470	95
2	66370	130
1	83690	145
0	105600	170
00	133100	195
0000	211600	260
350 MCM	350000	350
500 MCM	500000	430
750 MCM	750000	535

Source: 2017 National Electrical Code (NEC), Chapter 3 Table 310-15(B)(16) and ATIS-0600028.2016, DC Power Wire and Cable for Telecommunications Power Systems

Note: 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 affected by items such as insulation rating.

* Maximum fuse size

3.7. Vertical Power Cable Runs

3.7.1 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&T Engineer.

3.7.2 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.

3.8. Cable Color

3.8.1 Single power plant / single BDFB architecture is designated via gray color power cable. Dual power plant / dual BDFB architecture is designated via red and blue color power cable. Factory or shop wired bays must employ consistent wiring color scheme (e.g., red / black, see Table 12-4), regardless of the serving BDFB.

Exception: When a bay/cabinet mounted piece of equipment comes with a power harness from the OEM that does not match the required Red (BATT) and Black (RTN) listed in Table 4, then the installation vendor shall apply at least 1" of either red/black tape or red/black heat shrink to the power leads at the fuse panel end to ensure that the power leads match Table 12-4 requirements.

3.8.2 Where dual power plant / dual BDFB architecture is applicable, the AT&T Power Capacity Planner will designate the BDFB as either "red", "blue", or "gray" in the appropriate capacity planning database. Where there is no designation in the database, it is assumed to be "gray". The DESP shall engineer the color power cable or wire in accordance with Table 12-4.

TABLE 12-4 – DC POWER CABLE COLOR

BDFB / SPDU designation	PBD to BDFB BATT and RTN	BDFB to FAP BATT and RTN	PBD or BDFB direct to equipment BATT and RTN	FAP to equipment:	
				BATT	RTN
Gray	Gray	Gray	Gray	Red	Black
Red	Red	Red	Red	Red	Black
Blue	Blue	Blue	Blue	Red	Black

Note: Approved power cable #14 AWG to 750 MCM is offered in gray, red, blue, green, and black. Approved power wire #16 - #20 AWG is offered in red, green, and charcoal. Charcoal is acceptable as either gray or black. When blue #16 - #20 AWG power wire is

required, it is acceptable to use charcoal wire with either a minimum 1" wide blue heat shrink or blue electrical tape affixed on each end.

4. DC POWER DISTRIBUTION

4.1. Power Distribution Sources

4.1.1 In equipment space larger than 1200 square feet, all new Transport installations require Secondary Distribution and shall be provisioned with a BDFB if one does not exist.

4.1.2 BDFBs shall not be located in the traditional power plant footprint.

4.1.3 Each BDFB, deployed in either single or dual plant configurations, shall have a minimum of (but not limited to) two (2) load buses, designated A and B.

4.1.4 Primary A & B feeds to a SPDU / BDFB shall be sourced from separate primary distribution panels, either in separate PBD bays, or within the same PBD bay, as shown in Figure 12-3. Exceptions:

a) Where only one primary distribution panel has spare capacity, and there is no space to add another panel, A & B feeds may be sourced from the same panel to defer a PBD bay addition.

4.1.5 Fuses are preferred for primary and secondary power distribution. Circuit breakers may be used for circuits ≤ 400 amps. Fuses are required for circuits ≥ 401 amps. Only protection devices listed on the MML shall be used.

4.1.6 The primary feeds to individual, full size BDFB loads shall be a minimum of 400 amps and a maximum of 800 amps. The maximum supply feed is limited by the bus bar ampacity in the BDFB; in some locations, it may be governed by regulatory policy (e.g., Illinois).

4.1.7 Equipment designed with multiple loads shall be assigned to different primary load supplies on the BDFB unless specified otherwise in the AT&T standard equipment drawing(s) or when only 2 primary loads are available.

4.1.8 A and B battery return leads from the same equipment may be connected to the same BDFB battery external return bus bar position. Reference ATT-P-05100-E Fig 3.

4.1.9 The largest fuse to be used in a SPDU shall be 150 amps.

4.1.10 In a SPDU, a single bus bar shall not be powered from parallel source circuits. For example, a single bus bar in a BDFB cannot be powered from two (2) 400A fuses at the PBD simultaneously.

4.1.11 When the SPDU manufacturer recommends 45 or 90 degree lugs, only factory manufactured 45 or 90 degree lugs shall be used. Field modification of straight lugs is prohibited.

4.1.12 An SPDU located on one floor shall not be used to serve equipment located on another floor, unless required by the equipment manufacturer's documentation.

4.1.13 New BDFBs shall utilize external return bus bars. Exceptions:

a) Where overhead congestion prevents placement of the external return bus bar in compliance with Figure 12-2.

b) Bottom fed BDFB's where primary power cables enter via the bottom of the BDFB and secondary cables enter the BDFB from overhead. Internal return bars may be utilized if there is restricted cable clearance inside the BDFB for the number and size of primary cables (e.g., six load BDFB with multiple 750MCMs per polarity per load).

1. In this case, a cable reduction (drop) of up to twenty (20) feet in length is permitted for the primary return cables to allow use of an internal return bar assembly. Voltage drop, ampacity, and transition device requirements described elsewhere in this section shall be satisfied.

2. Where BDFBs are installed in a raised floor environment with secondary cables being fed into the top of the BDFB, the external return bars shall not be installed under the floor.

4.1.14 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, at the cable rack level or higher, based on space availability. See Figure 12-2 for BDFB external battery return bar placement.

4.1.15 BDFBs equipped with two or more external return bus bar assemblies within ± 20% equivalent engineered voltage drop shall electrically connect the external return bus bar assemblies with a single 750 MCM power cable. Exception:

a) A single BDFB powered from dual power plants shall not electrically connect multiple external return bus bar assemblies.

4.1.16 The use of early vintage miscellaneous fuse bays shall be discontinued as bay mounted SPDUs are deployed.

4.1.17 SPDUs shall be fused at their source with a fuse size not to exceed the maximum rating of the SPDU's bus bar.

4.1.18 Every SPDU shall be fed individually from the power source 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).

4.1.19 **BAY MOUNTED SPDU.** Data and transport bays shall be equipped with a SPDU located in the upper portion of the bay for local fault clearing and isolation at the equipment to prevent faults from affecting other equipment that may be served by a BDFB or Power Board power source. The bay mounted SPDU shall also provide remote and visual bay power alarm indications to facilitate equipment service restoral in the event of a fault and/or equipment failure. Exceptions:

a) Some manufacturers design local fault clearing and isolation into the equipment power distribution unit (PDU), which can satisfy the bay mounted SPDU requirement, if the same type of protection device is used at the BDFB, and if the protection device is field

replaceable. The AT&T standard equipment drawing will specify if the PDU qualifies to serve as the bay mounted SPDU. When a PDU serves as the bay mounted SPDU, electrical coordination must be maintained. Table 12-6 describes when a PDU may serve as the bay mounted SPDU (also refer to Figures 12-8A and 12-8B):

TABLE 12-6 – WHEN AN EQUIPMENT PDU MAY SERVE AS THE BAY MOUNTED SPDU

If PDU is e/w:	And if BDFB is e/w:	Bay mounted SPDU
Fuses	Fuses (BDFB)	Not Required
Circuit Breakers	Circuit Breakers (BDCBB)	Not Required
None	Either	Required

b) Bay mounted SPDUs may serve equipment outside the bay as long as it is within 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.

c) A bay mounted high current SPDU satisfies this requirement.

4.1.20 **HIGH CURRENT SPDU.** Some equipment may require the use of a dedicated high current SPDU (defined as ≥ 150A protection device), as specified by the AT&T standard equipment drawing. A high current SPDU may receive primary power feeds directly from the Power Board, instead of secondary power feeds from a BDFB. The use of dedicated high current SPDU shall utilize a calculated voltage drop from the Power Board (e.g., 0.5V PBD to BDFB + 0.25V BDFB to SPDU = 0.75V one way, reference TP76400 section 12 subsection 4.2).

a) If the high current SPDU cannot be physically located in the same relay rack as the served equipment, it may be located in a bay in close proximity – in the same lineup and within line-of-sight - to the served equipment. In these cases, the high current SPDU is subject to the same voltage drop calculations and labeling requirements as a normal BDFB (see TP76300 section L).

4.1.21 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 may be up to (≤) #2 AWG.

b) Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect may be up to (≤) #2/0 AWG.

4.1.22 Secondary power distribution cables larger than #2/0 AWG shall not be engineered into the interior of a BDFB.

a) For internal and external return bar BDFBs, the return lead may be engineered with a cable reduction and transition device.

4.1.23 Equipment with multiple secondary loads (i.e. “A”, “B”, “C”, etc.):

a) Shall be assigned to different primary load supplies on the BDFB.

b) Shall maintain separate primary fuse integrity throughout the circuit.

c) Equipment loads designated “A1”, “A2”, or “1A”, “2A” may be assigned to the same primary load supply on the BDFB.

4.1.24 SPDU frame alarm indicator lamp ABS shall be sourced internally (within the SPDU) using manufacturer in-line fuse kit, per SPDU manufacturer instructions.

4.1.25 **BRIDGING CLIPS**. Some equipment powering configurations benefit from the use of bridging or strapping clips on the input of 4, 6, and 8 way demarcation SPDUs, as shown in Figure 12-9. This configuration will minimize BDFB fuse position consumption and reduce cable congestion. The clips will “bridge” the input to two (2) distribution fuses, enabling one (1) larger feed to provide power for two (2) branch circuits. In no case shall the single input exceed the bus capacity of the SPDU. Refer to the specific AT&T standard equipment drawing for guidance. Bridging clip kits are specific to the SPDU manufacturer and will not fit on another manufacturer’s panel.

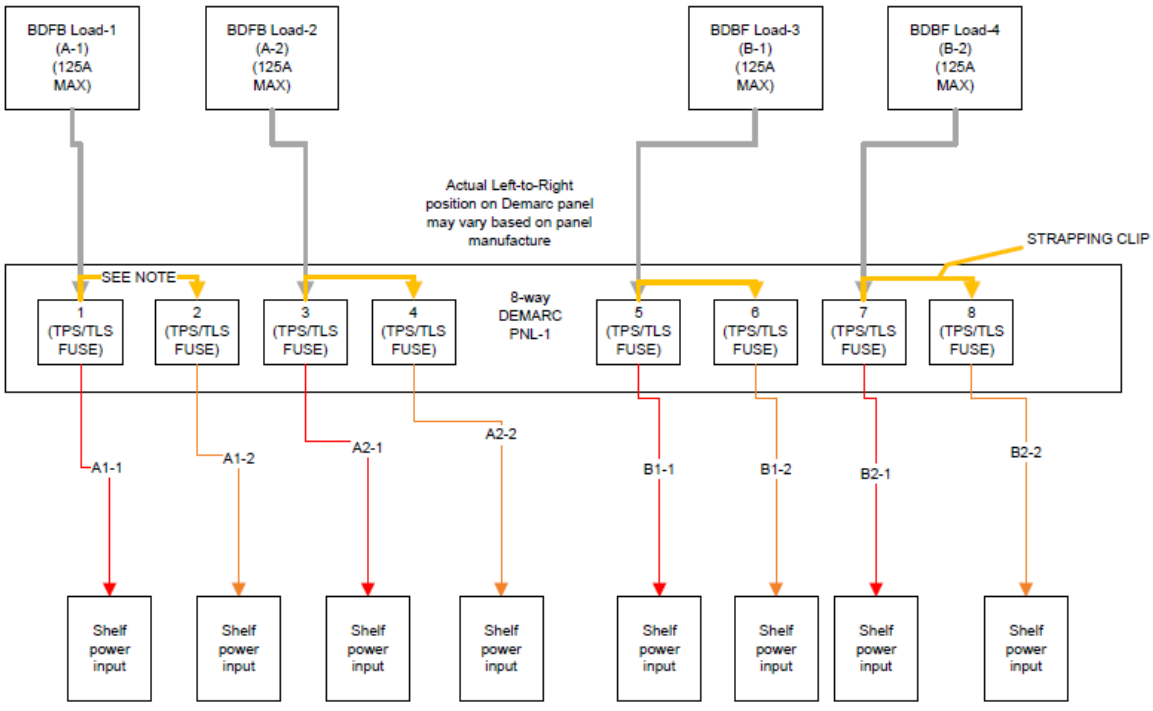


FIGURE 12-9 – PERMITTED USE OF BRIDGING CLIPS

4.1.26 **HEAT RAMPS**. Heat ramps shall be required directly beneath an SPDU when equipment is placed in a closed cabinet environment (four post cabinet) where blanking panels are used to seal the front to facilitate front to rear cooling. Note: In an open frame environment (two post rack), heat ramps may be placed – but are never required - in locations where significant air flow warrant their prudent placement.

4.2. Voltage Drop

4.2.1 The maximum allowable one way voltage drop from batteries to the served equipment shall be determined by the type of site, power plant, and equipment end-voltage.

a) Standard configuration offices with an equipment end-voltage of 42.6V DC or equipment loads served by single power plants shall have up to a maximum 1 volt, 1-way voltage drop, as follows: (Reference WoodDuck drawing ATT-P-05410-E)

1. 0.25V, 1-way maximum allowance from the batteries to the power plant;
2. 0.5V, 1-way maximum primary power cabling voltage drop from the power board to the BDFB or SPDU;
3. 0.25V, 1-way minimum secondary power cabling voltage drop from the BDFB or SPDU to the equipment bay fuse panel or equipment.

b) Sites with dual power plants that serve equipment exclusively with an equipment 40V or lower end-voltage shall have up to a maximum 1.75 volt, 1-way voltage drop as follows: (Reference WoodDuck drawing ATT-P-05411-E)

1. 0.25V, 1-way maximum allowance from the batteries to the power plant;
2. 1V, 1-way maximum primary power cabling voltage drop from the power board to the BDFB;
3. 0.5V, 1-way minimum secondary power cabling voltage drop from the BDFB or SPDU to the equipment bay fuse panel or equipment load.
4. Dual power plants engineered with a voltage drop design for 40V end-voltage equipment cannot be used to support equipment with a higher end-voltage, e.g., 42.6V.

4.2.2 The .25V, 1-way voltage drop from the batteries to the power plant is an established value to make up for losses in drops from the top of the bay to the equipment.

4.2.3 1-way voltage drop under the maximum allowed for the primary power cabling from the power board to the BDFB or SPDU may be added to and used with the secondary power cabling voltage drop allowance from the BDFB or SPDU to the equipment, not to exceed the overall 1-way voltage drop requirement.

4.2.4 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.

4.2.5 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.

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

V = (11.1 X Amps X Feet) / CM
CM = (11.1 X Amps X Feet) / V

Where:

V = Allowable voltage drop 1-way (see paragraph 4.2.1)

Amps = 2/3 (.667) of Power Board Supply Fuse Size

Feet = 1-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.

4.2.7 The voltage drop power cabling of a BDFB shall be calculated using L-2X = 2/3 of the protection device size. The individual actual load shall not exceed 50% of the supply protection device. Typical values are shown in Table 12-7.

TABLE 12-7 – BDFB MAXIMUM ALLOWED ACTUAL LOAD AND L-2X PER TYPICAL FUSE SIZE

Fuse Size	Max Actual Load Allowed per A or B feed:	Calculate voltage drop w/ L-2X of:
600A	300A	400A
400A	200A	268A
225A	113A	150A

4.2.8 Parallel conductors are sometimes required to meet current rating and/or voltage drop requirements. When parallel conductors are required, they shall be the same:

a) length,

b) gauge,

c) follow the same path,

d) run continuous in compliance with paragraph 3.4.6, and

e) be terminated in the same manner and area. Parallel conductors may be terminated back to back at the same bus bar position.

Exception: If termination space for all parallel conductors is not available, paralleled conductors may be joined electrically to form a single conductor prior to the termination

point, thereby reducing the number and size of wires to a combination that is suitable for termination in the available space.

4.2.9 The following formula applies for the calculation of secondary power cable voltage drop from a BDFB to equipment load:

V = (11.1 X Amps X Feet) / CM
CM = (11.1 X Amps X Feet) / V

Where:

V = Allowable voltage drop 1-way (see paragraph 4.2.1)

Amps = 2/3 (.667 of L-2X drain (or L-2 drain if L-2X is not published)

Feet = 1-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.

4.3. Protection Devices

4.3.1 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 has failed and the remaining circuit is at 42.6V at the equipment.

4.3.2 **PROTECTION DEVICE SIZE** shall be determined by the following formula:

a) Multiply the List 2X load by 1.25 (125%) and, if necessary, round up to the next standard protection device size. L-2X may be the equipment L-2X or the cumulative L-2X of multiple equipment for a bay mounted SPDU. The following example calculation assumes a bay mounted SPDU that serves a 4 equipment shelf layout (↑ is used to denote “rounded up to next standard size”):

TABLE 12-8 – PROTECTION DEVICE SIZING EXAMPLE

Equipment L-2X per shelf...	Bay mounted SPDU fuse...	L-2X for the bay SPDU is...	BDFB fuse...
13 A	20 A (16.25A ↑)	52 A (13A * 4)	70 A (65A ↑)

b) A circuit breaker with a 100% rating may be sized by rounding List 2X drain up to the next standard circuit breaker size (e.g., if L-2X drain = 79 A, then an 80 A circuit breaker may be used).

c) This formula does not apply to primary protection devices serving a BDFB, as described in paragraph 4.2.7 (in these cases, protection device size is selected by the Power Planner, as opposed to calculated by the DESP).

d) Once the protection device is sized, the DESP shall ensure the ampacity of the cable exceeds the rating of the protection device per Table 12-3. 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 ampacity.

4.3.3 **PROTECTION DEVICE COORDINATION**. Primary and secondary circuit protection devices shall be coordinated to prevent premature operation of primary fuses caused by a fault event on secondary circuits. This coordination allows for circuit protection closest to the fault to operate first. When calculating individual circuit design, there shall be a minimum 20% difference in size between one point of circuit protection and the next, unless specified otherwise in the AT&T standard equipment drawing.

a) This requirement does not apply to protection devices integral to the network element that act as an on/off switch, such as shown in Table 12-9:

TABLE 12-9 – PROTECTION DEVICE COORDINATION EXAMPLE

Equipment with an integral circuit breaker sized at...	Bay mounted SPDU protection device may be...	BDFB protection device minimum size is...
30 A	30 A	40 A (36A ↑)

4.3.4 Telecommunications DC fuses operate much faster than DC circuit breakers. For this reason, circuit breakers should not be protected by fuses, as the 20% coordination rule in paragraph 4.3.3 is no longer valid. Figures 12-8(a) through 12-8(d) shall be followed for fuse and circuit breaker coordination.

a) Figure 12-8(a) reflects the going forward AT&T standard to utilize fuses at the PBD, BDFB, and bay mounted SPDU for Transport / Data equipment.

b) Figure 12-8(b) reflects permitted fuse and circuit breaker combinations that economically utilize existing power assets / legacy architectures.

c) Figure 12-8(c) reflects the AT&T standard options for switching systems. Note the applicable option is dependent on the switching system manufacturer design.

d) Figure 12-8(d) describes fuse and circuit breaker combinations that are prohibited.

4.3.5 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.

4.3.6 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 Standard Drawing. Approved telecommunications power fuses shall be listed on the AT&T MML.

4.3.7 All non-cartridge type fuses and circuit breakers shall be AC rated for AC circuits and DC rated for DC circuits.

4.3.8 Renewable link and H type fuses shall not be used.

4.3.9 All DC fuses shall be provided with a blown fuse indicator connected to an alarm circuit and indicating lamp within the bay.

4.3.10 All telecommunications DC power (e.g. TELPOWER® or TELCOM®) fuse blocks equipped with a GMT alarm fuse circuit shall be equipped with a 0.18 amp fuse. Alarm pilot fuse applications other than the 0.18 amp GMT shall be 1/2 amp. (35 or 70 type).

4.3.11 Dummy fuses shall be provided at all exposed, vacant fuse positions. (This includes GMT and 70 type). It is not necessary to provide dummy fuses for enclosed cartridge type fuse blocks.

4.3.12 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.

4.3.13 Only manufacturer approved fuse reducers may be used for exposed face fuse positions. In all other cases fuse reducers shall not be used.

4.3.14 Primary fuses or circuit breakers, 400 amps and larger, shall be equipped with shunts and monitored via the power plant monitor / controller. All BDFB primary loads shall be monitored, including legacy primary BDFB loads less than 400A.

Exception: Primary circuits serving traditional Class 4 or 5 Switching Systems do not require monitoring (e.g., #4ESS, #5ESS, #5RSM, DMS-10, DMS-100, DMS-200, EWSD).

4.3.15 SPDUs that are designed to accommodate either fuse blocks or circuit breakers may be equipped with either fuse blocks or circuit breakers, but not both, in the same panel. Fuse blocks shall be used per Figure 12-8(a) except where network elements are provisioned with a bay mounted circuit breaker panel (PDU) and circuit breakers must be used in the BDCBB. Reference the middle configuration of Figure 12-8(b).

5. CONVERTERS (DC/DC)

5.1. Introduction

5.1.1 This unit covers DC/DC converters, which transform the DC output of a battery plant to other DC voltages. The converter output voltage may be higher, lower, or at a different polarity than the input voltage. In some special cases, where ground or transient isolation is required, the output voltage may be the same as the input.

5.1.2 DC/DC converters that are placed for equipment isolation should be physically located in close proximity to the served equipment.

5.2. Requirements

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

5.2.2 Individual battery returns shall be run for battery discharge circuits.

5.2.3 Converter plants shall be fed from battery plants, not other converter plants

5.2.4 Each converter in a plant shall be individually fused

5.2.5 Converter plants shall be configured and maintained at N+1.

6. RING, TONE, AND CADENCE PLANTS

6.1. General

6.1.1 This section provides general information regarding:

a) Ringing systems currently in use in switching and transmission systems;

b) The various call progress tones furnished by ringing plants;

c) General information on ring plant sizing.

6.1.2 Going forward, ring cadence and voltage of any type should be generated within the equipment

6.1.3 In Stored Program Control System (SPCS) offices, ringing, call progression tones, precision tones, Dual Tone Multi-Frequency (DTMF), dial tone, audible ringing tone, high tone and low tone, are provided by the switch. A separate ringing plant shall be provided for all non-switched services such as Foreign Exchange (FX), ring down, Interexchange Carrier (IC) special ringing requirement, metallic facility, etc.

6.2. Ringing Systems

6.2.1 Some non-switched circuits will require a ringing supply. Generally, non-switched circuits only require 20 Hz, AC/DC Superimposed ringing. Ringing supplies for non-switched circuit shall be separate from the ringing supply for the SPCS equipment.

6.2.2 The major ringing and tone components of the plant shall be provided with a redundant configuration.

6.3. Residual Ringing Plant - Ringing and Tone Distribution

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

6.3.2 The DESP shall verify with the AT&T Engineer that adequate fusing is provided on each ringing supply path when adding new equipment fed by the ringing supply.

6.3.3 Ringing plant distribution fuses shall not be multipled to more than one fuse bay.

7. INVERTERS (DC/AC) AND UNINTERRUPTABLE POWER SYSTEMS (UPS)

7.1. General

7.1.1 If the AC load is identified as “protected”, it shall be fed from a PPSC from an inverter plant or Uninterruptible Power System (UPS).

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

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

7.2. Inverter

7.2.1 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.

7.2.2 The preferred location for the Inverter systems > 10kVA is in the Power Area, in close proximity to the DC power source. Inverter systems ≤ 10kVA may be powered via a SPDU, and thus can be located close to the served equipment.

7.2.3 A Static Transfer Switch (STS) and Maintenance Bypass Switch (MBS) shall be provided for inverter systems > 10kVA that supporting critical service-affecting network load. New inverter designs may include the STS function internally, without the need for a component called an STS. Small inverter systems ≤ 10kVA may not be designed with STS or MBS capability. These small inverter systems may support ancillary network support systems that are not customer affecting. Small inverter systems ≤ 10kVA without STS or MBS shall be deployed in a 2N redundant architecture when they support service-affecting network loads.

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

7.2.5 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.

7.3. UPS

7.3.1 UPS systems shall be deployed in a 2N configuration or a Modular/Scalable UPS deployed in an N+1 configuration. All UPS units shall be on-line, double conversion, containing their own internal or external Maintenance Bypass Switch.

7.3.2 On the input side, it is required that UPS systems be fed by a dedicated Primary (Rectifier) and a Secondary (By-Pass) circuit. On the output side, UPS systems shall be wired out to their own PPSC's.

7.3.3 Distribution configurations shall be based on load requirements.

a) In 2N UPS configurations, Dual powered equipment loads shall be directly fed from both UPS A and UPS B PPSC's.

b) In N+1 configurations, Dual powered equipment loads shall be fed from both diverse PPSC's.

c) Single load equipment may be fed from either PPSC in both 2N and N+1 configurations.

7.3.4 UPS systems shall have their own dedicated (not shared) battery back-up.

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

7.3.6 In installations with VRLA batteries, thermal runaway monitoring and control per paragraph 2.8.2 shall be included.

7.3.7 UPS loads shall be monitored.

7.3.8 In dual architecture, neither UPS shall be loaded beyond 40% actual measured load. DESP shall notify the AT&T Engineer if actual load is found to exceed 35%.

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

7.3.10 Grounding of the UPS shall be in accordance with the manufacturer's specifications, NEC, and Section 13 of ATT-TP-76400.

7.4. UPS Battery Applications

7.4.1 Flooded lead acid and VRLA batteries are preferred in UPS applications.

7.4.2 UPS Batteries approved for use are listed on the AT&T Common Systems Power Approved Products list.

7.4.3 DC wiring shall be sized to meet manufacturers' specifications for ampacity (based on the appropriate battery discharge rate) and loop voltage drop loss between the battery and the charger or inverter.

7.4.4 Preferred method is to install DC power cable on open cable racks or trays. Conduit may be used if both the battery and return cables are run in the same conduit.

7.4.5 Battery and battery stand requirements described in TP76400 section 12 subsections 2.5 through 2.9 are applicable to UPS installations, with obvious exception of float voltage.

8. AC POWER DISTRIBUTION (DUPLICATE OF ATT-TP-76300 SECTION M-8)

8.1. General

8.1.1 All AC wiring, conduit, power strips, and duplex receptacles shall be listed on the AT&T AC Power Distribution Minor Material List, meet the requirements of the National Electric Code (NEC), and be listed by a Nationally Recognized Testing Laboratory (NRTL).

8.2. AC Panels

8.2.1 A **Power Service Cabinet (PSC)** distributes AC power to non-essential loads such as computer terminals, comfort lighting, and general purpose duplex appliance outlets. It is powered from a House Service Board or larger capacity PSC. Depending on their purpose and building electrical system, PSCs may or may not be served via the essential bus.

8.2.2 A **Power Distribution Service Cabinet (PDSC)** distributes AC power to essential loads such as DC Power Plants, Inverters or UPSs. It is powered from the essential bus protected by the standby AC plant. PDSCs exclusively serve essential loads.

8.2.3 A **Protected Power Service Cabinet** (PPSC) distributes AC power to protected AC loads. It is powered from AC Power Plants such as Inverters or UPSs.

PPSC is an AT&T defined term. These AC panel boards are given a variety of names by manufacturers such as Power Distribution Unit (PDU), Remote Power Panel (RPP) and Computer Load Switchboard.

8.2.4 AC test receptacle and equipment aisle lighting branch circuits shall be provided from a PSC that is served via the essential bus (i.e., protected by the standby AC plant).

8.2.5 Circuit Breaker additions to an existing PDSC shall be validated for the existence of available capacity. Additional distribution circuit breakers shall not be added to a PDSC where measured demand exceeds 80% of the primary supply circuit breaker. Installation Suppliers shall notify the responsible AT&T representative when the 80% levels have been met or exceeded.

8.2.6 The term “PPSC” shall be included in the labeled identification of all PPSCs located on the load distribution side of a UPS or inverter.

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

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

8.2.9 Work on AC circuits shall be performed de-energized whenever it is possible to do so without causing a service interruption. De-energizing a redundant circuit as part of an approved, planned SMOP during the maintenance window to perform work safely is not considered a service interruption. Work on energized circuits must be performed in compliance with Section B Protective Personnel Clothing and Equipment (PPE) requirements.

8.2.10 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a “**Warning - Working on Circuit**” tag at the AC source. The tag shall only be removed by the person performing the work. (a.k.a. “Lock-out, Tag-out”).

8.3. AC Cable and Power Cords

8.3.1 AC power cords shall be used to extend power from AC outlets located under raised floors to AC powered equipment, outlet strips or PDUs. The data processing system shall be permitted to be connected to a branch circuit by the following listed means:

a) Flexible cord and attachment plug cap not to exceed 80 feet (24.4 m) in AT&T Controlled Environment locations.

When run on dedicated horizontal raceways, flexible cords and cables are limited to a maximum 50 ft. distance within the raceway. The vertical portion of the flexible cord or cable may be 15 ft. on either end, for a maximum flexible cord or cable length of 80 ft.

b) Cord set assembly. Where run on concrete deck below a raised floor or in dedicated overhead raceway designed for AC power use, cord set assembly shall be supported and secured within 18 inches of terminations. Cords shall be secured at intervals not to exceed 4½ feet and protected against physical damage. Where securing is not practical, cord set assemblies may be bundled and tethered.

8.3.2 All AC conductors, except AC power cords or Metallic Clad (MC) cable, shall be enclosed in a metal conduit, metal raceway or metal trough.

8.3.3 Metallic Clad (Type MC) cable is strictly limited to the following AC branch circuit applications:

a) Factory installed within bay end guards.

b) Within bay end-guards and bases to connect light switches or bay test receptacles. MC cable does not have a distance limitation in this application, but shall not have excessive slack or be coiled within the bay end-guard or base.

1. Type MC cable shall not be installed within a cable rack or raceway containing any other cable.

2. Where Type MC cable exits the end guard, it shall be limited to up to 3 feet maximum vertically and/or up to 3 feet maximum horizontally to the conduit junction box or panel.

3. Where Type MC cable is secured horizontally under a cable rack, it shall be sewn to the cable rack at every cross strap.

4. Factory connectorized Type MC whips using snap on style compression fittings included in the AT&T AC Power MML are approved for use in these applications.

8.3.4 Type MC cable is prohibited for use in all other Network applications (feeder and branch circuit) not explicitly described above. e.g.,

a) It is prohibited for use between a PDSC and a rectifier or rectifier shelf or bay.

b) It is prohibited for use between a UPS or inverter fed PPSC and an AC powered network element, regardless of overhead distribution or under a raised floor.

8.3.5 Type MC cable may be used for certain building support applications outside the scope of ATT-TP-76300 (e.g., elevators, pumps, and motors).

8.3.6 Type AC cable is not approved in AT&T and is prohibited for all applications.

8.3.7 AC wire and cable shall be exclusively copper conductors.

8.3.8 A wire nut shall be used to cover the exposed end of all un-terminated AC conductors.

8.3.9 Wire nuts shall meet UL-94 V-1 oxygen index rating or better.

8.4 Conduit

8.4.1 Conduit shall be supported with material designed for the support of conduit, such as U-bolts, conduit clamps, conduit straps, etc. Hose clamps, cord, nylon tie wraps, and other similar material shall not be used to support conduit.

8.4.2 AC conduit troughs shall be mounted and secured per the NEC and local municipality.

8.4.3 Rigid Metal Conduit (RMC), Intermediate Metal Conduit (IMC), Electrical Metallic Tubing (EMT), Liquidtight Flexible Metal Conduit (LFMC), or Metallic Clad (MC) Cable shall be utilized for all AC circuits.

8.4.4 Non-metallic materials shall not be used as AC raceways.

8.4.5 RMC, IMC, and EMT shall be supported at intervals not to exceed 10 feet and shall be secured within 3 feet of each outlet box, junction box, device box, cabinet, conduit body, or other termination. Reference ATT-TP-76400 Figure 12-9 when using EMT with appliance outlet boxes.

8.4.6 Standard compression fittings are required. "Rain-tight" or "wet location" (per UL 514B, typically designated "RT") compression fittings are not required. Set screw fittings are prohibited.

8.4.7 LFMC is permitted where flexibility is necessary after installation. LFMC shall be supported and secured at intervals not to exceed 4½ feet and shall be securely fastened within 1 foot of each box, cabinet, conduit body, or other termination. Securely fastened boxes, cabinets, and conduit bodies are considered supports. Specific applications where LFMC is permitted:

a) All final AC powered equipment connections (LFMC whips are 6 feet maximum).

b) At a rectifier bay (6 feet maximum).

c) Conduit transitions from walls or columns in Seismic Zones 3 & 4 (3 feet maximum).

d) All final AC lighting fixture connections (6 feet maximum).

e) Within bay end-guards and bases to connect light switches or bay test receptacles. LFMC does not have a distance limitation in this application, but shall not have excessive slack or be coiled within the bay end-guard or base.

f) Between the power trough and the power strip or between the PDU and the AC powered equipment being served (6 feet maximum whip).

g) Between the junction box and engine/alternator set.

h) Under a raised floor, directly on the concrete deck in an established engineered pathway, or off the floor secured to the pedestals. In an existing line-up where existing LFMC is run unsecured and securing new runs is not practical, then bundling or tethering new runs may be permitted.

i) In dedicated overhead raceway designed for AC power use.

8.4.8 When conduit (including LFMC) must be secured over equipment areas, it may be secured to cable rack stringers or auxiliary framing using conduit mounting brackets designed for this purpose. No conduit shall be run on cable racks with other cable.

8.4.9 All conduit raceways, regardless of type, shall have an Equipment Grounding conductor installed with the feeder or branch circuit conductors, sized in accordance with Table 250.122 in the NEC.

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

8.4.11 The Installation Supplier shall install bushings, nipples or connectors to protect wiring. Exposed AC conductors shall not be in contact with edges of metal frameworks, boxes or raceways (e.g. running through a knockout).

8.4.12 Enclosure support shall be as follows:

a) Enclosures without devices or luminaires may be supported by RMC, IMC, or EMT if the conduit is connected to the enclosure by threaded hubs, the threaded conduits enter the box on two or more sides, and are supported within 3 ft of the enclosure.

b) Enclosures with devices or luminaires may be supported by RMC, IMC, or EMT if the conduit is connected to the enclosure by threaded hubs, the threaded conduits enter the box on two or more sides, and are supported within 1½ feet of the enclosure.

c) Enclosures with threaded entries supported by only one RMC, IMC, or EMT raceway shall be secured to building structure or framing.

d) Enclosures with knock outs shall be secured to building structure or framing.

e) Enclosures shall not be supported by LFMC.

8.5. Appliance Outlets/ AC Test Receptacles

8.5.1 AC duplex test receptacles shall be provided in equipment line-ups in AT&T Technical Space. This includes Carrier Communications Space as well as Global Technical Space. Permitted exceptions where ac test receptacles are not required within the equipment line-up include:

a) In non-AT&T controlled facilities where the facility owner provides the test receptacles (e.g., POPs, collocation cages, customer premises).

b) In facilities or equipment rooms < 500 sq ft that are equipped with existing test receptacles in the walls, spaced a maximum of 12 feet apart.

8.5.2 In Stored Program Control System (SPCS) equipment, the duplex test receptacles will be provided as an integral part of the switching system in the maintenance area (e.g., MAP, MCC) only. Any appliance outlets added to any SPCS equipment shall meet all interface and grounding requirements of that SPCS equipment.

8.5.3 New equipment lineups outside of a SPCS shall utilize the Overhead Design in the front aisle, as shown in Figure #12-9. The Overhead Design provides for a single branch circuit using standard ½" EMT conduit and metal outlet boxes installed in the middle 2/3rd's of the center of the front aisle, to serve both equipment line-ups.

8.5.4 EMT conduit and outlet boxes shall be secured mechanically (e.g., supported from below aux framing) in accordance with NEC Articles 314 and 358, and TP76400 section 12 paragraph 8.4.5. Figure #12-9 summarizes NEC Article 310 and 358 distance requirements for securing EMT conduit and outlet boxes, including the preferred method of using a combination box/conduit hanger.

8.5.5 The first outlet box shall be required when the first relay rack / equipment bay / cabinet is installed in either of the two facing equipment line-ups. The first outlet box shall be located within 6 feet of the first bay or cabinet, measured from the center of the first bay or cabinet to the closest edge of the outlet box, linearly along the length of the aisle. The intent is to allow flexibility for use of existing aux framing for support of conduit and outlet boxes.

8.5.6 Spacing of outlet boxes shall be at approximately 10 feet intervals, corresponding to the use of standard 10 ft sections of EMT conduit between outlet boxes. The intent is to not cut a standard 10 ft section of EMT conduit to extend the Overhead Design, unless site conditions dictate, such as the need to change the elevation of the conduit run, or to avoid an obstruction. Where obstructions occur, the maximum distance allowed between outlet boxes (edge to edge, measured linearly along the length of the aisle) shall be 12 feet.

8.5.7 Extensions of the Overhead Design shall be required when an equipment bay or cabinet is added - in either of the two facing aisles - where the center of the bay or cabinet is more than 6 feet from the edge of the closest existing outlet box, measured linearly along the length of the aisle.

8.5.8 When positioning aisle lighting with the Overhead Design for ac test receptacles, the position of the aisle lighting takes precedence. Conduit and outlet boxes shall be located to one side or the other of the aisle lighting, and not interfere with extension and placement of future aisle lighting fixtures.

8.5.9 In the Overhead Design, test receptacles and outlet boxes shall face down toward the floor, and be accessible.

8.5.10 Test receptacles shall not be deployed in the rear aisles of equipment line-ups.

8.5.11 Extensions of existing legacy overhead designs shall follow Figure #12-9 and paragraphs 8.5.3 through 8.5.10. If two overhead conduit runs exist (one for each equipment line-up), then only one shall be extended, transitioning to the center 2/3rds of the front aisle, to serve the growth of both line-ups.

8.5.12 Extensions of existing legacy Bottom of the Bay Designs shall transition to the Overhead Design, as shown in Figure #12-10. The transition riser shall utilize either LFMC or a Jacketed Type MC whip, and can be routed using the cable duct of the last equipped bay in the line-up. While vertical in the bay cable duct, nine cord may be used to tether the LFMC or Jacketed Type MC whip, if no means of securing is available. At the overhead junction box, transition riser must be secured per paragraph 8.4.7 (within 1 ft of the box). If two branch circuits exist (one for each equipment line-up), then only one shall be extended, transitioning to the center 2/3rds of the front aisle, to serve the growth of both line-ups.

Exceptions:

a) In 9’ and 11’6” line-ups, the Bottom of the Bay Design shown in Figure #12-6 shall be followed, pursuant to paragraph 8.5.12 (c).

b) Where obstructions do not allow for transition to the Overhead Design, the Bottom of the Bay Design shown in Figure #12-6 shall be followed, pursuant to paragraph 8.5.12(c).

c) When only one (1) duplex test receptacle is required to finish the line-up, transition to the Overhead Design is not required, and the last duplex test receptacle shall be omitted, even if the 12 ft maximum distance limitation will be exceeded.

8.5.13 AC test receptacles shall be mounted flush and equipped with a metal cover plate.

8.5.14 The Installation Supplier shall ensure that the grounding and polarity of AC test receptacles are correct, verified and recorded on the test record.

8.5.15 The DESP shall provide the installer specific work items for placement of appliance outlets, outlet boxes, conduit, J-boxes, and risers.

8.5.16 Isolated ground receptacles (orange) shall not be installed.

8.5.17 Appliance outlets shall be NEMA rated per Table 12-10:

TABLE 12-10 – NEMA APPLIANCE OUTLET RATINGS

AC Voltage	Ampere Rating	General Purpose / AC Test Receptacle	Receptacle Serving Multi-Outlet Strip	Multi-Outlet Strip Output
120V	15A	5-15R	L5-15R	L5-15R or 5-15R
120V	20A	5-20R	L5-20R	L5-20R or 5-20R
120V	30A	N/A	L5-30R	L5-30R
208-240V	15A	N/A	L6-15R	L6-15R or 6-15R
208-240V	20A	N/A	L6-20R	L6-20R or 6-20R
208-240V	30A	N/A	L6-30R	L6-30R

8.5.18 New 120Vac test receptacle branch circuits shall be 20A circuits using NEMA 5-20R duplex receptacles and #12 AWG wiring. Extensions of existing 120Vac test receptacle branch circuits shall utilize #12 AWG wiring and NEMA 5-20R receptacles, unless it can be verified that the branch circuit is protected by a 15A overcurrent protection device (where #14 AWG wire and NEMA 5-15R receptacles can be used).

8.5.19 The maximum number of duplex appliance outlets allowed on a general purpose / AC test receptacle branch circuit shall not exceed the number specified in Table 12-11:

TABLE 12-11 – MAXIMUM ALLOWED DUPLEX OUTLETS PER BRANCH CIRCUIT

	All Technical Space
Ampere Rating	**Max # Duplex Outlets**
15A	30
20A	40

Note: Calculation based on a 60 VA load for a typical test set per duplex output (NEC 220.14(A)).

8.6. Intra-Rack Strips

8.6.1 Rack Power Distribution Units (Rack PDUs, aka Multi-outlet Power Strips) serve as the final point of AC distribution typically found in the corded AC powered equipment cabinet / rack. Input to the Rack PDU may be a single phase or three phase ac circuit. Output receptacles are typically single phase NEMA or IEC 60320 standard receptacles. The combination of

NEMA or IEC input and outputs will be dependent on site specific distribution and equipment requirements.

8.6.2 Rack PDU shall be securely fastened to the cabinet / rack structure per manufacturer's recommendations. Rack PDU's shall be placed so as not to impede the removal of equipment from the rack. Depending on the configuration, the Rack PDU may be specified as horizontal or vertical mounting.

8.6.3 Separate A&B Rack PDUs shall be provided.

a) Exception: When the equipment cabinet / rack is designed exclusively for single power feed equipment.

8.6.4 Each Rack PDU shall be engineered with a dedicated branch supply circuit sourced from a PPSC (aka RPP or overhead busway) and load managed, not to exceed 80% of the supply circuit breaker rating.

8.6.5 All Rack PDUs that utilize factory installed input cords shall be either IEC 60309 pin and sleeve or NEMA twist-lock style, depending on site specific distribution.

8.6.6 Equipment shall be plugged into assigned output receptacles, per the equipment standard drawing, if applicable.

8.6.7 All IEC 60320 C13/14 or C19/20 cords plugged into IEC 60320 C13/14 or C19/20 Rack PDU receptacles shall have compatible retention clips installed.

a) Exception: Existing Rack PDUs equipped with button-type locking receptacles.

8.6.8 All NEMA cords and Rack PDUs that power network equipment shall be a twist-lock type connector that matches the voltage and ampacity of the equipment served (e.g., L5-15, L5-20, and L5-30 for 120Vac; L6-15, L6-20, and L6-30 for 208-240Vac).

8.6.9 NEMA cords and Rack PDUs that power test or maintenance equipment may utilize straight blade connectors, dependent on the equipment (e.g., computer monitor cord with IEC 60320 C13/C14 on the monitor end and NEMA 5-15P on the Rack PDU end).

8.6.10 Standard size IEC 60320 cords shall be listed and either #16 AWG IEC 60320 C13/C14 (limited to 10A), #14 AWG IEC 60320 C13/14 (limited to 15A), or #12 AWG IEC 60320 C19/C20 (limited to 20A).

a) Warning-1: #18 AWG and smaller IEC C13/C14 cords are prohibited for network equipment. #18 AWG IEC C13/14 cords provided by the manufacturer for test or maintenance equipment are permitted (e.g., computer monitor).

b) Warning-2: IEC 60320 C13/14 standard is rated for 10A and utilizes #16 AWG wiring. However, some high wattage power supplies utilize UL listed IEC 60320 C13/14 connectors rated at 15A and require #14 AWG cords. Power supplies that require a 15A rated cord shall not be powered with a #16 AWG IEC 60320 C13/14 cord.

c) Warning-3: #14 AWG and smaller IEC C19/C20 cords are prohibited for network equipment.

8.6.11 Equipment that utilize standard NEMA plugs and receptacles shall utilize listed matching NEMA cords.

8.6.12 When a three phase ac input circuit is utilized, the group responsible for powering up the cabinet / rack equipment shall review the Rack PDU's LED readout (or management tools) to verify the loads are balanced (evenly distributed across the electrical phases, defined as within ± 20% of the middle single phase value). If the loads are not distributed equally across the three electrical phases, appropriate AT&T personnel shall be notified.

8.6.13 The group responsible for powering up the cabinet / rack equipment shall review the Rack PDU's LED readout (or management tools) to verify the overall load does not exceed 80% of the Rack PDU capacity. Verification must include when the A Rack PDU is the sole source of power, and when the B Rack PDU is the sole source of power. If the load exceeds 80% of Rack PDU capacity, appropriate AT&T personnel shall be notified.

8.7. Branch Circuits

8.7.1 An Alternating Current Equipment Ground (ACEG) lead shall be provided with each AC branch circuit. When a conduit contains more than one AC branch circuit, one ACEG lead may be used if properly sized per the NEC.

8.7.2 AC test receptacles and equipment aisle lighting shall be placed on separate branch circuits.

8.7.3 When adding new branch circuits, or extending existing circuits, the Installation Supplier shall verify that no additional connection is made between the grounded conductor neutral (white wire) and the required green wire grounding conductor (ACEG).

8.7.4 Branch circuit conductors serving appliance outlets shall be sized per Table 12-12:

TABLE 12-12 – MINIMUM CONDUCTOR SIZE PER BRANCH CIRCUIT

Ampere Rating	Conductor Size
15 Amp	#14 AWG
20 Amp	#12 AWG
30 Amp	#10 AWG
50 Amp	#8 AMG
60 Amp	#6 AMG

8.7.5 From the panel source to the end appliance outlet, the one way length of the branch circuit shall not exceed the limits specified in Table 12-13:

TABLE 12-13 – MAXIMUM CONDUCTOR LENGTH PER BRANCH CIRCUIT

Ampere Rating	Conductor Size	AC Test Receptacles	Corded AC Equipment	
			120V	208-240V
15A	#14 AWG	125 ft.	45 ft.	80 ft.
15A	#12 AWG	200 ft.	75 ft.	130 ft.
20A	#12 AWG	150 ft.	55 ft.	100 ft.
20A	#10 AWG	N/A	90 ft.	155 ft.
30A	#10 AWG	N/A	60 ft.	100 ft.
30A	#8 AWG	N/A	95 ft.	165 ft.
50A	#8 AWG	N/A	55 ft.	100 ft.
50A	#6 AWG	N/A	90 ft.	160 ft.
60A	#6 AWG	N/A	75 ft.	130 ft.
60A	#4 AWG	N/A	120 ft.	210 ft.

Note: Calculations based on 5% voltage drop and 50% load for AC Test Receptacles and 3% voltage drop and 80% load for corded AC power service affecting equipment.
Formula: L = (CM * VD) / (2* 12.9 * I)

8.8. AC Circuit Protection Devices

8.8.1 Circuit breakers shall be sized and coordinated with system components to ensure proper isolation of feeders due to faults or overloads. Breakers shall be sized to allow all charge units to operate at full output during battery recharge.

8.8.2 Thermal breakers are acceptable for most applications and may be used unless prohibited by the equipment manufacturer's documentation.

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

8.8.4 Circuit design shall not include circuit protection devices engineered in parallel.

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

8.8.6 Circuit protection devices installed in PPSC distribution cabinets shall be specified as bolt-on type rather than the clip-on type.

FIGURE 12-1 – TYPICAL POWER SYSTEM

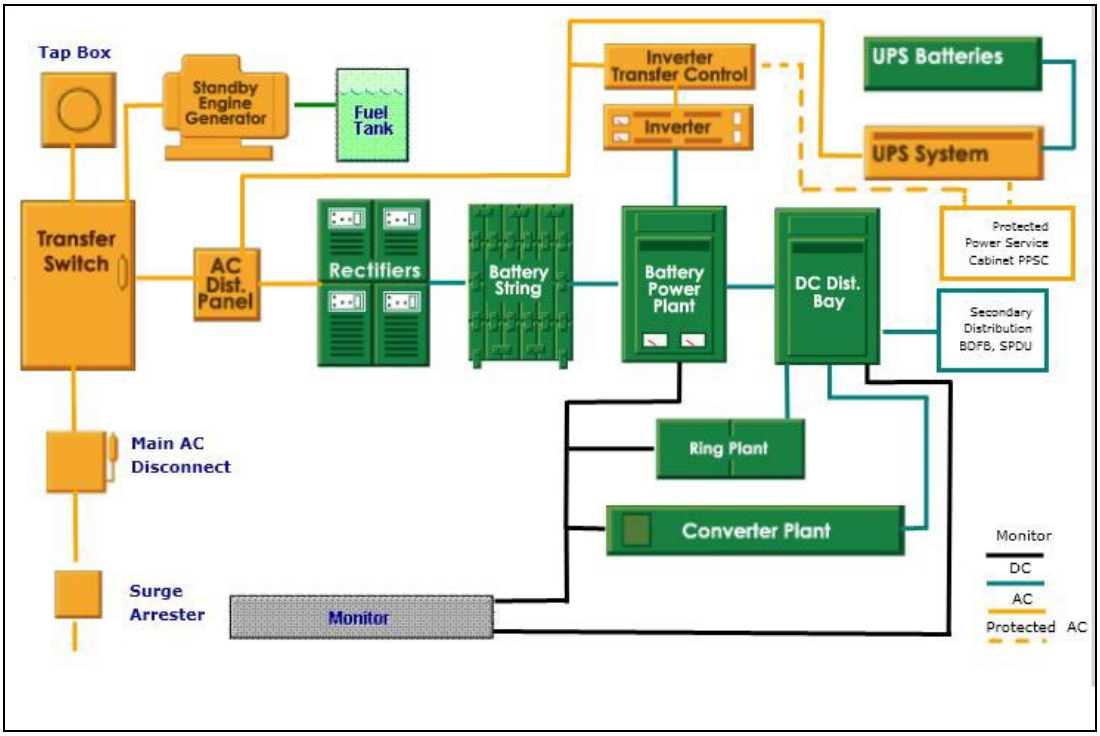


FIGURE 12-2 – BDFB EXTERNAL BATTERY RETURN BAR PLACEMENT (TOP VIEWS)

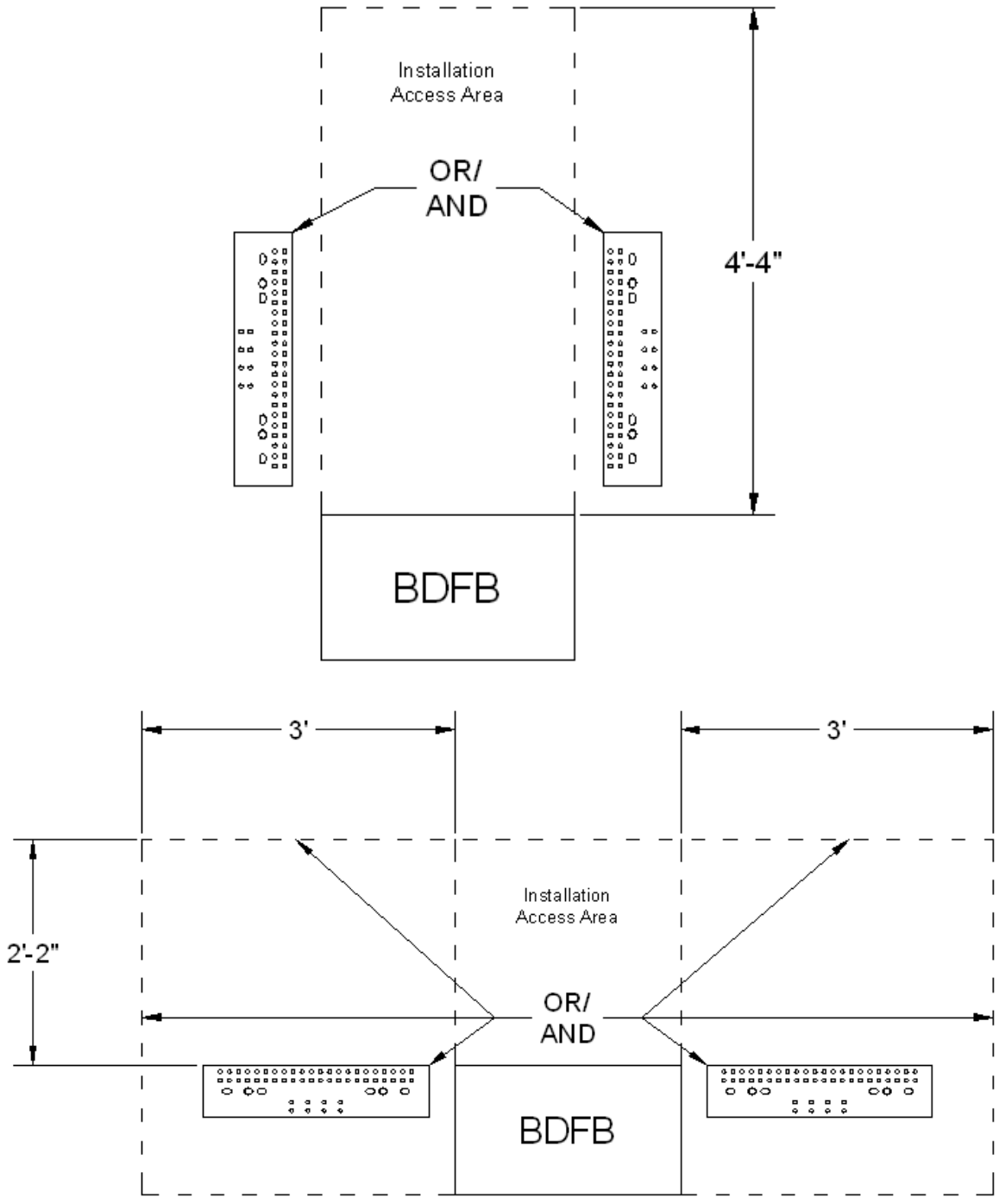


Figure 12-3 Single Power Plant Architecture – Standard Design

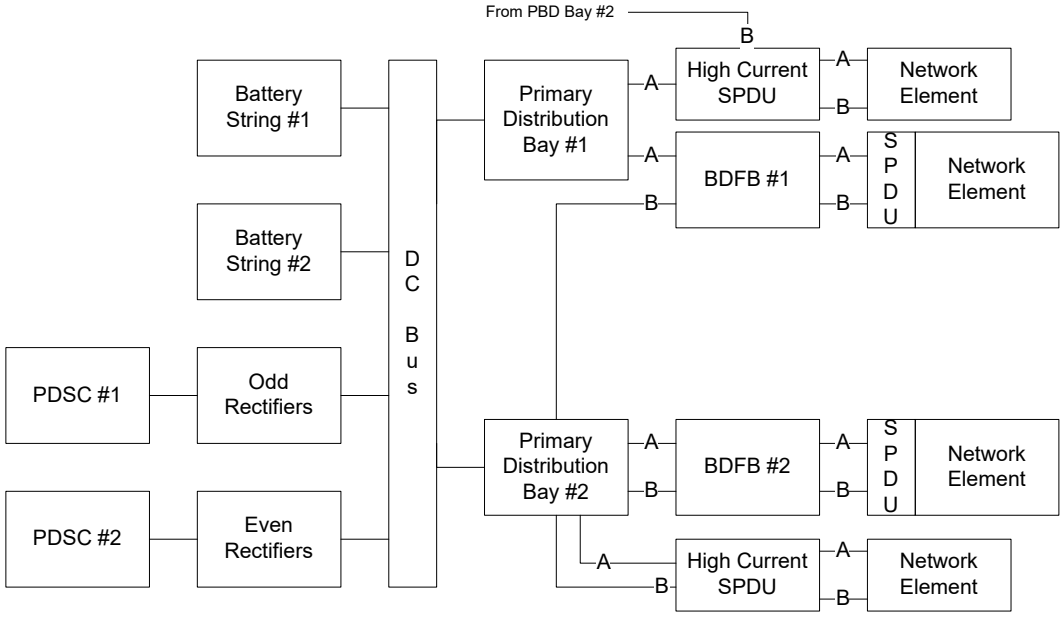
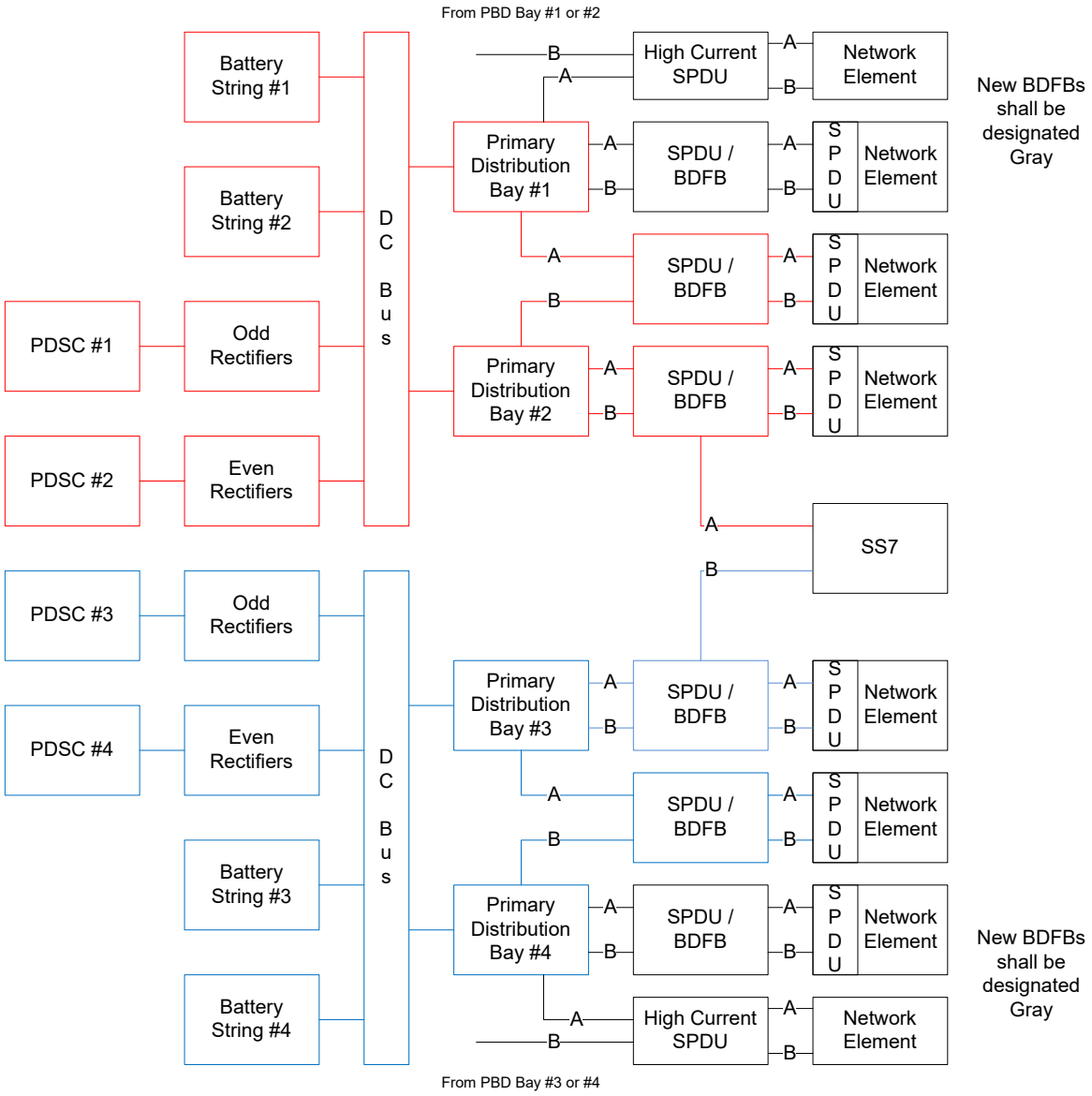


Figure 12-4 Dual Power Plant Architecture – Non Standard Design



Note: High Current SPDU option and bay mounted SPDUs are not shown for clarity of the figure.

Figure 12-5 Single Plant Architecture – Small Sites typically < 1200 sq ft

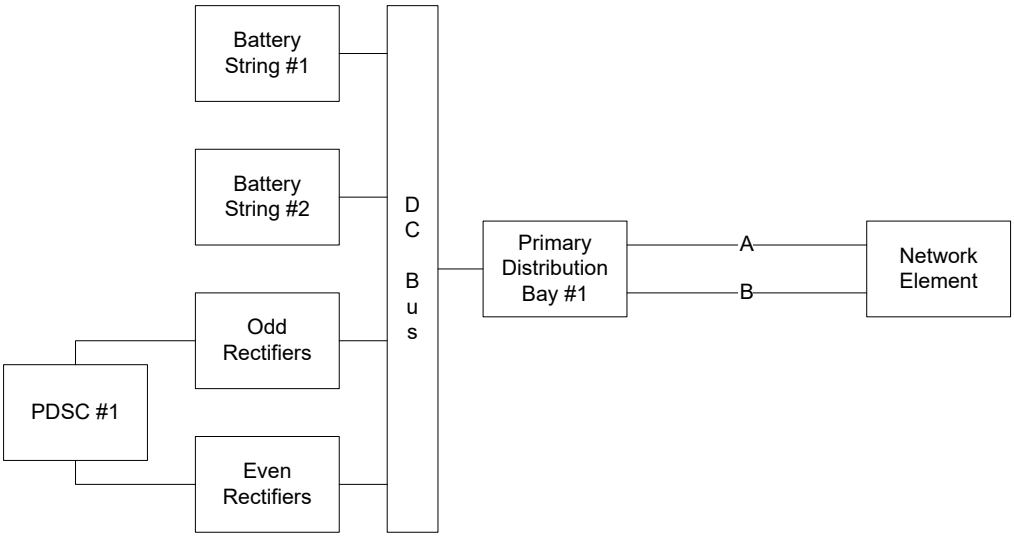
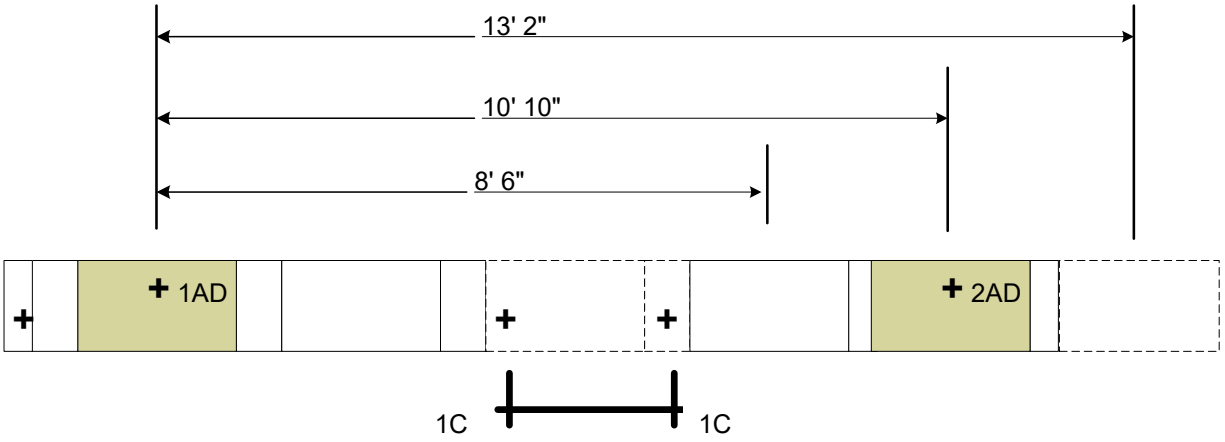


Figure 12-6 Example AC Test Receptacle Spacing
(LEGACY BOTTOM OF THE BAY DESIGN)



Notes:

- 4th bay in this line-up does not require an AC test receptacle.
- 5th bay in this line-up does require an AC test receptacle because the 6th bay will exceed the 12' maximum spacing requirement.
- AC risers and conduit bridge to span 3rd bay gap are not required until the 5th bay is added.

Figure 12-7 Working Space for Battery Stands

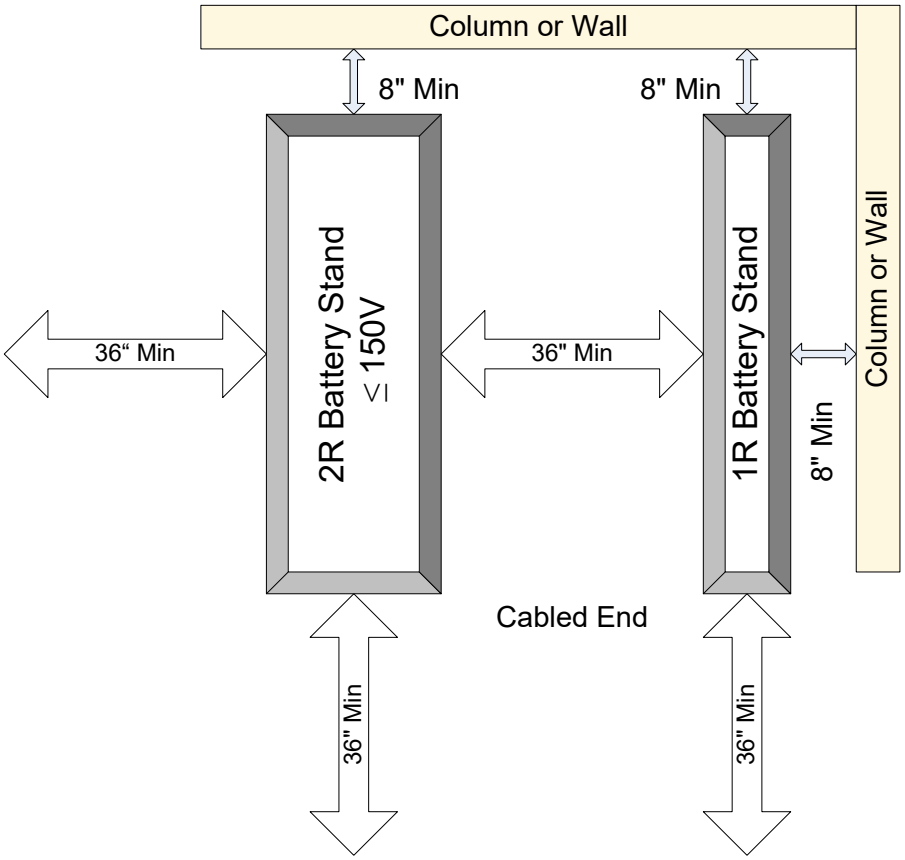


FIGURE 12-8(a) – TRANSPORT / DATA EQUIPMENT

FUSE AND CIRCUIT BREAKER COORDINATION

PREFERRED STANDARD

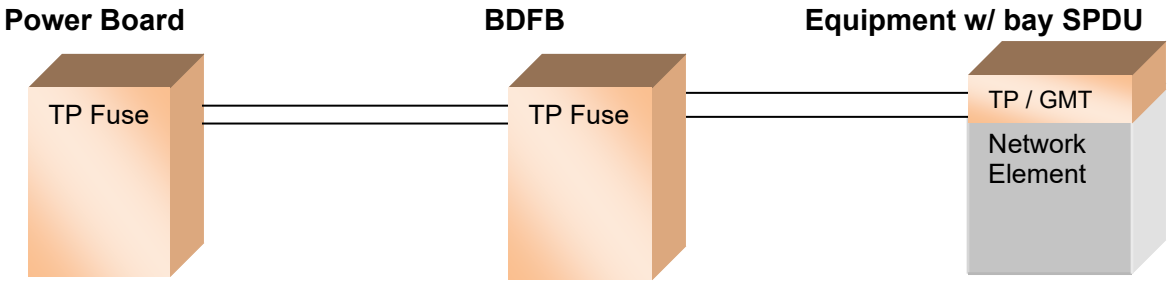


FIGURE 12-8(b) – TRANSPORT / DATA EQUIPMENT

FUSE AND CIRCUIT BREAKER COORDINATION

PERMITTED FOR <u>EXISTING</u> ASSETS / LEGACY ARCHITECTURE

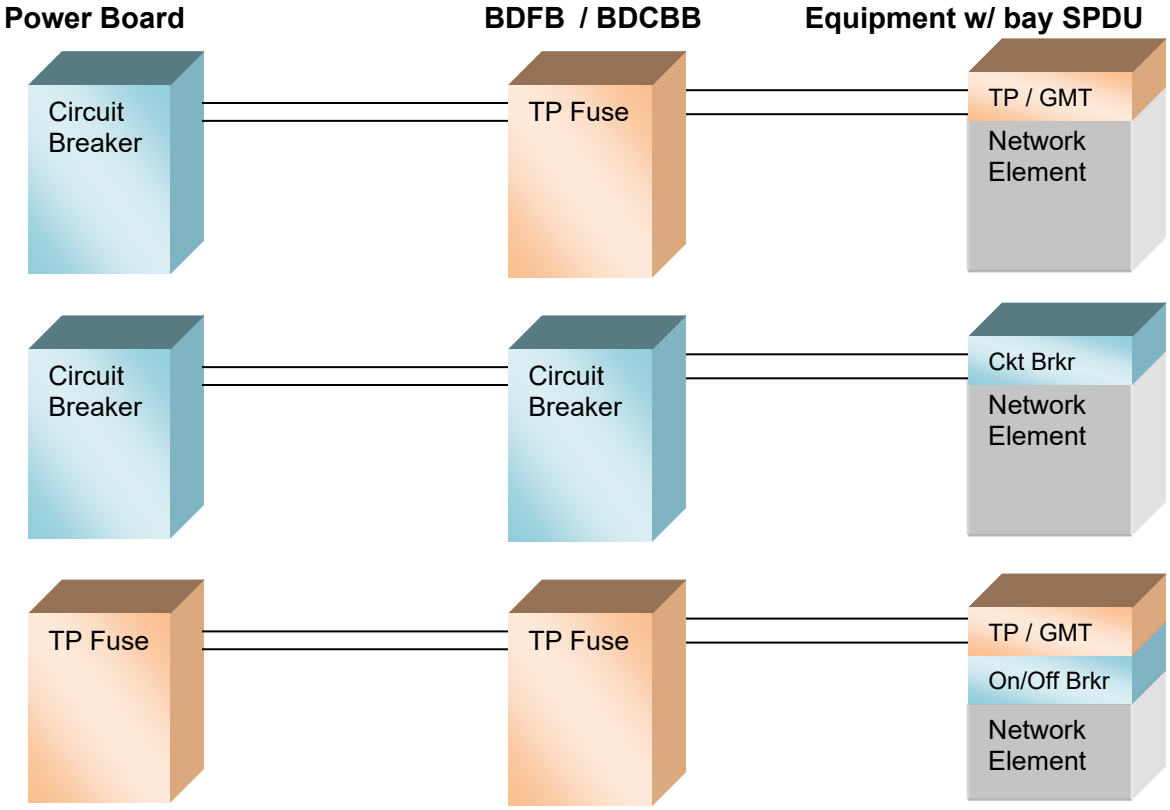


FIGURE 12-8(c) – SWITCHING SYSTEM

FUSE AND CIRCUIT BREAKER COORDINATION

PREFERRED STANDARD

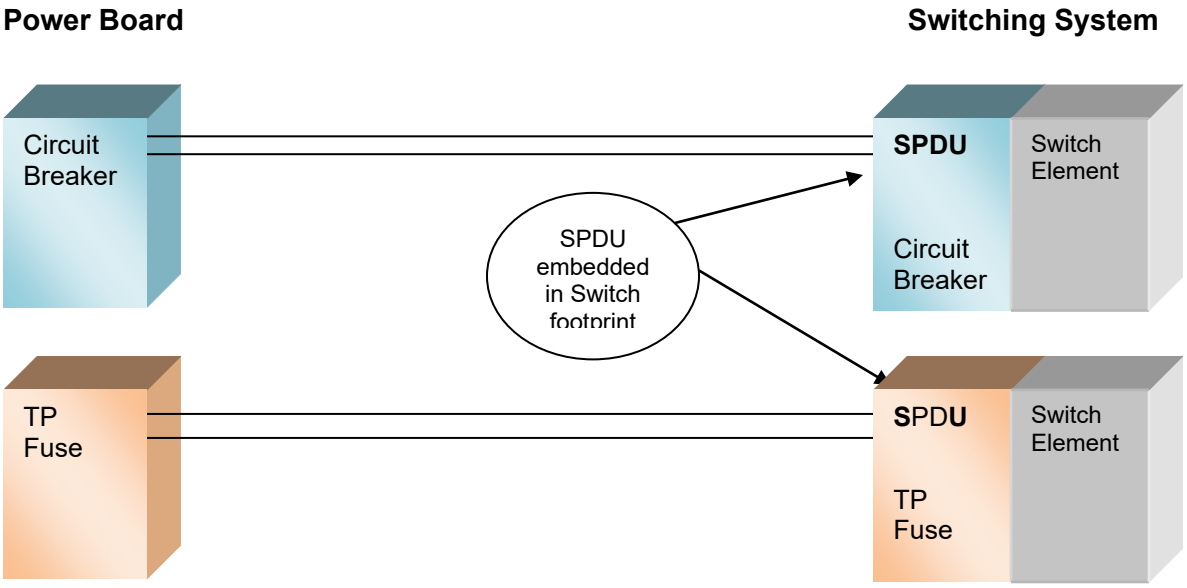


FIGURE 12-8(d) - TRANSPORT / DATA EQUIPMENT

FUSE AND CIRCUIT BREAKER COORDINATION

PROHIBITED COMBINATIONS

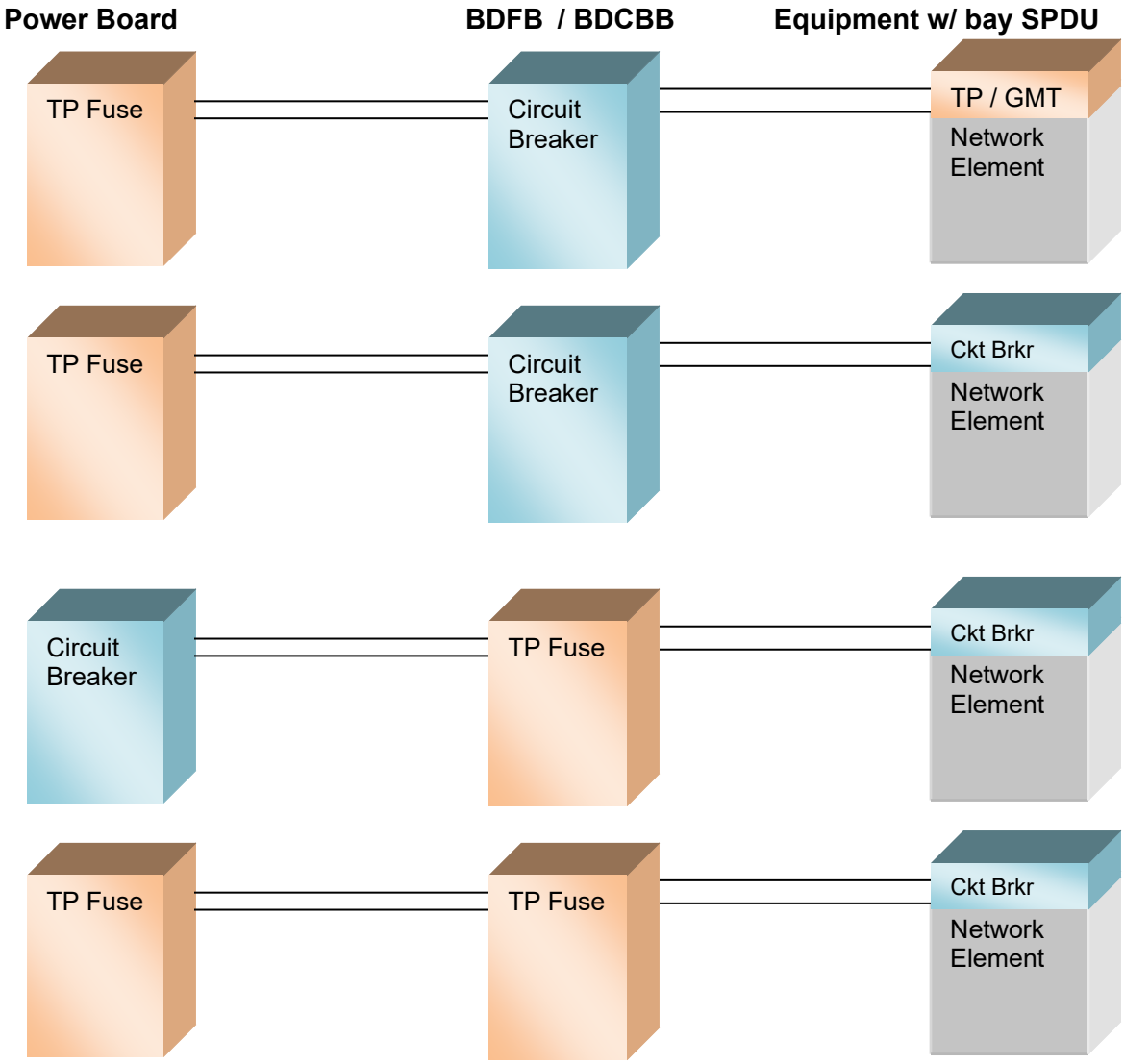


Figure 12-9 Overhead AC Appliance Outlet / Test Receptacle Design

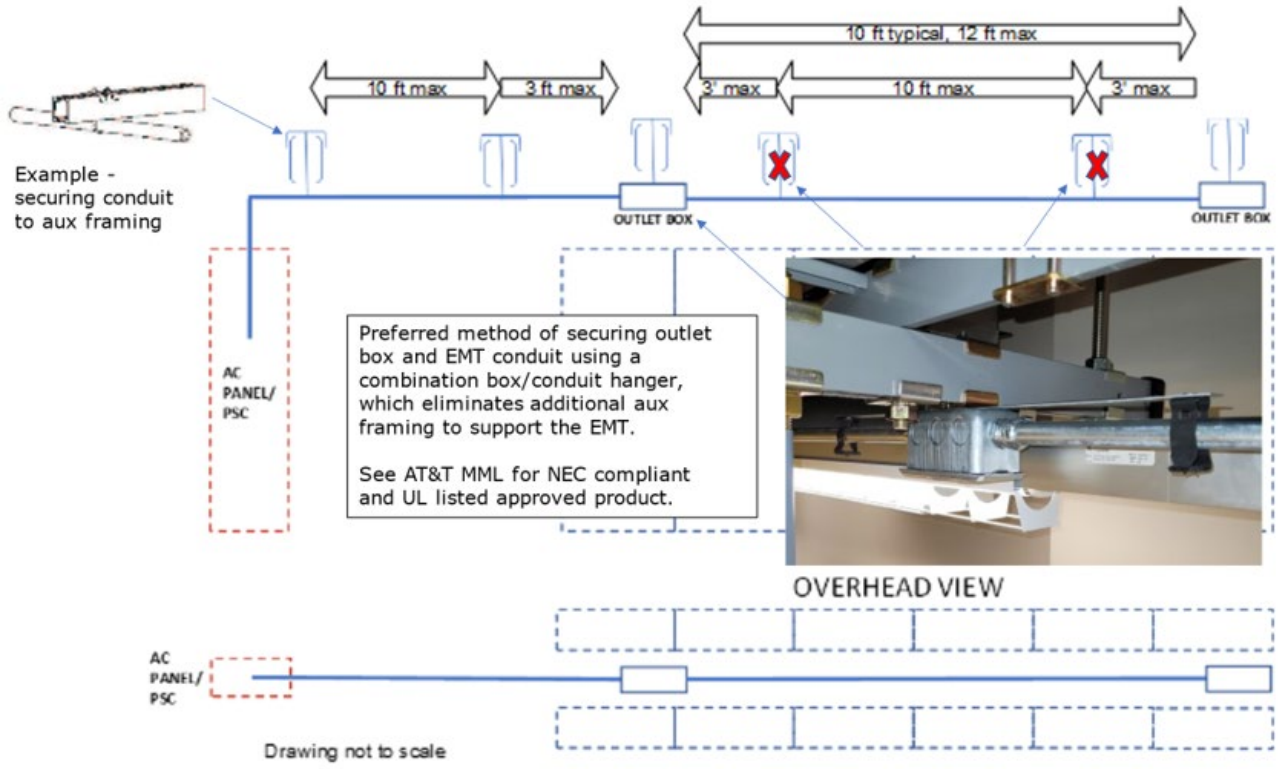


Figure 12-10 Legacy Bottom of the Bay Design Transition to Overhead Design

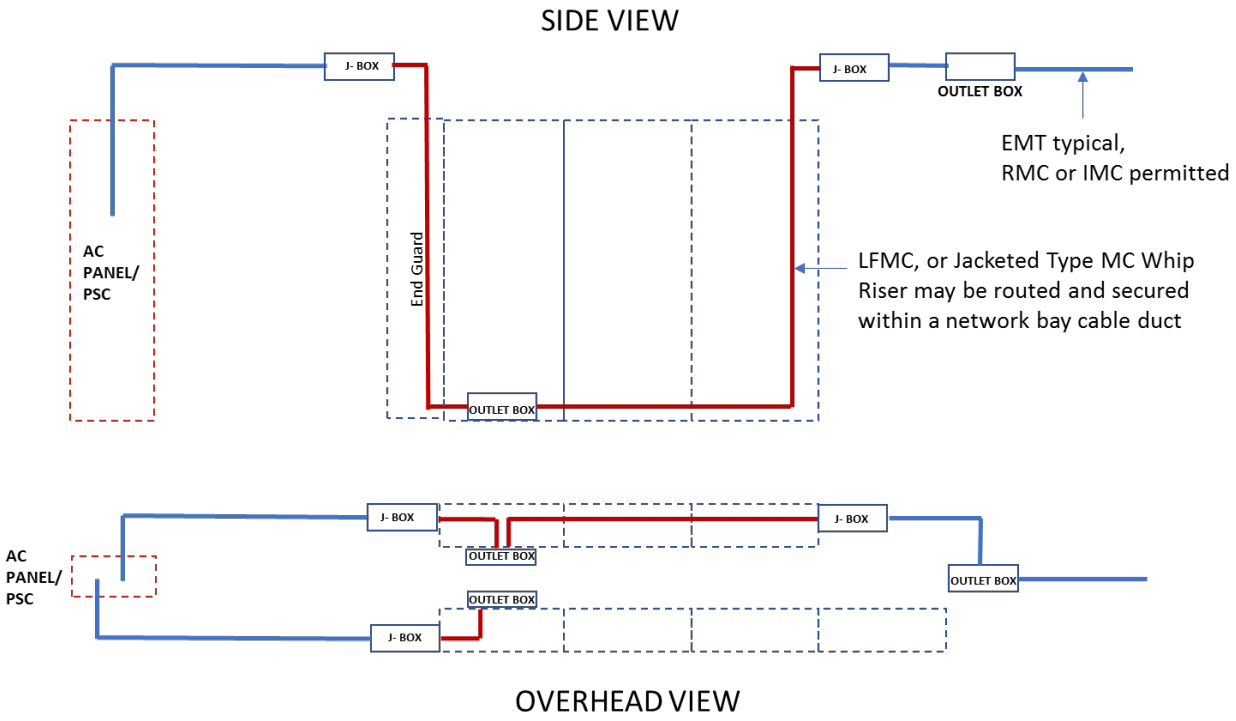


TABLE 12-5 BUS BAR SIZING CHART

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
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
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
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
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

[END OF SECTION]

SECTION 13 -- GROUNDING AND BONDING

CONTENTS PAGE

TABLE 13-1 – SUMMARY OF CHANGES IN SECTION 13

Revision Date	Item	Action	Requirements Change Notification
1/5/2016	Subsection 1	Modification	ATT-TP-76400-170
1/5/2016	Subsection 2	Modification	ATT-TP-76400-171

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 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. AT&T Grounding and Bonding Documentation

2.1.1 For traditional wireline and wireless equipment installations in conventional spaces, the Detail Engineer (Internet Services Engineer) shall engineer to the applicable bonding and grounding requirements of ATT-TP-76416, Grounding and Bonding Requirements for Network Facilities.

2.1.2 For AT&T Integrated Cloud (AIC), Internet Services, and Video equipment installations in conventional spaces, the Detail Engineer (Internet Services Engineer) shall engineer to the applicable bonding and grounding requirements of ATT-TP-76403, Grounding and Bonding Requirements for AT&T Integrated Cloud, Internet Services, and Video Facilities.

2.1.3 At the time of this revision (December 2015), bonding and grounding requirements specific to AT&T Modular Technical Space (MTS, aka Modular Data Center and 'containers') have not been determined. MTS bonding and grounding requirements will be determined on a case by case basis until standards are developed.

[END OF SECTION]

SECTION 14 -- OPERATIONS SUPPORT SYSTEMS

CONTENTS PAGE

TABLE 14-1 – SUMMARY OF CHANGES IN SECTION 14

Revision Date	Item	Action	Requirements Change Notification

1. GENERAL

1.1. Introduction

1.1.1 This section covers requirements for the engineering of Operations Support Systems (OSS).

1.1.2 Changes in this issue of Section 14 are summarized in Table 14-1.

1.1.3 All new OSS shall adhere to ATT-TP-76400. Modifications to existing OSS should be engineered to incorporate these requirements.

1.1.4 Due to the large variety of OSS, only general information is included in this section. Where manufacturer's documentation provides the necessary requirements for a specific OSS, that documentation shall take precedence over ATT-TP-76400.

1.2. Location and Layout

1.2.1 In general, the weights of OSS components are well within the range of normal floor loading specifications. The AT&T Equipment Engineer will determine floor loading based upon equipment weight information and system configuration from the computer manufacturer's specifications.

1.2.2 Many OSS require the use of a raised floor. A notation that raised floors are being utilized will be made in the TEO. Raised floors may be provided for system cable control or for under-floor cooling requirements.

1.2.3 When raised flooring is used as an air plenum, the cabling requirements shall be as follows:

a) Data processing interconnecting cables and connecting cables do not require a plenum rating if the plenum meets the criteria of the National Fire Protection Association (NFPA) 70-465, and the plenum has a smoke detection system.

b) Communication cables, as defined in the NFPA 70-800-51, shall meet the listing requirements of types CMP, MP or MPR for use in ducts, plenums, and other space used for environmental air.

c) Plenum rated interconnecting cables and connecting cables meeting the requirements of type CMP, MP, or MPR, shall be used in a plenum space.

d) These are the minimum requirements: local codes may be more stringent. Therefore, before beginning any large scale data processing cabling project, the DESP shall refer to the relevant codes.

1.2.4 Raised floor designs shall provide an insulating floor surface. The raised floor grid is utilized as a signal reference plane and shall be a part of the common bonding system.

1.2.5 Metallic hardware that penetrates the floor and contacts the metal undersurface or support structure shall not be used. Nonmetallic fasteners shall be used.

1.2.6 Within the Carrier Communications Space environment, metal hold down bolts for OSS framework that penetrates a floor shall be furnished with nylon bushings or other suitable nonconductive hardware. This prevents electrical continuity through the bolting material. Computer hardware shall not be bolted through the floor.

1.3. Environmental Controls

1.3.1 Temperature and humidity alarms shall be set to alarm as specified by the equipment manufacturer.

1.3.2 When the OSS is clustered in one location, the system with the most stringent temperature and humidity requirements shall be used for the environmental provisioning.

1.3.3 OSS equipment is sensitive to excessive vibration and shock. Isolation from the source of the vibration and shock shall be provided.

1.4. Power Requirements

1.4.1 A master disconnect switch shall be provided and controlled from a location near the main AC control panel and the exit doors. This disconnect switch shall discontinue the flow of power to all equipment in the OSS area.

1.4.2 The requirements for grounding an OSS are contained in Section 13 of ATT-TP-76400.

1.4.3 To clarify interrelationships, the various sources and combinations of AC supplies that can be used to power OSS installations are summarized as follows:

a) Unconditioned commercial AC power is the least expensive form of power supply suitable for OSS installation. This supply is not adequate for most OSS installations. Commercial power sources are subject to interruptions, spikes, sags, surges, and other transients generated on the incoming lines. Computers served by unconditioned commercial power may experience processing interruptions and occasional damage to components.

b) Standby power from an engine generator is generally available in COs to provide power to units classified as essential loads. Essential loads are defined as loads that are capable of tolerating power interruptions of more than five seconds without damage. This scenario is not an acceptable alternative in the computer data centers.

c) Standby inverter plants operated from the CO battery supply switch standby AC power during a commercial power failure to loads classified as protected. Such loads are those that can tolerate interruptions from a few milliseconds up to five seconds without interfering with operations.

d) Continuous operation inverters operated from a DC power plant (i.e., CO battery) are employed to supply interruption proof AC power when the OSS cannot tolerate processing interruptions. The AC output is not affected by noise that may be present on the commercial AC supply.

e) Uninterruptible Power Supply (UPS) is utilized in cases where interruptions are too great for OSS that requires no-break power. UPS typically provides coverage for interruptions of short duration.

1.4.4 Autotransformers do not interrupt the AC neutral. Certain UPS employ an autotransformer that allows the neutral to be continuous from the main AC switchboard to the OSS. Units that maintain neutral continuity from feeders to downstream distribution circuits shall not provide local ground to the distribution grounded (neutral) conductor.

1.4.5 When commercial AC supply does not allow satisfactory operation of OSS, the supply shall be conditioned. Available devices for treating the commercial power include Line Voltage Regulators (LVR), isolating transformers, motor-alternators, inverters, and UPS. Logical combinations are acceptable. An LVR or nonregulating transformers may be interposed between the power source and the load to regulate sags, surges, and to block spurious line transients. Conditioning devices may be used to establish a separately derived system.

1.4.6 Certain conditioning units isolate the grounded (neutral) conductors of the distribution circuits from the neutral of the feeder circuit, if a feeder neutral is provided.

1.4.7 An LVR may be interposed between the power source and the panel board serving the OSS, to address voltage sags. Unless an autotransformer is used, the LVR establishes a separately derived system.

1.4.8 Isolating transformers provide isolation from transient and high frequency common-mode noise. Isolating transformers always create a separately derived system. Isolating transformers are used:

a) When other equipment attached to the building AC imposes excessive noise on the feeder serving the OSS;

b) In place of LVR when voltage sags are not a problem;

c) As part of some power distribution units.

1.4.9 An inverter is customarily connected to a panelboard on a one-to-one basis; however, when the load is restricted to the capacity of one inverter, a pair of inverters may be connected to one panelboard to protect the system if an inverter fails.

1.5. Alarms

1.5.1 At a minimum, alarm systems shall be provided for the OSS which include the following:

a) Computer sanity alert (such as a watchdog or sanity check circuit)

b) Loss of power to the OSS

c) Fire alarm

d) High temperature

e) High and low humidity

f) Water alarms

g) Loss of commercial power.

1.5.2 The OSS shall be alarm compatible with external maintenance and monitoring systems. The AT&T Equipment Engineer will specify interconnection requirements for external maintenance and monitoring.

1.5.3 The alarm system shall function whether using normal or emergency power.

[END OF SECTION]

SECTION 15 -- CABLE ENTRANCE FACILITY

CONTENTS PAGE

TABLE 15-1 – SUMMARY OF CHANGES IN SECTION 15

Revision Date	Item	Action	Requirements Change Notification

1. GENERAL

1.1. Introduction

1.1.1 This section covers the grounding requirements in the cable vault or Cable Entrance Facility (CEF). Note: Areas in AT&T buildings which are not carrier code compliant will need to meet the requirements of the National Electrical Code- Article 770 for Fiber Cable and Article 800 for Copper Cable.

1.1.2 Changes in this issue of Section 15 are summarized in Table 15-1.

1.1.3 The CEF is the area of a structure where communications cables first enter from the outside plant, and serves as the interface linking the outside plant cables to the main distributing frame(s) (MDF, Mainframe, or termination frame) in central office, SHO/VHO, or certain customer premises locations. These outside plant cables are feeder and trunk cables that may be paired-conductor, coaxial, or optical. The paired cables that leave the CEF and attach to the connectors on the main distributing frames are known as tip cables or stub cables.

1.1.4 A below ground CEF is sometimes called a cable vault.

1.2. Requirements – All CEFs

1.2.1 The protection measures should be applied to the cables in a designated area of the CEF that promotes uniform methods and facilitates inspections; this area is identified as the cable protection area. In a horizontal-entry CEF it is located between the entrance conduit and the splice frame, normally between the second and third cable racks, or second bay (configuration of some existing offices and the congestion of cable may make this requirement impractical in some cases; however, the protection area should be located as close to the cable entrance as is practical). In a vertical-entry system, the protection area horizontally traverses the CEF for connection to all metallic cables.

1.2.2 All of the protection area ground bars located in a CEF shall be bonded to a 1/0 AWG conductor connected to the building ground system, via the OPGP, CO ground bar, or other main building 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 cable protection area ground bars together.

1.2.5 Each lineup of cable rack in the CEF shall be equipped with an insulated ground bar, establishing a cable protection area near each cable entry area. (See Figure 15-1)

1.2.6 The protection area insulated ground bar (also known as CEF ground bar) shall normally be mounted above the top horizontal support arms between verticals 2 and 3. As an alternate location, in CEFs 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 protection area insulated 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 an available protection area ground bar nearest its point of entry. Stacking ground connectors is not acceptable. The bonding conductor shall be a #6 AWG conductor equipped with a single hole crimp type lug for connection to the cable splicing case. Lockwashers are required to ensure a secure connection.

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

1.3.3 Foil-lined or metallic air pipes shall also be bonded to the nearest protection area ground bar using #6 AWG bonding conductors. Air pipe fittings are available for this purpose. Multiple air pipes may be connected together.

1.3.4 Connections to the protection area (CEF) ground bars shall be made using two (2) hole crimp type connectors.

1.3.5 If Cable Rearrangement Facility (CRF) cabinets are in the CEFs, a 1/0 AWG dedicated conductor shall be run from each CRF cabinet/panel to the OPGP, CO ground bar, or other main building ground bar.

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

1.4. Requirements – Insulating Joint CEFS

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

1.4.2 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 lead sheaths of lead cable, the metallic shields of composite-sheath cable, the metallic components of optical fiber cable, and the metallic components of air pipes.

1.4.4 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, constituting the field side of an isolated protection area. See Figure 15-2.

1.4.5 Outside plant entry cables shall be electrically isolated from the CEF framing structure by either hardwood insulating members placed between the cable racks and framing structure or by durable insulators placed between the cables and cable hooks or cable support arms.

1.4.6 The metallic cable shield on the Carrier Communications Space or SHO/VHO office side of the insulating joint shall be connected to a second bus in the protection area which is bonded to the structure grounding system following the requirements for a Non-Insulating Joint CEF, except no bond is made between the OSP cable sheath and the tip cable sheath. See drawing 15-2.

1.4.7 To maintain a path to ground for lightning and ac currents, the insulating joint shall be bridged with a bridging capacitor between the protection area bus bars or across each cable isolation gap. See Figure 15-2.

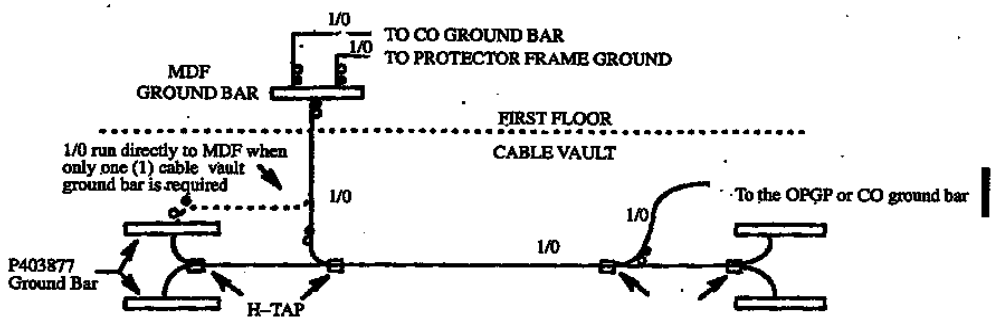
1.5. terbonding

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

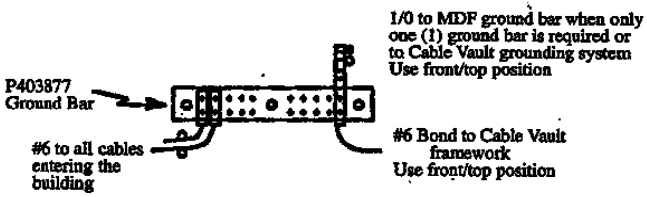
1.6 Fiber Optic Cable

Any Fiber Optic cable containing a metallic shield shall be bonded to the CEF as described in this section.

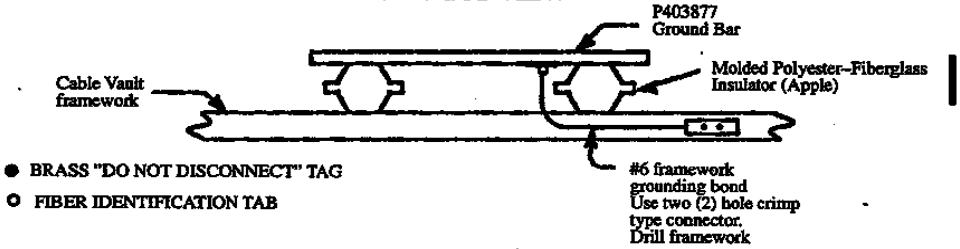
FIGURE 15-1 -- CABLE VAULT GROUNDING



CABLE VAULT GROUNDING SYSTEM
SK – A

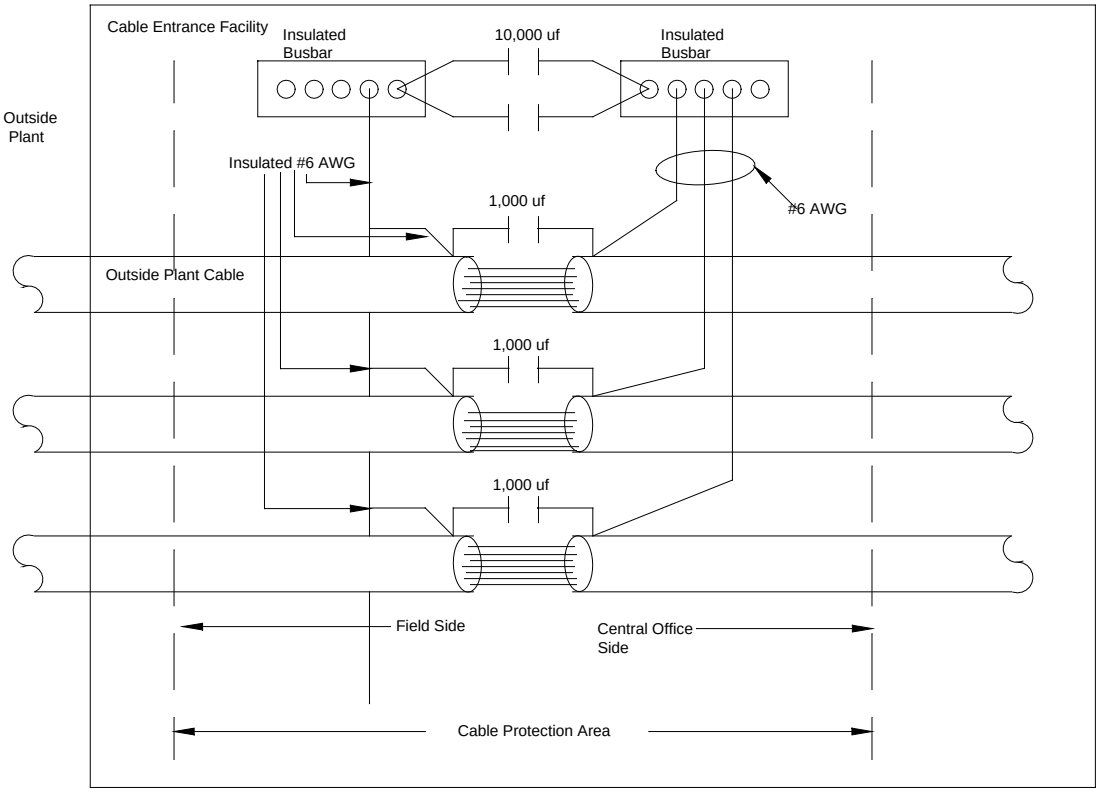


10 POSITION GROUND BAR
ONE REQUIRED PER 18 CABLES
SK B TOP VIEW



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

Revision Date	Item	Action	Requirements Change Notification
07/05/2016	2.5.5	Addition	ATT-TP-76400-190

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.

1.1.3 See 790-100-658 (Standard Specification and Performance Requirements for Engine/Alternator Sets) for additional information.

2. REQUIREMENTS

2.1 General

2.1.1 This document contains Standard Specifications for Engine Alternator Sets and requirements for all standby AC systems and equipment including engine/alternators with automatic transfer equipment.

2.1.2 The completed and installed Engine/Alternator set and all associated equipment shall be in compliance with all applicable air pollution control laws, including any and all federal, state and local laws, ordinances, guidelines and practices. Where subject to more than one emission law or standard, the more stringent laws, ordinances, rules, guidelines, practices, or standards shall apply.

2.2 Engine Requirements

2.2.1 The AT&T Power Equipment Engineer/Capacity Manager shall work with ATS (Advanced Technical Support), and CRE (Corporate Real Estate) to complete the ATT-790-100-658JP, detailing the Engine/Alternator requirements.

2.2.2 The use of diesel fuel engines shall be the first choice and is to be used for any installation going forward. The current use of natural gas is considered an isolated case, and any future installations shall be determined by the local AT&T Power Equipment Engineer/Capacity Manager and Advanced Technical Support (ATS) representatives.

2.2.3 Engine critical building interface systems (intake louvers, fuel transfers, etc.) shall be sourced either directly on the engine or on the essential buss (as directed by the AT&T Power Equipment Engineer/Capacity Manager) 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 Power Equipment Engineer/Capacity Manager.

2.2.4 House service control panels or other controls shall not override generator OEM operation controls (fuel, air intake, air exhaust, network load, etc.). Load shedding controllers shall only control building load shedding, not network load (see section 2.10).

2.2.5 Tap boxes shall be provisioned as requested by Network Planning & Engineering (NP&E) following the requirements detailed in CRE-50-07-04-ATP-1 (PORTABLE STANDBY GENERATOR TAP BOXES / QUICK CONNECTS).

2.3 Fuel Systems

2.3.1 The AT&T Engineer will outline basic requirements of the fuel system, such as tank size and the need for a day tank, in ATT-790-100-658JP. CRE will design and implement the fuel system based on those requirements and CRE-33-56-00-ATP-001, Petroleum Storage Tank and Piping System Standard Design Drawings and Specifications.

2.4 Exhaust Systems

2.4.1 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. Pipes shall not be supported by the engine or silencer, and all externally exposed pipes will be stainless steel.

b) Exhaust plumbing shall have a stainless steel flexible bellow type section installed within 12 inches of the engine manifold (if possible).

c) Pipes shall have a clearance of at least 9 inches from combustible materials and terminate outside the building;

d) Pipes shall be guarded and/or insulated to prevent burn injuries to personnel and excessive heat in the engine room;

e) All connections shall be bolted flange (with gaskets) or welded. No automotive type exhaust pipe clamps are permitted;

f) The surface temperature of the muffler and all indoor exhaust piping shall not exceed 140° 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;

g) Exhaust piping shall be of sufficient length to allow for proper exhaust flow and configured to meet manufacturer EPA requirements.

2.4.2 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 TP 76400.

2.5 Starting Systems

2.5.1 The engine starting batteries shall be chosen and sized per AT&T-790-100-658, sections 3.10.4.2. and 3.10.4.4

2.5.2 The engine start batteries shall be located so the cells will not be exposed to excessive engine heat.

2.5.3 An engine start battery rectifier shall be mounted either in the control cabinet or mounted on a wall near the start battery stand and be powered from the essential AC bus. Engine driven alternators shall not be used as the sole source for maintaining charge on start batteries.

2.5.4 The engine 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.

On new engine/alternator installs using VRLA start batteries, a filtered battery charger shall be specified per ATT-790-100-658, section 3.10.4.4.

2.5.5 All batteries shall be contained in an appropriately grounded rack or other manufacturer recommended container that meets local seismic requirements.

2.6 Cold Starting Aids

2.6.1 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.

2.6.2 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.

2.7 Acoustic Noise

2.7.1 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 TP 76200 or local codes, whichever is more stringent.

2.7.2 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.

2.7.3 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.

2.7.4 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.

2.7.5 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

2.8 Cooling System

2.8.1 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. A remote radiator that ventilates a room or has ducting shall not be located where its airflow is reduced or opposed by prevailing winds.

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.

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

2.8.3 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).

2.9 Alternator Technical Requirements

2.9.1 Alternators shall meet the following requirements:

a) Lead Termination - The alternator leads shall terminate on the line side of the circuit breaker. Ring terminal compression 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.

Three phase alternators of 1,000kW and smaller with voltages under 600V, shall be 12 wire re-connectable type. Means shall be provided to prevent connectors from turning at connection points.

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

2.9.2 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.

2.9.3 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.

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

2.10 Load Prioritization

2.10.1 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.

2.10.2 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.

2.10.3 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.

2.11 Automatic Transfer Switch Systems.

2.11.1 For information on Automatic Transfer Systems see:

CRE-50-36-01-ATP-001 GENERAL CONSIDERATIONS FOR ELECTRICAL SYSTEMS

2.12 Outdoor Enclosures

2.12.1 When the engine/alternator is to be enclosed, it will be necessary to provide adequate 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.

2.13 Safety

2.13.1 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.

2.13.2 All exposed surfaces with temperatures greater than 45° C / 113° F shall be marked with warning labels. Surfaces with temperatures greater than 60° C / 140° F shall be guarded as well as marked with warning labels. Non-asbestos insulation and/or ventilation guards shall be provided to protect the operator from accidental contact with the engine/alternator set

exhaust system parts and piping or any other components with surface temperatures higher than 60° C / 140° F.

2.13.3 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.

2.13.4 The design engineer shall ensure that suitable warning labels for automatic start are provided.

2.14 Hazardous Voltages

2.14.1 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.

2.15 Alarms

2.15.1 All new standby engine/alternator sets shall have the capability of forwarding alarms via TCP/IP to the appropriate alarm center. The alarms specified shall be the AT&T minimum alarms and required equipment specific alarms per AT&T drawing ATT-P-05010-E.

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 The emergency shutdown switches for the engine shall be labeled and covered to prevent accidental activation.

[END OF SECTION]