# ATT 812-000-003
# STANDARDS FOR NETWORK EQUIPMENT ENVIRONMENTS

**Abstract:**
**Presented in this document are the standards for planning, engineering, and managing the physical and operational environments in which network equipment is housed. The standards to be implemented in the Central Offices of AT&T Local Exchange Carriers.**

**Audience:**
Network Planning and Engineering, Operations, Cluster Vendors, and Corporate Real Estate.

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**STANDARDS FOR NETWORK EQUIPMENT ENVIRONMENTS**

# 1.0 INTRODUCTION

## 1.1 General

This Practice provides the general standards for planning, engineering, and managing the physical and operational environments in which network equipment is housed. The purpose of this practice is to ensure that network equipment environments, equipment configurations, and the working environment for network support and operations personnel are established and managed consistently throughout AT&T Local Exchange Carriers so that network technology can be efficiently deployed and maintained.

*Refer to product specific M&P for site specific design, installation and operational considerations. This section is applicable to new and existing network equipment installations.*

## 1.2 Applicable Codes

The Practice shall be used in conjunction with other applicable codes and methods and procedures to achieve site specific building and equipment area arrangements. Whenever information contained in this document conflicts with a standard published by an authority having jurisdiction or the technical requirement of a network equipment system or element, those published standards shall take precedence over the applicable text of this document.

### 1.3 Reason for Re-issue

Issue B is being issued to revise the following sections:

1) Section 3 – Wire Center Space Planning Standards
2) Section 7 - Frame Planning Standards
3) Section 9 – Deleted and referenced to "Collocation Provisioning Guidelines"
4) Section 14 – Raised floors Environment Standards

### 1.4 Documents and General References

See section 16 for:

a) List of Figures/Drawings
b) List of Tables
c) Acronym
d) Definitions
e) List of Methods & Procedures
f) List of BSP & TP
g) Wide Band Temperature Control Checklist

## 1.5 Table of Contents:

# Section 2
# EQUIPMENT OPERATING ENVIRONMENTS

## 2.1 General

This part describes the physical characteristics of equipment building structures that are relative to the efficient management of equipment environments in general. *It is presupposed there is a common understanding that the primary purpose of network equipment buildings and equipment spaces within buildings is to provide a physical and operational environment conducive to network reliability and technology evolution.* Acknowledged also should be the understanding that integral to network equipment environments are working environments for operations and maintenance people that are as practicable as possible.

## 2.2 Construction

2.2-1 General

The evolution of telecommunications and data processing equipment requires *a greater emphasis be placed* on the proper design and construction of building structural slabs, columns, walls, and equipment loading facilities used for housing network equipment. Accordingly, to minimize equipment location restrictions and the need for supplemental equipment support or bracing measures to achieve seismic stability of equipment configurations, the designs of network facilities in general shall include the physical characteristics described in this part.

a) Designs of network facilities for high risk areas shall include seismic loading capabilities using the building importance factor of 1.25 referenced in the Uniform Building Code

b) Seismic loading capabilities of network facilities for low risk areas shall be appropriate for the seismic zone of the construction site

c) Each floor of a network facility shall have an approximate 4'-0" wide by 8'-0" high equipment entrance provision.

d) The floors of network equipment areas shall be void of electrical raceways, pipes, and other building service type provisions that will restrict the random locating of equipment floor anchors (see anchor embedment requirements in 2.3-3).

e) Building service facility and apparatus shall not be attached to the superstructure provided above network equipment areas. Such attachments may inhibit the efficiency to provide and manage the equipment interconnection and migration within a building.

f) Building floors shall not be constructed of, covered with, or otherwise contain any material that would be considered environmentally hazardous.

g) Areas not permitting future coring or cutting operations due to concentrations of reinforced rod or structural members shall be noted on the Real Estate construction drawings.

2.2-2 Floor Construction

2.2-2.1 Type of Floors:
Although a variety of floor systems are in common use in equipment buildings, the vast majority of floors are constructed on reinforced concrete. Concrete is easily formed; has excellent fire resistant characteristics; and, if poured and finished properly, can have a level and uniform surface. Concrete for slab should be of sufficient quality to develop the pullout strength of floor anchors as well as the pullout strength of the cast-in-place inserts on the underside. The floor

surface should have a steel-toweled, dust free finish. Floor structures in equipment buildings can be grouped into one of three different framing systems:

a) Reinforced concrete framing
b) Steel framing
c) Precast concrete framing

Most buildings have floors in the first category.

2.2-2.2 Floor deflection

Floors should be designed to meet a maximum allowable deflection. Individual elements of a floor, such as a beam or girder, should prevent a total live and dead load deflection that is greater than 1/480 of the elements span. However, where beams are supported by girder, individual deflections can accumulate significantly and produce large deflections at the center of the building bays. For floors with multiple-element one-way construction, the sum of individual deflections should be limited so that the center of bay deflection is less than 1/360 of the column spacing.

2.2-2.3 The reference standard for floor construction of network facilities is the American Concrete Institute standard 302.1 R-80. The floors of equipment areas *shall include* the following characteristics as covered in ACI 302.1 R-80:

a) Class 5 Single Course Industrial construction having a minimum thickness of 6 inches,
b) Class 5 Finishing using a minimum of three toweling, and
c) A Class AX Surface Finish Tolerance. Although means to level and plumb the frames to compensate for variations in floor flatness are provided by means of wedges, shims, leveling screws; it has increasingly become important for the newer generation equipment to be properly leveled so that circuit boards can properly fit in backplanes. CRE shall make every effort to limit the depressions in floors between high spots to 3/16-inch below a 10 foot long straight edge.

2.2-2.4 Normal temperature and shrinkage cracks are permitted. Any substantial cracks or diagonal cracks on the floor or wall shall be examined. Cracks larger than 1/8 inch on the structural floor slab (not slab on grade) shall be analyzed by a structural engineer for cause and determination of appropriate repair and prevention of subsequent spread. All concrete repair work shall have a surface finish that is flush with the surrounding concrete. Spalls shall be repaired using epoxy based mortar materials. Spalled areas shall be free of all debris including dust before repair materials are applied.

2.2-2.5 Equipment buildings where new concrete floors will not have surface covering shall have finished surface coated with a sealer/hardener (specifically designed to protect concrete floors against abrasion, dusting and spillage). The sealer/hardener material shall be selected by the CRE bearing in mind that the material be of quality that would penetrate the concrete creating an integral matrix that will not wear away. Coatings shall be applied prior to electronic equipment being installed into floor space. Coating material shall not contain Volatile Organic Compounds or other chemicals detrimental to electronic equipment or building occupants.

## 2-3 Floor/Ceiling Loading

2.3-1 The floor designs of all new construction and additions to existing construction shall be capable of supporting uniformly distributed live loads of 150 lb./ft.$^2$ for equipment areas in general, and 300 lb./ft.$^2$ for areas intended for office -48 Vdc power equipment. This includes dead load (equipment + superstructure) and live load (people + moving equipment).

2.3-2 It is highly recommended staying with our traditional numbers, 150 lb./ft.$^2$ and 300 lb./ft.$^2$ In the future, technologies may get heavier and to stay within the 150 lbs./sq. ft. limit aisle spacing around equipment may have to be increased. Otherwise, traditional narrow aisle spacing will create floor overloading and heat dissipation problems. The wider aisles also help spreading heat load over a larger floor area and stay within design limits of equipment cooling.

2.3-3 The concrete floors and ceilings of all new construction and additions to existing construction shall be constructed of concrete having a *minimum compressive strength of 3000 psi* at 28 days and *a minimum thickness of 6 inches* to facilitate minimum equipment anchor embedment of 4-1/2 inches.

## 2.4 Equipment Superstructure Support Provisions

2.4-1 The ceilings of all new construction and additions to existing construction above areas designated for network and power equipment installation shall include an integral means of supporting equipment superstructure arrangements using 5/8-11 threaded fasteners.

Unless otherwise specified in the construction specifications for a specific structure, continuous slot "U" channel having the physical equivalents of Unistrut Corporation's P-1000 channel shall be used for equipment superstructure support. Continuous slot channels provide horizontal flexibility for the placement of superstructure support rods and earthquake bracing apparatus.

2.4-2 Surface mounted channel

Surface mounted channel shall be fastened to ceiling surfaces in a manner providing a maximum vertical loading of 4,000 pounds across a 5 foot span of 5/8-11 hangers. Additionally, the surface mounted fastening arrangement shall prevent the U channel from twisting when subjected to a 2000 pound lateral load suspended 6 feet below the channel.

2.4-3 Ceiling U channel

Ceiling U channel shall be placed across the entire ceiling surface in accordance with the below as illustrated in Fig. 2-1.

a) The channels shall be as continuous as the ceiling design permits in the direction perpendicular to the exterior wall along which local loop (OSP) cables enter the building (Fig 2-1, wall 1).

b) Unless otherwise restricted by the ceiling's design, the first run of U channel shall be no more than 1 foot from wall 1. Using 5'-0" as the preferred and 6'-0" as the maximum spacing between runs of channel, the remaining runs of U channel shall be uniformly spaced across the ceilings surface.

2.4-4 Ceiling inserts safe working load

Ceiling anchors (usually called drop-in anchors) should be capable of supporting at least 9600 pounds minimum. The building codes require 8 to 1 safety factor, therefore 9600 pounds divided by 8 equals 1200 pounds. Hence, the rating or working safe load shall be 1200 pounds for cast in anchors and 2000 pounds for embedded ceiling channel. The threaded rod also, 5/8 x 11, shall be rated at 1200 pounds working load although they will support much more. Loads for beam clamps, ceiling inserts, threaded rods, etc. for purpose of determining the spacing of supports other than normal, may be considered as follows:

| **APPARATUS** | **SAFE WORKING LOAD[1] (in pounds)** |
|---|---|
| 5/8-11 threaded rods | 1200 |
| Ceiling inserts (set in place when ceiling is poured) | 1200 |
| Acme beam clamps | 800 |
| 5/8 inch drop-in anchors | 480 |
| 3/8 inch drop-in anchors | 300 |
| 5/8 inch lag screws in wood (2 inches or more) Framing Channels (2" x 9/16" x 3/16" steel) | 300 |
| | |
| **Span Between supports:** | |
| Up to 2'-0" | 2000 |
| 2-0" to 3'-0" | 1500 |
| 3-0" to 5'-0" | 1000 |
| 5-0" to 7'-0" | 700 |
| 7-0" to 8'-0" | 500 |
| | |
| **Embedded Ceiling Channel (Unistrut):** | |
| At any one point | 2000 |
| Where two or more are within 2'-0" of each other | 2000 total for the group of loads |

2.4-5 Iron work and cabling load

The requirements in GR 63 state no greater than 25 pounds per square foot for the iron work and cabling load supported by the ceiling anchors or embedded channel. A building bay is 400 square feet, 20 x 20 = 400, and with 25 pounds per square foot the load should not exceed 10,000 pounds in the building bay *distributed evenly*.

2.4-6 Real Estate may determine if embedded or surface mounted U channel is the preferred means for supporting equipment superstructure and other apparatus from building ceilings.

2.4-7 Use of pipe stanchions versus ceiling hanger

It is the *AT&T policy* that auxiliary framing and the cable racks they support be suspended from ceiling hangers rather than supported by means of pipe stanchions. Pipe stanchions are an exception for unusual circumstances and *permitted only* in small offices such as CDOs or Huts where ceilings are typically unable to support suspended loads.

Where ceiling or framework support cannot be provided, cable rack may be supported by pipe stanchions at intervals not to exceed six feet. Auxiliary framing be supported at 5' intervals.

Floor-mounted pipe stanchions shall not be used in high seismic risk locations.

2.4-8 Floor Loading of Equipment superstructure

Refer to AT&T document number 812-000-016MP for *"Network Engineering Considerations For Determining The Affects On Floor Loading Of Equipment Superstructure Suspended From Building Ceilings"*

[1] Source TR-NWT-001275, Issue 1, January 1993 Telcordia document

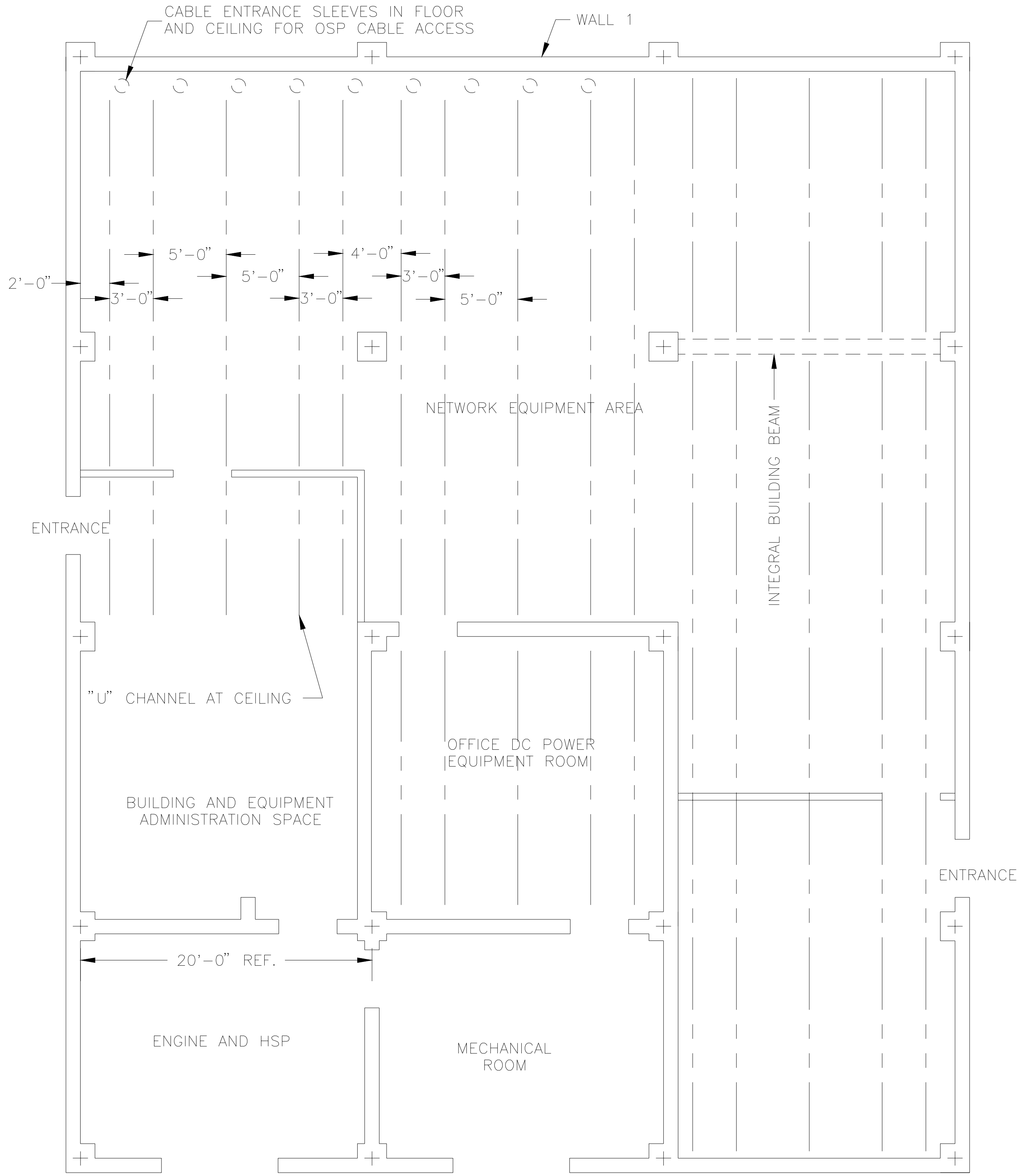



**Figure 2-1** - Generic Layout Of Office Superstructure Support Channel

## 2.5 Ceiling Heights

2.5-1 The *clear ceiling height* in network equipment areas is the unobstructed distance between the floor and the underside of the lowest building structural member including ventilation ducts, drain pipes, etc. It's within this clear ceiling height that network equipment and its associated cable and cable distribution systems are managed. The actual vertical distance required between the floor and the underside of a building's ceiling is the combination of the clear ceiling height required for network equipment and the distance required for ventilation ducts and other building service apparatus. Refer to Figure 2-2 for how the clear ceiling height are used in equipment areas.

2.5-2 A clear ceiling height of **12'-0"** is generally required above transport and collocation equipment areas in medium and large network facilities. A minimum clear ceiling height of **10'-0"** is generally required above network power and switching equipment areas. Where possible the clear ceiling height of contiguous equipment space shall be the same. The lesser clear ceiling height for switching and power equipment areas is predicated on those technologies being completely self supporting, including their required cable distribution scheme or system. Usually, this can be accomplished because of the relatively smaller amounts of interconnection cable required by these technologies. Higher clear ceiling heights are necessary above transport and collocation equipment areas in larger offices to enable network engineering to effectively manage cable segregation requirements and the increased amounts of cabling associated with transport equipment technologies (other than switching).

2.5-3 Provisioning new ductwork or retrofitting existing ductwork in an equipment environment may require deviation from *the12" clear ceiling height standard* . Office conditions that require exceptions to the minimum clear ceiling heights must be socialized with space planners and LFO groups because equipment planning will likely be impacted.

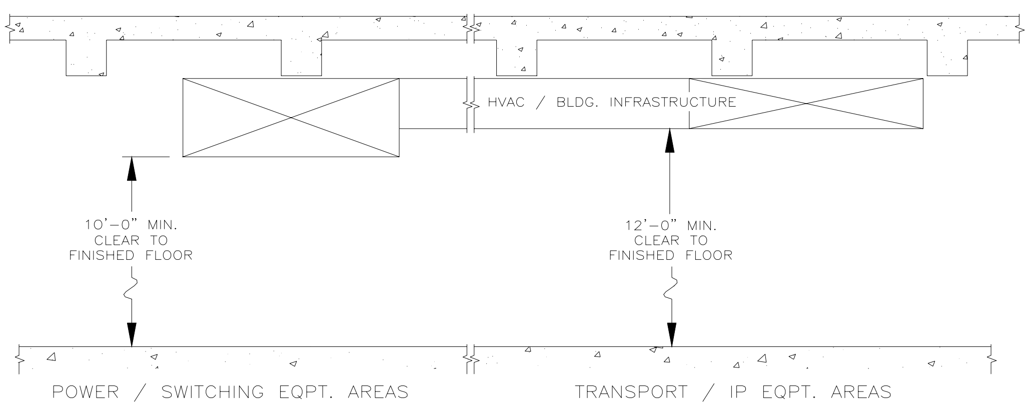



**Figure 2-2** Minimum Clear Ceiling Height Requirements

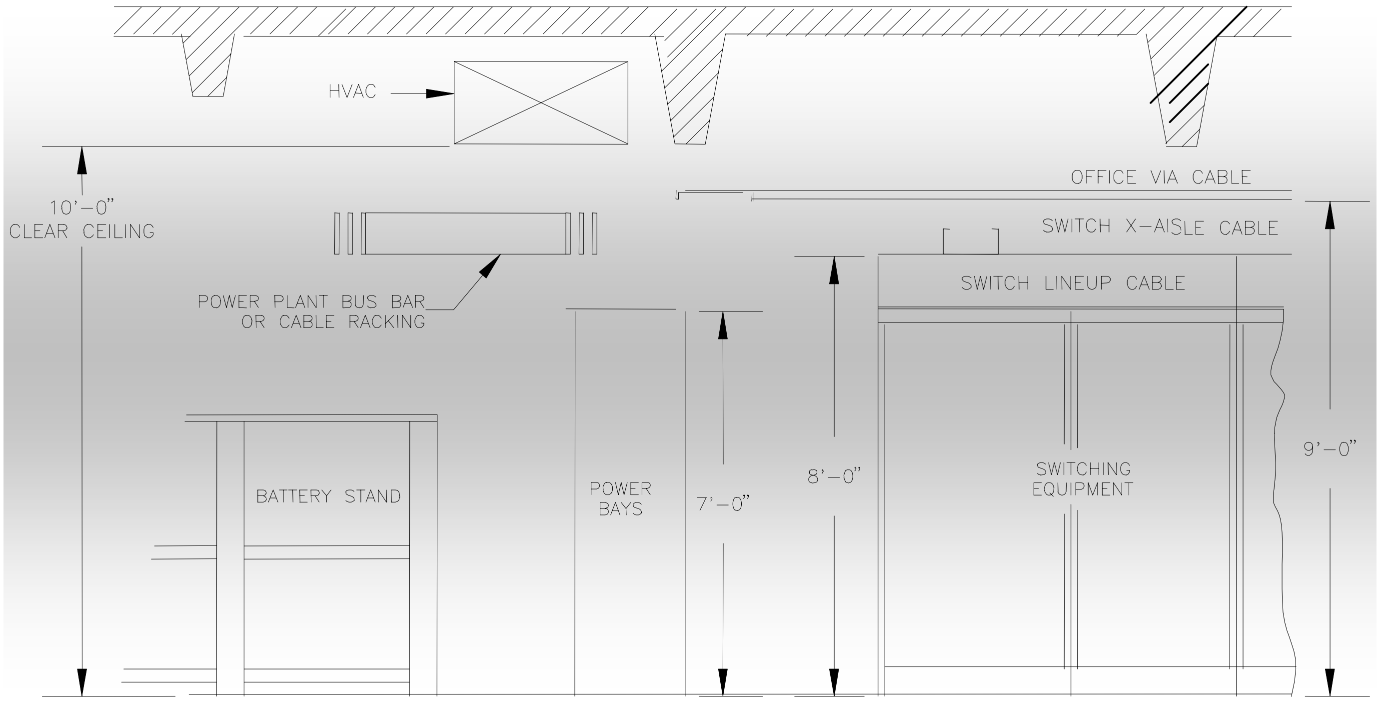



**Figure 2-2a** - Clear Ceiling - Power And Switching Areas

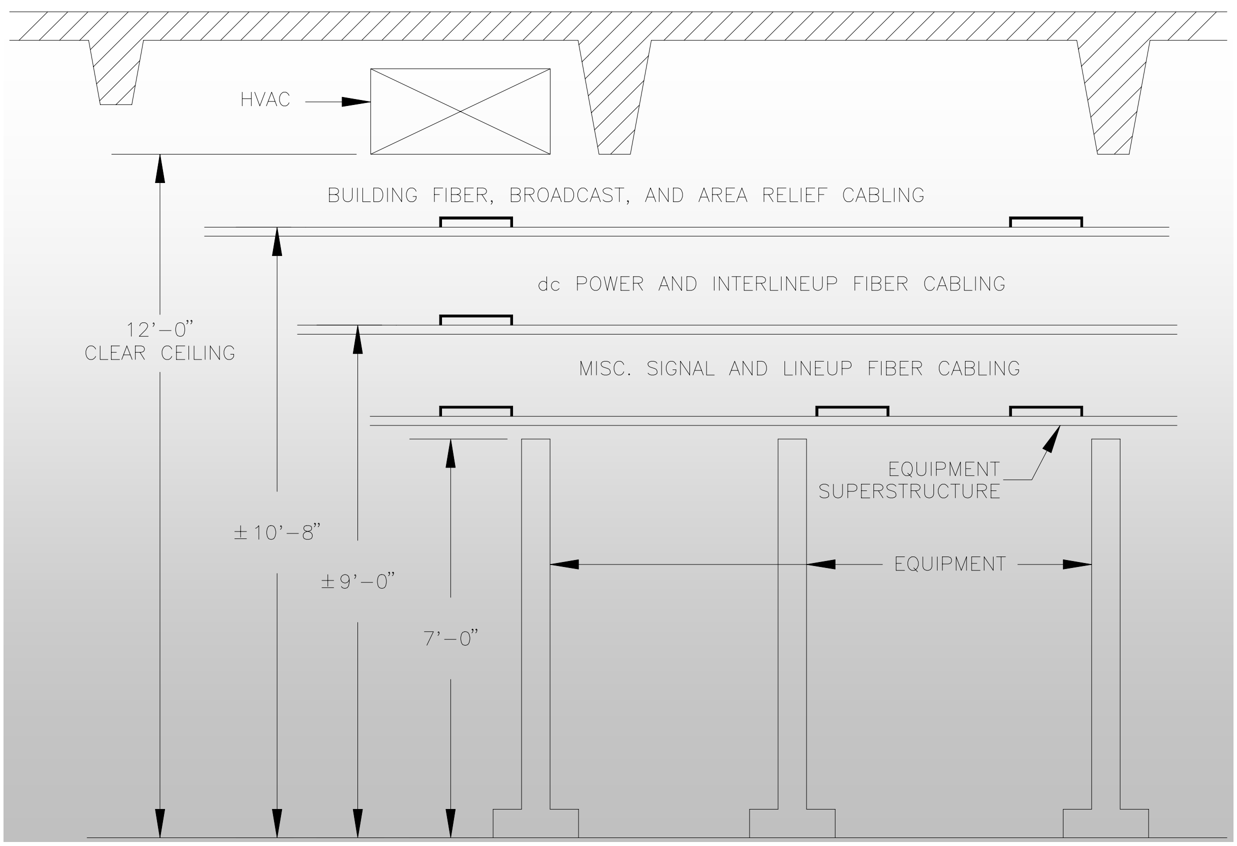



**Figure 2-2b** - Clear Ceiling - Transport And Collocation Areas

## 2.6 Column Designations, Sizing and Spacing

2.6-1 Column designations enable more effective communication of relative locations within equipment areas during emergency response situations and during normal business activities. Accordingly, all building columns within and perimeter to network equipment areas shall be designated using their corresponding unique identifier appearing on office floor plan records. Column designations shall be in the form of labels having *3 inch black characters on silver industrial grade self adhesive reflective media.* Each character of a column designation shall be spaced 2 inches apart.

2.6-2 Column designations shall be applied at the 6'-6" and 13'-0" levels to facilitate communicating relative locations during emergency situations from the floor or from within the equipment's overhead superstructure. Labels at the 13'-0" level shall be on all four sides of building columns (four opposing sides of circular columns). Labels at the 6'-6" level shall be on all four sides of columns in areas that are void of network equipment. Where network equipment does exist, labels at the 6'-6" need only be applied on the front and rear aisle sides of building columns.

2.6-3 Starting at one corner of the building plan, all columns in each vertical row are assigned a letter beginning with ‘A’ for the first row, ‘B’ for the second row, etc. and columns in each horizontal row are assigned with 1 for the lower row, 2 for the next row above, etc. Refer to figure 2-3 for an example of the designation plan. Each column is thereby designated a combined letter and number, and columns of future extension on sides remote from the starting corner may be similarly treated in sequence. *It is important* that the starting corner be selected so that there is no probability of extension being made beyond either of the two walls forming the corner.

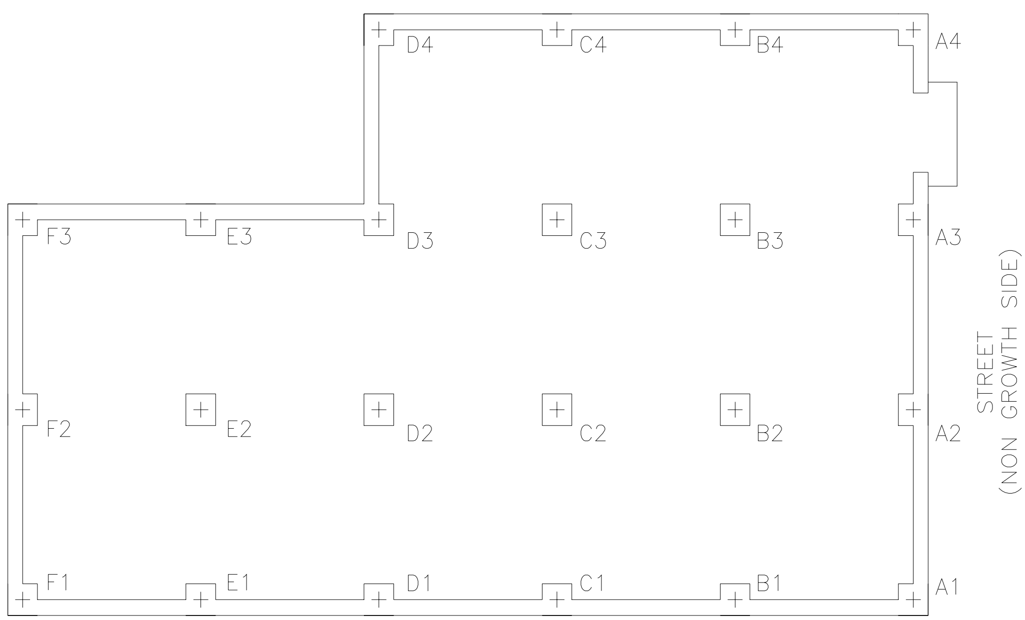



**Fig 2-3** Column Designation Plan (not to scale)

2.6-4 Column Spacing

Traditional equipment buildings have 2'-0" x 2'-0" columns spaced on 20 foot centers. Column sizes of new construction should not exceed the traditional 24" x 24" size to complement established equipment space planning practices. The columns line in multistory buildings that are inline with equipment lineups should contain some cable holes. Column spacing in new construction should not be less than 16 feet on center or more than 20 feet on center when practicable. Network engineering shall be consulted in the design phase of new construction when the minimums and maximums of column sizes and spacing must be used.

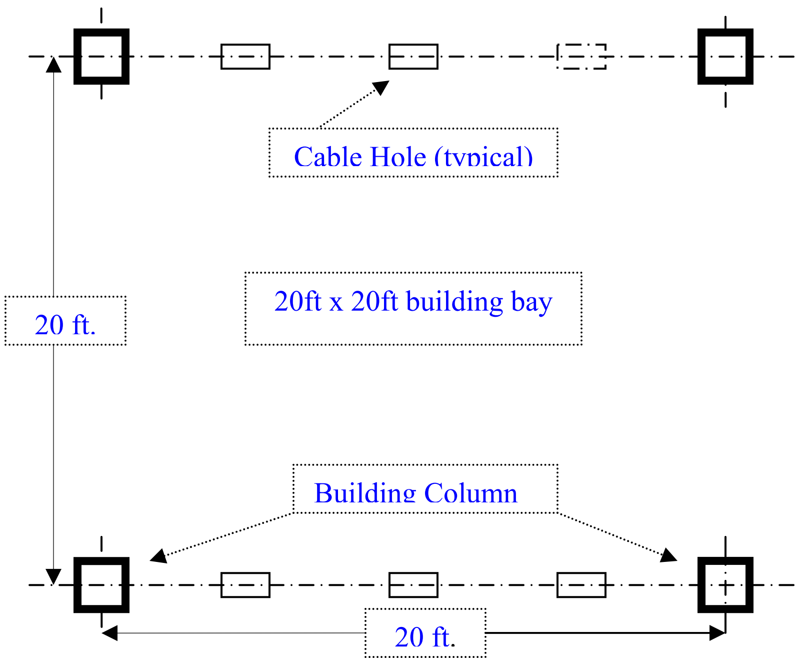



**Figure 2-4 Column Spacing and Building Bay**

## 2.7 Cable Holes and Slots

2.7-1 Sufficient provisions shall be included in building designs to permit a reasonably "at-will" approach to interconnection of equipment on different sides of floors and walls. To accomplish this building floors shall be equipped with cable slots or individual cable holes between columns and under planned locations of conventional office distributing frames. Cable slots between building support columns shall be no less than 1'-0" and no more than 1'-3" wide and should be as long as reasonable construction techniques permit.

2.7-2 Cable slots under conventional office distributing frames shall be 8- to 10" wide and run continuous along the floor except that they should begin and end 4'-0" from perpendicular walls.

2.7-3 Distributing frame cable slots shall be located from their paralleling wall/column surface according to the design of the distributing frame to be used. Ideally distributing frame floor anchors will be located in concrete rather than the structural steel forming the cable slot.

2.7-4 A minimum of three general use (1'-0" x 2'-0") cable holes shall be installed between building columns and arrayed across entire equipment areas.

2.7-5 Cable holes in walls shall be minimally 2'-0" high x 2'-4" wide for network equipment interconnection applications. The bottom of holes used for power equipment interconnection should be no less than 9'-0" above finished floor. The bottom of holes used for miscellaneous equipment interconnection should be no less than 7'-5" above finished floor. Cable holes in walls shall be located latterly in quantities to suit foreseeable site-specific equipment configurations.

2.7-6 Cable holes in hollow wall constructions shall be framed on all four sides.

2.7-7 Cable holes in non-fire barrier walls shall not be equipped with covers.

## 2.8 Building Cooling System Design and Operating Considerations

2.8-1 The physical design of network equipment evolves rapidly. Two major trends that impact on physical compatibility are the increased modularity of equipment systems and the increased density of electronic packaging. Modular design makes it easier to increase the equipment capability without requiring the purchase of new equipment. Increased capability is being packaged into smaller and smaller equipment enclosures. The environmental compatibility of such equipment becomes an even greater consideration because of the heat loads generated by the equipment. *Effective environmental control is imperative*, both internal and external to equipment, to minimize the potential for service disruption.

In order to ensure proper sizing of HVAC systems in a particular central office (initial design phase when actual heat dissipation characteristics of equipment are not known), the equipment heat dissipation criteria shown in Table 1 shall be used.

| Building Category[2] | Watts / Sq. ft. (Design Allowance[3]) |
|---|---|
| 1 | 45-50 |
| 2 | 35-45 |

Table 1 Equipment Heat Dissipation Criteria

2.8-2 Specific Equipment Heat Load

It is the *responsibility of* network engineering to ensure equipment heat load information is communicated to local real estate organizations. This is important, as HVAC Plant sizing is dependent upon the heat load provided by the network group. Equipment heat load information shall be communicated by the Common systems Space Planners to real estate **before** equipment is added to, removed from, or relocated within network equipment spaces. Equipment heat load for specific equipment shall be provided to CRE either through SAF (when a new high heat producing equipment is added, i.e. equal or greater than 100 watts/sq. ft.) or when a copy WCFF is submitted to the CRE project manager bi-yearly.

## 2.9 Building Environmental Guidelines

2.9-1 Operating Ambient Temperature[4]

[2] For more information related to building category refer to section 6 of the latest issue of the "Wire Center Planning M&P." Corporate Real Estate shall consult Common Systems Space Planners to determine current building category.

[3] The heat dissipation limits per square foot in a central office are to be used for sizing HVAC cooling needs for a central office when a new building is being built, or when detail equipment heat information are not available in a timely manner. The CRE and network have agreed to use these limits in absence of any detail data (to ensure that HVAC air handlers, chiller and condenser pipes, and main air supply ducts are sized for the maximum building capacity, initially); hence, a design plan for an ultimate HVAC growth.

Operating ambient temperature indicates the central office aisle temperature rather then return air or thermostat temperature. The operating ambient temperature *will be maintained by CRE* to the levels stated in Table 2-2. Rate of temperature change shall not exceed 56°F per hour. The upper limit of the temperature range may be lowered in a specific CO if it is determined that equipment located in the CO is temperature sensitive[5].

In general telecommunications equipment are built robust to sustain a long term temperature and humidity reliability, and shall continue to operate reliably when CO ambient temperatures exceed the ranges stated in table 2-2, provided:

- the CO average ambient temperature[6] does not exceed 78°F continuously
- and the ambient temperature measured in front of the equipment ("hot spot") does not exceed 85°F, and
- the CO average ambient temperature does not exceed 85°F for over 4 consecutive days.

2.9-2 Recommended Temperature & Humidity Levels in a CO

| Area | Normal Operating Ambient Average Temperature Range | Normal Operating Relative Humidity Range[7] |
|---|---|---|
| Switch/Transport: Occupied/Unoccupied | 65°F - 78°F | 15 – 55% |
| Power Room Without Batteries | 50°F - 85°F | 5 – 55% |
| Power Room With Batteries | 50°F - 77°F[8] | 5 – 55% |

Table 2-2 **Recommended Temperature & Humidity Levels in a CO**

2.9-3 Wide Band Temperature Protocol

In COs with Wide Band temperature protocol (refer to Table 2-2), CRE should be notified when any ambient temperature measurement exceeds 83°F, or the average CO ambient temperature exceeds 80°F for 24 hours.

- An audit of the facility must be performed by CRE per the Wide Band checklist as described in section 16.5, before the ambient temperature in COs (operating in the traditional Narrow Band range (70°F to 75°F) is changed to the Wide Band range (65°F to 78°F).

[4] Per Telcordia GR-63-CORE, ambient temperature should be measured 59" above the floor and 15.8" away from the face of the equipment.
[5] NOTE: All new equipment is tested for reliable operation at much larger range of continuous and short-term ambient temperatures than stated in table 2-2 (i.e., max 104°F continuous and 122°F short-term).
[6] The average of temperature measurements taken every 10 ft. in each equipment aisle. Measurements should be taken as described in footnote 3 above.
[7] Bellcore studies show that it may be economically advantageous to humidify up to 15% when existing humidification equipment is present. In COs that have existing humidification equipment and the RH values drops below 15% for periods longer than short-term durations*, the humidification equipment shall be activated such that the relative humidity levels will not fall below 15%. Bellcore studies also state that humidification should be considered for mission critical equipment, in unhumidified spaces where Tandems, 911 Routers, or STPs are located. Design considerations should be supported by environmental load analysis. Installation of humidification should be considered with levels set at 15% RH.

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

[8] 77° F is for battery string area space ambient temperature (not measured by electrolyte temperature). In no instance shall heating systems be utilized to raise the space temperature to 77° F.

2.9-4 Recommended HVAC provision for dc Power Rooms

Battery & dc Power rooms shall meet the following conditions:

- All new power rooms shall be equipped with air conditioning with the ability to meet a 50/77°F aisle temperature rating. This becomes applicable to existing battery room in case of major building addition. COs that can be identified through power reviews performed by Maintenance Engineering, METS, LFO and Reliability Personnel that do not meet ambient temperature criteria, shall be brought up to the 50/77°F standard.
- For new power rooms, NP&E representatives shall work with CRE in identifying specific power rooms and heat load that will be included in any building additions. The CRE representative shall recognize these spaces with regard to conditioned air and minimum air exchanges needed for rooms containing flooded batteries.
- When a major power plant (dc power plant, Inverter or UPS System) is added to existing floor space, the conditioned air space shall be reviewed and re-validated.

## 2.10 HVAC Systems Requirements and Overhead Obstruction

2.10-1 Conventional Equipment Cooling without LumiCool light fixture

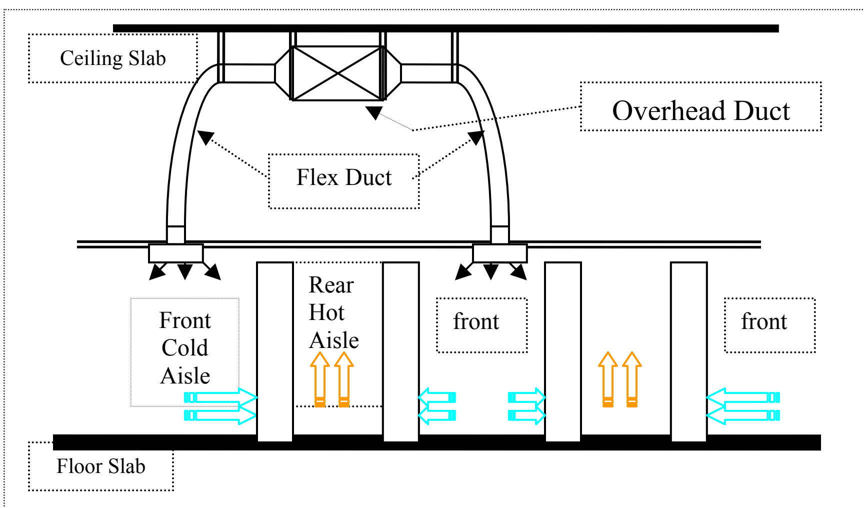



**Figure 2-5 Conventional air Cooling**

2.10-2 CRE is *responsible for* setting standards for equipment cooling requirements, the design of ventilation and air conditioning systems, air filtration, and seismic design guidelines for electrical and mechanical systems. CRE shall assure that all building mechanical and electrical systems (e.g. pipes, chillers, ducts, etc.) are secured and seismically braced in accordance with the recommended practice.

2.10-3 The location of mechanical room is critical and shall be placed (when possible) adjacent to power and switching equipment areas where larger ventilation ducts can be more easily accommodated in order to appropriate clear ceiling heights as discussed in section 2.05

2.10-4 It is also recommended that the primary air supply and return ventilation ducts shall not be engineered above office distributing frames, unless absolutely necessary. Any required ventilation/cooling air movement at office distributing frames shall be achieved by the use of minimally sized ducts placed at the ceiling to maximize cable pileup and people access capabilities above distributing frame frameworks and equipment aisles. Secondary air supply ducts such as vertically oriented ducting and diffusers may extend below an equipment area's clear ceiling when necessary to provide required air flow provided the ducting does not interfere with access to or the cable pileup capacity of equipment cable distribution systems and equipment lighting arrangements.

2.10-5 Equipment cooling air flow shall be directed down the front of equipment aisles unless otherwise specified by the engineering documentation issued for a particular equipment system or technology area. The cooling fans of network equipment generally draw air in from the front of equipment frames and cabinets.

2.10-6 Extensions of existing HVAC ducting above network equipment areas shall be (where possible), accomplished in a manner that provides a minimum of 1’-0” of clearance between the bottom of new air ducts and the top of existing office cable rack assemblies (the structure supporting equipment cabling). The LFO shall be notified whenever the foregoing cable pile-up clearance is not possible.

2.10-7 The engineering of ventilation duct arrangements for a given building or equipment area shall be accomplished in a way that maximizes access to superstructure support apparatus located at or in the building's ceiling. LFO shall be consulted when it is apparent or questionable whether ventilation ducts will encroach the clear ceiling heights mentioned in section 2.05. or whether access to ceiling inserts or U channel will not be sufficient for earthquake bracing purposes[9].

2.10-8 When need be, the network working with CRE shall decide whether equipment frames below the area requiring new ventilation ducts be reconfigured, or the floor space below should be used for some other purpose, or a suitable superstructure support and bracing arrangement should be installed before installation of the ductwork.

2.10-9 **Equipment Cooling using LumiCool light fixture**

2.10-9.1 LumiCool light fixtures include an integral means of distributing conditioned air directly into equipment aisles with minimal impact on overhead cabling and ironwork arrangements. LumiCool fixtures have the below physical and electrical characteristics as illustrated in Figure 2-5, and the product information included at the end of this practice.

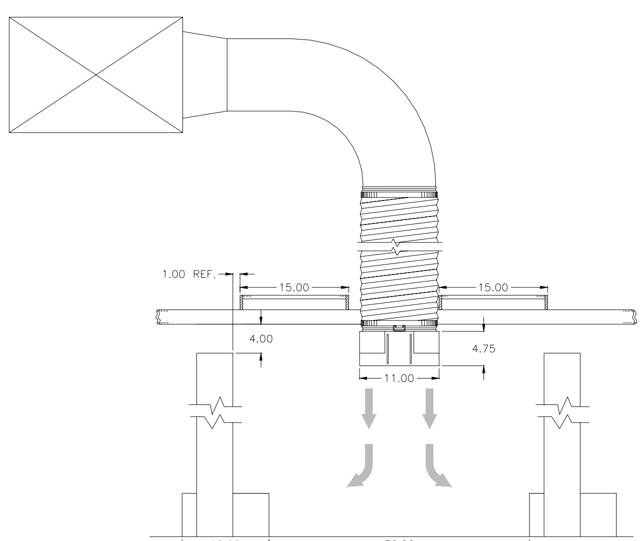



**Figure 2-5, Cross section: LumiCool fixture installed in line-up.**

[9] refer to BSP800-006-150MP for earthquake bracing methods

2.10-9.2 Unless otherwise directed by AT&T's local real estate representative, LumiCool fixtures shall be EF&I'd for all new equipped areas scheduled for installation after March, 2005 as part of NP&E's normal site conditioning or detail equipment engineering processes. Traditional lighting fixtures shall only be used to finish out existing lighting arrangements and where required due to space restrictions or special equipment/area requirements.

The objective for equipment areas equipped with LumiCool fixtures is for each 5-foot section of lighting fixture to be connected to the office HVAC ducting via a 10" diameter flexible duct. Office cable racking arrangements shall be accordingly planned and installed to accommodate this objective where possible.

Unless otherwise negotiated for a particular job or service area, AT&T's HVAC contractors will install flexible ducting between LumiCool fixtures and the office HVAC system. AT&T's detail engineering service provider shall accordingly notify AT&T's local real estate representative as soon as the equipment lighting and superstructure arrangements are conducive to flexible ducting installation.

## 2.11 Air Quality in a CO

2.11-1 General

Growing concerns for improved indoor air quality (IAQ) coupled with a demand for greater energy conservation and proper filtration of outdoor air, often presents a dilemma for design professionals. IAQ standards call for increase outdoor air. This often creates a requirement for additional ventilation (heating or cooling energy). A good IAQ in a CO is measured in terms of ventilation requirements (for example, a minimum air change per hour ACH requirement is met) and filtration requirements (for example, cleanliness of air from contaminants, such as, airborne particulate matter, hygroscopic dust, volatile organic compounds, gaseous pollutants, fibers, human debris, products of combustion) being met. Poor IAQ has negative economic impacts in sense of damage to materials and equipment or loss of productivity.

2.11-2 Ventilation Requirements

Proper ventilation of a building is a balance between removing pollutants that originate indoors and keeping out pollutants that originates outdoors. **Ventilation is not necessarily introducing outside air to indoors, but could be recirculation of clean air.** In general, the air exchange rate (with outside air) for all building space should not be less than ¼ ACH or 20 CFM per person, whichever is greater. A decrease in usage of outside air in some COs may be necessary to reduce outdoor gaseous contaminants or the count of particles 0.5 micrometers and larger. Such approach could be based upon historical trends.

The ventilation requirement shall be guided by Telcordia document *"Ventilation of Central Office Buildings'* BR 781-810-885 and Section 6-5 of *TP76400.* Local codes or practices that exceed the ventilation rates specified above should be followed.

2.11-3 Air Filtration Requirements

Airborne particles typically has bimodal mass distribution. Particles larger than 2.5 micron diameter are referred to as "coarse," those smaller than 2.5 microns diameter are called "fine." Fine and coarse particles tend to have different sources, different chemical compositions, and different physical properties. Fine particles pose the greater threat to modern circuitry for several reasons, and are much more difficult to remove from an airstreams. Motion of coarse particles are influenced by gravity, those of fine particles are influenced by air currents. Hence, coarse particles are likely to accumulate on topside horizontal surfaces, while fine particles are equally likely to soil vertical and horizontal surfaces.

Airborne particulate matter is known to contribute to the failure of electronic equipment. For example, carbon soot is a good conductor and can lead to short circuits on circuit boards and in exposed connectors. Typically, water soluble salts account for more than half the mass of indoor fine particles in switching offices; most of these are ammonium sulfate salts. Hygroscopic salts are a major component of airborne particulate matter and, under conditions of high humidity, have led to circuit pack failure by forming alternative conduction path. Semi-volatile organic compounds are released from plastic components and form non-conductive polymers on metal connectors. The microprocessor and chips are very sensitive to the pollutants. Computer boards inserted into slots with these polymers-coated connectors may fail. Also, abrasive particles cause friction wear on mated connectors leading to the loss of thin precious metal plating, thus exposing the base metal beneath to the environment. Gaseous pollutants, such as, $O_3$, NO, $NO_2$, $H_2S$, $SO_2$ can react indoors to generate acidic species that are potentially harmful to equipment. In area of the country with severe photochemical pollution, gaseous species such as $NO_2$, nitric acid and nitrous acid may be contributing to the buildup of hygroscopic salts at a faster rate than sub-micron particles. Organic vapors in a CO usually originates from indoor sources, and can lead to material deterioration.

The levels of Airborne particulate matter within buildings vary widely by both location and time of the day. Though it is not necessary to maintain a CO in a clean room environment, but sufficient filtration and ventilation must be provided to prevent contamination buildup, and to keep the contaminants within the allowable range in a CO. Some high air pollution city like Burbank, California may dictate the *use of a high* efficiency *filters*.

*CRE is responsible for* determining proper ventilation and filtration requirements for COs, and shall assure that at least a minimum of "65% ASHRAE dust spot rating" air filtration requirement is met, proper ventilation is provided. The following are Telcordia[10] Air filtration Recommendations.

- 65% ASHRAE dust-spot rated filters for facilities located in rural areas.
- 85 or 95% ASHRAE dust-spot rated filters for facilities located in urban areas or areas where outdoor air pollution is severe.
- 30% ASHRAE dust-spot rated pre-filters for all facilities.
- 85% arrestance filters for all fan-cooled equipment frames such as those found in digital switching equipment.

The rating of filters are presented in ASHRAE standard 52.1-93. Please note that the ratings most often do not reflect the actual particle removal efficiency; e.g., for 85% ASHRAE dust-spot rated filters, the removal efficiency is nominally 75-80% for 0.5 µm particles.

2.11-4 Environmental Envelope During Construction

During the building construction, the equipment environmental envelope shall be enclosed by a combination of permanent walls, temporary protective sheeting, temporary protective paneling, and exit doors or flaps(where necessary). These materials shall be fire-retardant and shall not significantly contribute to particulate or gaseous contamination load within the envelope. The use of these materials will create a compartment that is essentially free from the influence of the installation activities. The application of the *environmental envelope* shall also facilitate the heat release requirements of the telecommunications equipment contained within the environment. The *temperature*, *relative humidity*, or *rate of temperature change* within the envelope shall not, at any time, exceed the limits for operating conditions specified in table 2-2. Further, precaution shall be taken by the placement of adhesive *floor mats* in front of all construction area exits and at entrances to environmental envelops. The environmental envelope must not be compromised at

[10] Glen G. Neuberger Letter to Sha Hoda dated January 31, 1994 File: LG-ES-94-03 Client: 2480

any time during installation. Environmentally enveloped area shall be maintained under a slight *positive pressure* (.05”$H^2$0), and *fan operation* must always be continuous. The parameters of airborne-particle counts, temperature, relative humidity, and environmental envelope differential pressure should be *monitored daily* during the heavy construction period. For further detail, refer to *TP76300* for protection of network equipment during the construction.

### 2.12 Building Lighting Guidelines

2.12-1 General Building Lighting
Central office building lights are provided by the CRE. In planning a equipment lighting system, adequate and efficient lighting at all locations shall be taken into consideration. Adequacy implies that the quantity and quality of illumination are sufficient for the task or other activity, while efficiency implies that unnecessarily high illumination levels have been avoided and that high performance light sources selected are being used economically. Economical means the lights are placed where needed only, can be turned off, uses less energy, and can be maintained.

2.12-2 Equipment Lighting
T8 fluorescent lamps and electronic ballasts shall be used in equipment and operating areas because of their relatively high light output per watt. Fluorescent lamps with the most color correct rating shall not be used (i.e., do not use pink, blue or other tinted lamps). A light switch shall be provided at each entrance of the central office. Lighting fixtures shall not be placed directly over batteries. Motion detector lighting control (infrared technology) shall only be used in central offices where special circumstances dictate their use (e.g., some collocation spaces). Additional frame and aisle lighting requirements are given in section 8 of TP 76400MP, “Illumination.”

2.12-3 Emergency Lighting - General
General building emergency lighting is provided by Corporate Real Estate.

### 2.13 Fire Suppression and Fire Detection

2.13-1 General Policy

Telecommunications buildings are exempted from installation of fire suppression device such as sprinkler systems due its implication on network equipment. Sprinkler systems may be used in other parts of the building, such as office area and storage room depending upon the local code. *In lieu of installing a fire suppression system in COs,* AT&T has instituted strong fire prevention and fire detection strategies. This includes installation of most advanced fire and smoke detection technology, deployment of fire resistant materials, provision of fire alarms and fire drill programs; and instituting several other means, such as depowering electrically energized equipment, air handling strategies during smoke control and smoke exhaust, firestopping through cable penetrations, etc..

2.13-2 Due to the variety of fuels contained within a central office, a broad coverage smoke detection including both ionization and photoelectric detectors may be applied. The systems mentioned below may be present in AT&T wire centers.

a) Early Warning Fire Detection (EFWD)
b) EWFD Alarming – to avoid blunting the response to actual fire events as a result of too many false alarms.

Other fire suppression device or fire detection device may be installed depending upon the local jurisdiction and building occupancy type.

NFPA 72 section 2-3.4.1.1 - The location and spacing of smoke detectors shall result from an evaluation based on the guidelines detailed in this code and on engineering judgment. “Engineering Judgment” means predicting flow patterns to intercept combustion products or smoldering smoke from line-ups. Some of the conditions that shall be included in the evaluation are the following:

- Ceiling shape and surface
- Ceiling height
- Configuration of contents in the area to be protected
- Burning characteristics of the combustible materials present
- Ventilation
- Ambient environment

Since smoldering smoke is diluted as it leaves equipment, and affected by room air flow, aisle air flow, air flow thru equipment, and return air flow to HVAC, the detector placement is intended to intercept smoke off equipment as opposed to rising smoke finding a detector. Take issue with detector height above finished floor and judgment about air flow patterns from equipment lineups. Detectors shall be visible from the floor.

2.13-3 Fire detection and alarm reporting systems shall comply with the latest standards for "*Operational Guidelines for Fire Detection and Alarm Systems in Telecommunications Buildings*," section PBS-766-100PT, Issue A, February 1995.

2.13-4 Because of the potential for interfering with the cable management needs of network equipment and equipment evolution within a given area, fire detection and/or fire suppression apparatus shall never be installed within an equipment area's clear ceiling height space without explicit coordination with network engineering.

### 2.14 Compartmentation

2.14-1 Compartmentation refers to building construction within the confines of a building's exterior walls. Compartmentation of work and equipment areas within network facilities shall comply with the latest standards on *Fire Safety Compartmentation*. In a high risk areas, partitioning walls constructed within and adjacent to equipment areas shall withstand at least 1.0g lateral ground acceleration to ensure their exceeding the UBC Zone 4 requirements. Partitioning walls shall not be attached to the overhead superstructure created for network equipment.

2.14-2 Generally, fire rated construction shall be used to separate engine rooms, power equipment areas containing batteries, and storage rooms from people and network equipment areas. Non-combustible construction shall be used when it is desired or necessary to compartmentize large network equipment areas into smaller ones for equipment management or maintenance reasons.

2.14-3 It is important to distinguish "fire rated" construction to avoid anyone needlessly firestopping every hole they go through; by the use of Company approved labels and/or by the absence of doors installed at pass through locations. All cable holes penetrations through fire rated walls must be properly fire and smoke stopped, and labeled, as described in the BSP 800-005-200MP *"Common Systems- Through-Penetrations Firestopping Requirements."* All other types of penetrations through a fire rated wall must be fire and smokestopped as well.

### 2.15 Safety

2.15-1 Local building codes may dictate minimum egress/ingress and working clearance requirements. Ventilation requirements must be maintained as recommended in Bellcore document BR 781-810-880. Posting of hazardous materials must be maintained per OSHA and EPA requirements. Building materials shall be environmentally safe. If possible, remove all floor tiles that contain hazardous materials. The following considerations must be given when planning for safety.

1. Egress/Access Requirements (are based on NFPA codes)
2. Working Clearances (are internal AT&T aisle requirements)
3. Hazardous Materials (are based on OSHA, EPA requirements)

### 2.16 Bonding and Grounding

2.16.1 Standards for bonding and grounding are contained in ATT-TP-76416 "*Grounding And Bonding Requirements for Network Facilities*." The network facility grounding and bonding system provides:

a) Grounding of communication systems equipment units,
b) Earth potential reference for ac and dc power systems and communications circuits,
c) Lightning and 60 Hz current discharge paths for communication system entrance cable protectors, and
d) Current paths for equalization of dc voltages.

### 2.17 Raised Floor Equipment Environments

2.17-1 In AT&T raised floors system (or access floors) may be used in the equipment environment for installation of data equipment, network equipment and peripheral equipment with under-floor cable management. Electronic equipment is installed on a raised floor system where there is a preference or need for placing cable under the floor for situations such as:

a) For equipment designed for installation on a floor system with cabling entry from under the floor as intended by the equipment manufacturer,

b) To avoid costs for building modifications to accommodate a ceiling supported equipment superstructure arrangement,
c) To provide a cable management alternative for areas where overhead clearance does not exist for a ceiling supported equipment superstructure arrangement.

2.17-2 For network applications, raised floors system shall not be used as air plenum. Cable management space and cooling air delivery should be separated to avoid conflict of space use.

2.17-3 Standards for raised floor equipment environments are contained in:

BSP 800--000-103MP "*Technical Requirements For Raised Floor Systems* - *Network Equipment Applications,"* and,

BSP 800-000-103MP Appendix 1, "*Guidelines For Cable Rack, AC and Alarm Conduit And Framework Installation On Raised Floor Systems*."

## 2.18 Electrical Protection

2.18-1 Electrical protection requirements are contained in separate BSPs having 876 Layer.

| | |
|---|---|
| BSP 876-101-130MP | *Electrical protection Grounding* |
| BSP876-310-100MP | *Electrical Protection of Communication Facilities Serving Power Stations* |
| BSP876-400-100MP | *Cable Electrical Protection Engineering Considerations* |

# Section 3
# WIRE CENTER SPACE PLANNING

## 3.1 General

Wire center planning is the deliberate and harmonious combination of network technology disciplines and real estate management for the purpose of ensuring local network growth without compromising network capabilities and are therefore collectively supportive of the Company's business strategies (network reliability and service provisioning). Effective planning consists of a clear understanding of the following:

- Organizational roles and responsibilities relative to wire center planning, and preconditioning
- Organizational roles and responsibilities relative to collocation space survey,
- Allocation of wire center floor space based upon forecast sheet, space assignment form, and the long form, and general building activities,
- The product(s) to be produced by the planning activities (wire center plans),
- When validation of plans and their progress with implementation should occur, and
- Mitigation strategies should plan management problems arise,
- Wire Center space reservation policy and equipment space forecasting strategies

## 3.2 New Technology Introduction

The selection and introduction organizations of new network products and technologies are responsible for communicating the baseline planning and engineering considerations associated with new products and technology to space planners and line engineers as the products/technologies are approved for use. To accomplish this, the engineering and space planning *information* documented by equipment suppliers via forms ESP-001 and ESP-002 (AT&T document TP76200) during the initial product evaluation process shall be made available to line engineering when new products are approved for use.

## 3.3 Vendor Provided Equipment Space Planning Data

3.3-1 Equipment Space Planning Guidelines
Vendor's documentation for a large system should include Equipment Space Planning Guidelines that provide specific information for arranging the required equipment frames in an efficient layout within the building structure, as well as data for planning and coordination of these layouts. These guidelines should cover the following areas:

1. Floor load distribution
2. Cable distribution
3. Lighting
4. Power
5. Equipment cooling
6. Fire Safety considerations
7. Seismic considerations

3.3-2 Initial Information
The space planner's needs will vary throughout the equipment system planning process. Broad general information will usually suffice in the initial stage of the planning process. Later planning tasks require more detail information. Thus, data for an equipment system may come in several stages. *The space planner must have the following information at the earliest possible so*

*that the telephone power, electrical service, and cooling requirements can be determined:*

- Frame dimensions, including guard rail dimensions
- aisle spacing
- weight
- Heat dissipation
- Power requirements
- A dimension sketch should be provided by the vendor when other physical considerations affect floor space during installation, operation, and maintenance. The following should be shown on the vendors provided sketch:
  - Door swing clearance
  - Protrusions (writing shelves)
  - Front and rear aisle minimum space between front and rear guard rails
  - Any other information that would be helpful in the development of a layout
- For a frame containing like multiple units, or multiple elements, the vendors should provide the frame capacity for such units or elements, for example, the quantity of trunks, circuits, etc., for which space is available in the frame.
- DC Current Drains
  The vendors should specify the maximum and the minimum frame current drains for each dc voltage that is required. When the frame is powered by more than one bus, the currents that would be supplied by each input should also be specified. Normally, DC current drains are identified as either List 1, or List 2 or List 3 drains.
  - List 1= average current drawn by equipment operated at normal voltage and operating conditions during the busy hour of the busy season. Used to determine the size of dc power plants, i.e., rectifiers and batteries.
  - List2 = the peak current that is imposed on a power feeder at any voltage within the normal or emergency operating conditions. List 2 current drain may also be caused by circuit variation (traffic, test condition, etc.) while operating at normal voltage. Used to size the distribution plant.
  - List3 = Used to size a converter plant. Normally, not required.
- Cabling Data
  The vendor should provide,
  - the details of the interframe cabling that includes the cross sectional area of the cable interconnecting each frame to all other possible frames and maximum interframe cable lengths or other interconnection limitations.
  - For transmission systems equipment, the switchboard (non power) cable connected to a frame can generally be divided as:
    - Line-side cable – transmission cable from a frame on the line facility side,
    - Drop-side cable – transmission cable from a frame on the subscriber or terminating side,
  - Other cable related information (cross-sectional area, separation, shielding, length limitation, cable termination, limit of frames per lineup or various ways of cabling, cable spreading)

  The vendor should provide the effective cross-sectional area of the cable that ends on the frame, and is distributed to other frames in the overhead cable rack. It should

include the area for all cable to and from the frame. Vendor should also provide any special requirements such as separation, shielding, length, etc. If there is a limitation on cable length between two frames, the constraint should be stated. Also, a note should be provided for a frame on which a large cross-sectional area cable terminates. This note should recommend a limit of such frames per lineup or various ways of cabling to avoid cable congestion
*For power conditioning frames*, a note should show the maximum cross-sectional area, in square inches, of a power cable that should be connected to the frame through access opening provided.
*For distributing frames*, expanded cable cross-section specifications and cable spreading information should be included.

### 3.4 Equipment Footprint Data

Available in the form of "job aid" prepared by the Common Systems Application Engineering are equipment foot print data. Initial application data for manufacturers (e.g. Alcatel, Fujitsu, Nortel, Cisco, etc.) of newer generation equipment is being gathered on a going forward basis.
Figure 3-1 provides dimensions of Cisco ONS 15454 equipment on a shelf-level basis (shelf height, width, depth, weight, number of shelf in a relay rack, top and bottom spacing). Figure 3-2 provides dimensions of bay footprint and how configured for field installation (relay rack width and depth, recommended spacer size between relay racks for cable management and heat dissipation, front and rear guard box depth, and minimum front and rear aisle spacing requirements). Also, data regarding power drain (List 1, List2), BDFB and shelf fuse size, and heat dissipation (total watts per bay) are provided in the job aid for the convenience of space planners.

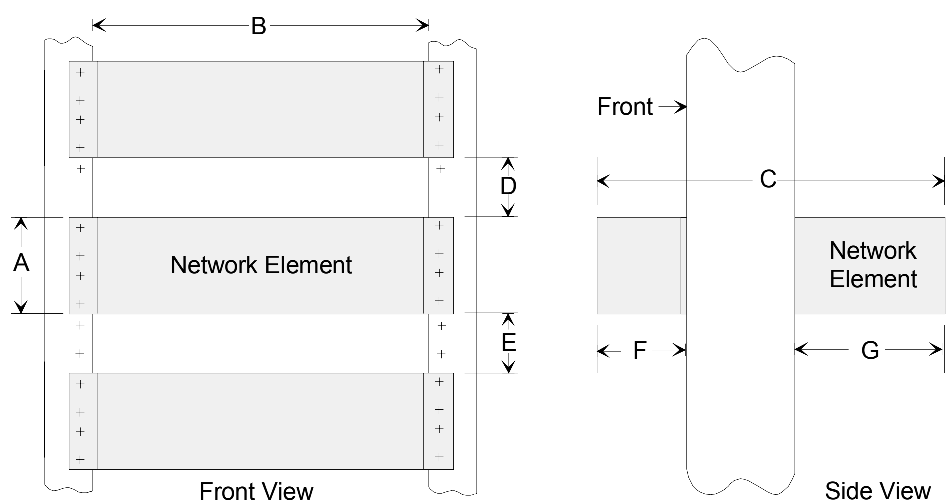
When spacers, (i.e. spacer junction, frame extender, cable spacer, spacer box) are required between equipment frames, the space between frames shall include a base filler matching the guard box details of adjoining equipment frames and a full height filler panel covering the space between frame uprights (unless an AT&T standard drawing indicates that a filler panel is not required for a specific project). Refer to TP76400 Section 5-2.2.6

Refer to examples (figures 3-1, 3-2) below for equipment footprint data available on APEX for all new transport equipment approved for use as of year 2004 onward.

**Example of Shelf Dimensions**

The following are shelf-level equipment dimensions. (Example - Cisco ONS 15454)

| **Relay Rack Capacity** | | **Weight** | |
|---|---|---|---|
| 2 units per seven-foot relay rack | | 165 –lbs Each | |
| **A Height** | **B Mount Width** | **C Depth** | **D Dimension** |
| 18.5-inches | 23-inches | 18-inches | 0 -inches |
| **E Dimension** | **F Dimension** | **G Dimension** | |
| 1 -inches | 5 -inches | 8 -inches | |




Note-1: The drawing above is not to scale.

Note-2: D=Top spacing, E=Bottom spacing

**Figure 3-1** Space planning data for the network element ( shelf level)

List-1 Power

The List-1 power drain per bay is 33 amperes.

BDFB Fuse Size

The List-2 power drain *per bay* is 48 amperes.

Note: The vendor will compute the fuse and power cable size per BSP 790-100-656M&P, DC Power Distribution.

Shelf Fuse Size

Fuse: 24 amperes

Heat Dissipation

The wattage per bay is 920 watts. (data used by CRE for equipment cooling as well by the CSSP for equipment spacing)

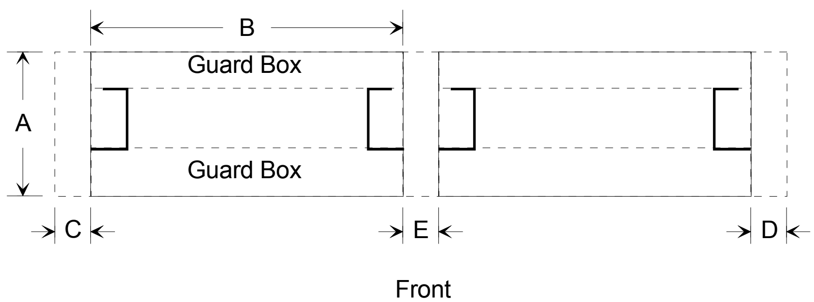
**<u>Example of Bay Footprint</u>**

The following are bay-level equipment dimensions. (Example - Cisco ONS 15454)

| **Floor Plan Designation** | **MDF Blocks Per Bay** |
|---|---|
| C15454 | NA blocks |
| **Minimum Aisle Space – Front** | **Minimum Aisle Space – Rear** |
| CSSP Standard: 36-inches | CSSP Standard: 30-inches |

| **A Dimension** | **B Dimension** | **C Dimension** | **D Dimension** |
|---|---|---|---|
| 18 -inches | 26-inches | 6.5 –inches (Nt-3) | NA |

| **E Dimension** | **Front Guard Box Depth*** | **Rear Guard Box Depth*** |
|---|---|---|
| 6.5 –inches (Nt-3) | 5 –inches | 8 –inches (Note 4) |




| |
|---|
| <u>Note</u>-1: The drawing above is not to scale. |
| <u>Note 2</u> : Dimension 'A' is the total footprint including front and rear guard box. |

**Figure 3-2** <u>Space planning data for the network element ( Bay level)</u>

Note(s)

3. The "C" and "E" space it to be provided by ADC Cable Glides (ADCCM-06). This will provide both cable management space and a big enough heat footprint to allow for 2 unit is the same bay.

4. The 8" rear guard <u>may</u> appear excessive on some initial installs, but it provides for the long term protection if a High-Density back plane is added in the future.

### 3.5 Spacers between equipment bays

Older style bays were likely laid out on drawings without cable spacers between frames. With recent high service density equipment, a minimum 2 1/2 inch spacers are commonly placed between frames, such as, Litespan line-ups and <u>shall not</u> be ignored by space planners when the equipment layouts are developed. The need for extra space because of the seismic frames must be recognized.

The information on spacer size to be used between equipment frames <u>shall be</u> posted on Apex as mentioned in section 3.4.

### 3.6 Maximizing Space Utilization

*Maximizing space utilization* refers to configuring the layout of network equipment environments so that network elements are located in their most appropriate physical relationship *electrically* as opposed to simply placing as much equipment in as little space as possible, or arbitrarily placing like equipment together. Maximization of space utilization is achieved when the following equipment environment layout elements have been harmoniously taken into consideration initially and proactively managed during the life of a network wire center.

- Allocated space for future growth is based on justifiable forecast information as opposed to being arbitrarily determined.
- Space for the linear growth of cross connect equipment and systems is not obstructed.
- The bulk of equipment interconnection cable lengths are minimized.
- Front and rear equipment aisle widths permit the installation of appropriately sized (in width) overhead equipment lineup cable racks.
- Equipment lineup cable rack widths permit sufficient HVAC air circulation to equipment frames.
- Front and/or rear equipment aisle widths facilitate installer access to the overhead environment for cable installation and removal purposes.
- Required types of overhead cable racks (copper, fiber, power, etc.) will not unnecessarily congest/restrict available cable space.
- Equipment administrative and maintenance personnel space is not excessive.
- Obsolete unused equipment whose functionality is no longer needed is removed rather than retired in place. (Refer to the latest issue of Wire Center Planning M&P, for policy on obsolete unused and RIP equipment).

### 3.7 Equipment layouts

The below conditions and interactions <u>shall be</u> incorporated into the space planning drawings developed by 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.

* Equipment layouts <u>shall be</u> in accordance with the Company's standards for network equipment environments.
* Equipment layouts <u>shall be</u> in compliance with published equipment manufacturer's requirements/restrictions relative to actual placement of equipment.
* Equipment layouts <u>shall be</u> reviewed by a tenant representative(s) to ensure the physical relationship of network elements is appropriate and efficient from an equipment operations and maintenance perspective.
* Equipment layouts <u>shall be</u> reviewed by a person familiar with equipment environment cable management and superstructure engineering to ensure those matters are appropriately incorporated into equipment layouts. It is expected that Transport Equipment Engineers and/or DESP (detail engineering service providers) will perform this function.
* Equipment layouts <u>shall be</u> reviewed by a power engineer or person familiar with dc power distribution to ensure equipment power distribution has been sufficiently planned for and accommodated.

For all new constructions or building additions, equipment layouts <u>shall be</u> reviewed by CRE for matters related to code compliance, clearance, general safety, ac power, cable holes, equipment floor anchors, and air conditioning requirements.

3.7-1 Equipment placement when building addition takes place.

Equipment shall not straddle across a joint between two building structures. The risks are that building motions from seismic activity could result in that joint separating. The two buildings would react differently to ground motions due to differences in stiffness and those forces are what pulls the joint apart. Placing equipment perpendicular to the joint line and straddling the frame across the two building sections may cause the equipment frame to follow the movement of the joint and stress the frame. There are many possibilities of stressing the frames, one side of the joint could rise and could bend the frame, the joint may move laterally and torque the frame, the joint may separate and tear the frame base.

Placing the equipment parallel to the building joint would be possible, however it is important that lineups of equipment frames be at least 6 inches away from the joint. The primary reason is so floor anchors securing the frames are not near the edge of the two floor slabs at that joint. In order for floor anchors to perform as designed, they must be at least 6 inches away from the slab edge so no part of the equipment frames would be sitting or be near the building joint. Ideally the building joint should be in the aisle between two lineups.

### 3.8 Floor Space Planning drawing

*Floor space planning drawing is the fundamental reference document used to record space utilization throughout the life of the wire center.* The drawings contain pertinent information related to Plot Plan, Equipment layout Planning and Space Allocation. They are updated constantly to reflect changes in floor space consumptions, almost on daily basis. *The floor space planning drawings do not contain specific installation details and are used for space planning purposes only.* Floor plans are essentially a part of floor space planning drawings and consist of specific equipment location in a building. Floor plans should provide a high degree of standardization while maintaining enough flexibility to permit natural growth from initial to the ultimate equipment configuration. Floor plans should be designed to ensure that all equipment functions together effectively without excessive special engineering or poor use of building space or services.

Once floor space planning drawings have been sufficiently developed, they shall be made available to line engineering for implementation.

Space planners are responsible for developing and maintaining floor plan drawings for each wire center that depicts how available space has been planned and allocated. Details of floor space planning drawing are provided in the latest issue of the Wire Center Planning M&P.

### 3.9 Detailed Wire Center Plans

Detailed wire center plans are the tools developed by network planning groups for network engineering and operations groups to guide site specific equipment and network management activities. Each network equipment facility shall have a comprehensive master floor plan that accurately depicts the evolution plans for the technologies installed in and planned for the facility. The master floor plan shall be supplemented with necessary justifications and time-lines supporting the equipment configurations and space allocations of the facility. The purpose of a comprehensive master floor plan is to not only track equipment locations but to model where in a building new equipment should be located, and from where existing equipment should be removed or relocated to achieve the optimum equipment configuration for that office. Only after an IDEAL floor plan has been developed can a practical plan be implemented to transition less than optimal equipment configurations to an ideal or most appropriate one. Integral to the transition of an existing network facility to a more optimum equipment environment is the removal and consolidation of equipment as discussed elsewhere in this section.

### 3.10 Common Systems Space Planner

3.8-1 In addition to having a master floor plan, each network facility shall be assigned to a Common Systems Space Planner who will serve as Network Engineering's single point of contact for equipment space planning and building utilization matters. This is to minimize confusion about who to contact (geographically) for space planning matters. It may be necessary for more than one individual to manage the equipment space planning of high-rise type network facilities, however, only one of the individuals will be the single point of contact for the facility.

3.8-2 Equipment space planners will:

1. Manage an up-to-date floor space planning drawings for the building or equipment area within a building,
2. Coordinate the progression of technology into and out of the building at the equipment frame level by assigning equipment locations as needed in the facility,
3. Coordinate equipment heat load with CRE,
4. Coordinate power drain load with power planners,
5. Coordinate cable hole plan with equipment engineers, and
6. Coordinate space utilization issues with the network and real estate organization.

### 3.11 Equipment Bay Location Approval Requirements

The physical installation location for all equipment requiring office floor space shall be obtained from the *building's* network engineering equipment space planner ***before*** the equipment is placed into the building. All requests for floor space is submitted through the Space Assignment Form (SAF) that includes equipment's high heat and power drain values. Floor space requirements shall include a description of how the equipment will interconnect with other network elements in the building, and any special cabling or cable rack considerations that are associated with the equipment. Unless specified otherwise, the floor space requirements will include AT&T standard front and rear aisle clearances for individual frame as stated in section 9.5.

### 3.12 Assigning a Bay and Aisle Number

3.12-1 Equipment Numbering Plans for Central Office Equipment
The numbering of bays and frames on all CO records shall be consistent with the Floor Plan Record. Switching equipment shall conform to the manufacturer's lineup and frame numbering scheme. New equipment frames or lineups shall be designated numerically. These numbers shall be unique and assigned only by the CSSP. Accordingly, the Space Planner, using available tools and resources, will develop and administer a master numbering plan for network and "other" equipment areas, and resolve localized frame and aisle numbering issues as they arise. This "single point of contact" relationship should ensure eventual commonality among LEC equipment numbering schemes and facilitate more efficient information exchange relative to new equipment frame location designations.

3.12-2 Aisle Numbering
Numbering shall be applied to equipment racks, relay racks, fuse bay type frames, distributing frames, power boards, rectifier's, cabinets, etc. Lineup numbers for all floors shall consist of up to 5 digits beginning with the number 0101. Reading from left to right[11]:

The first two digits signifies the floor number. $1^{ST}$ FL-01

[11] Refer to the CSSP Floor Plan CAD Guidelines, Section 22, Issue: May 1, 2001

The second two digits signify the line-up on the floor: FL Line No.

The lineup numbers can be assigned on a particular floor per the following examples:

Basement 0001. To 00999.

1st Floor 0101. To 01999.

2nd Floor 0201. To 02999.

10th Floor 1001. To 10999.

NOTE: The above numbers do not include the particular relay rack number. Add relay rack numbers as follows:

| First Floor | 1st Lineup | 1st Relay Rack |
|---|---|---|
| 01 | 01 | 01 |

Consequently, the first lineup on the first floor can be numbered 0101.01 to 0101.99. Consider bays separated by a column, desks or other frames as being in the same lineup.

3.12-3 Frame Numbers in TEOs.

Engineering TEOs issued to equipment suppliers and DESPs shall include explicit equipment/frame installation location information such as RR numbers when such information is how the equipment is normally referenced on/in office records. This practice is intended to minimize physical space management conflicts with multiple coordinating job efforts, and to ensure the relative physical relationships of equipment is clearly communicated to users of TEO information.

## Section 4
## OFFICE LAYOUTS

### 4.1 General

This part contains generic guidelines for developing and managing ideal office layouts for single and multi-floor equipment environments. To the degree practicable, more detailed office layout information is provided in subsequent parts of this section. For the purposes of this section office layouts are hereafter referred to as *Floor Plans* which may be the actual T-base office floor plan record or an accurate facsimile thereof.

All equipment planning efforts shall include adequate growth considerations for HVAC, AC switchgear, miscellaneous storage space, equipment administration and maintenance space, as well as the network equipment elements themselves. Refer to the latest issue of the Wire Center Planning M&P for more detail.

### 4.2 Recommended Office Layout Development Procedure

a) Block Out Major Components of the building and of the network (e.g. Distributing Frame Area, Switching Equipment Area, Transport Equipment Area, Battery Area, Maintenance Area, Equipment Loading Area, Storage Room, Standby Power Room, Air Conditioning Plant, AC switchgear etc.)
b) Identify potentially High Heat Release Areas and equipment
c) Identify major Cable Path (primary) for power and network interconnection
d) Identify Any Physical Special Situations that may impact equipment placement
e) Identify primary people Traffic Pattern and work area needs that may affect Aisle Spacing
f) Establish people Egress and Ingress Paths.

### 4.3 Equipment Height Considerations

Floor space planning shall consider 7'-0" height as the standard elevation for all equipment areas. For all new equipment space and growth to existing space shall be configured for 7'-0" equipment frames with related cable rack and auxiliary framing to support that configuration. Transition plan shall be established as part of the master planning to convert existing equipment areas from equipment heights other than 7'-0" down to the 7'-0" standard height. The plan shall include a strategy for replacing older technologies when time comes with 7'-0" lineups of equipment and systematically convert area to 7'-0". Cable rack and auxiliary framing may have to be staged to grow over a period to allow for systematic transitioning of area.
Equipment Frame Floor Loading

### 4.4 Equipment Frame Floor Loading Considerations

4.4-1 Generally, Bell System network equipment structures have been constructed with floor load capabilities of 150 lb./ft$^2$ for network equipment areas and 300 lb./ft$^2$ for the dc power equipment rooms that were defined prior to a building's initial construction. The weight of any overhead superstructure that is supported by the floor for equipment installed on the floor below must be considered when making equipment floor loading calculations. Equipment floors in multi-story buildings are subject to significant amounts of vertical loading by superstructure arrangements that may be suspended below them. The following equipment frame placement guidelines shall be used to ensure equipment superstructure engineering is not restricted by the vertical floor loading effects of equipment frames.

a. For equipment buildings incorporating the use of ceiling supported superstructure arrangements, the combined weight of all equipment frames installed in any 400 ft$^2$ floor area (building bay), including power equipment located on floors above the building's dc power room, should not exceed 80 lb./ft$^2$. Likewise, the combined weight of all equipment frames located on a given floor should not exceed 80 lb./ft$^2$ for the entire floor area. The 80 lb./ft$^2$ loading restriction should enable unrestricted engineering of superstructure arrangements.

b. The combined weight of equipment AND any superstructure supported by the floor for equipment installed on the floor below SHALL not exceed 140 lb./ft$^2$ in any 400 ft$^2$ floor area (building bay). Likewise, the combined vertical load applied to a given floor shall not exceed 140 lb./ft$^2$ for the entire floor area.

4.4-2 Floor loading of equipment frames is calculated by dividing the equipment's maximum installed weight by the area of the equipment overall footprint including half of front and rear aisle footprint. Floor loading calculations for battery stand end aisle spaces should include the total area required between the end of a battery stand and a building wall or partition, and one-half the area between the end of a battery stand and another piece of floor mounted equipment.

*a.* Equipment front and/or rear aisle spaces shall be appropriately increased *so that maximum floor loading values are not exceeded.*

b. Equipment floor loading on the upper floors of a building shall not be accomplished with the expectations that the total weight of any superstructure supported below the floor can be effectively controlled or restricted.

4.4-3 Tracking equipment floor loading

The master floor plan or space planning document for a building or equipment area shall be used to track equipment floor load conditions that affect the placement of additional equipment on a floor and superstructure engineering for equipment installed on the floor below.

### 4.5 Equipment Lineups

4.5-1 Network facilities are considered to be "industrial occupancies containing ordinary hazards" according to the Life Safety Code published by the National Fire Protection Association (ANSI/NFPA 101). NFPA 101 specifies a maximum travel distance of 200 feet to at least one point of equipment room exit. Travel distances are measured from the most remote occupancy point in an equipment room along the center of aisles to the center of an exit doorway or entrance to an exit. At turns, the travel distance is a curve not closer than 1'-0" to any object. NFPA 101 and relative state and local ordinances shall be taken into consideration when determining equipment lineup lengths and configurations.

4.5-2 *To help ensure adequate egress and the general purpose movement capability* for people throughout an equipment area, the length of individual equipment lineups shall not exceed 50 feet unless otherwise specified by the application documentation of a specific technology. Additionally, the edge of the end frame of an equipment lineup including the frame's protective end guard shall not be closer than 3'-6" to a building wall or partition. Except as covered in 4.4-2 and Section 7, office distributing frame lineups may be as long as necessary.

4.5-3 It is more difficult to predict depth of network elements installed in an equipment environment will be. The historic Bell System standard equipment depth of 1'-0" is for the most part only followed by those manufacturing traditional telephony technology for use in traditional 1'-0" deep equipment lineups. The recent and rapid evolution of the network from telephony to information technology functions requires that IT products be placed into the telephony equipment areas. These new functionality's or technologies bring with them the equipment depth and spatial standards unique to their traditional equipment environments to which the network environment must be adapted. To the extent practicable, more detailed equipment lineup planning information is provided under the Transport Equipment heading.

### 4.6 Equipment Aisles

The equipment and/or equipment lineups require a balanced spacing all around due to the following reasons:

a) The provision of a better cooling air by avoiding heat concentrations. The aisle spacing requirements associated with equipment identify *the minimum front and rear aisle space* required for the equipment to function properly with respect to area ambient temperatures and air flow
b) The physical safety of the personnel working around the equipment
c) The physical operating and installation/maintenance space. The space required to properly access the equipment for test and maintenance purposes
d) The equipment's primary network interconnection characteristics. Some technologies require dedicated amounts of floor space so that they can be located in a specific place relative to other equipment or building services. However, most equipment technologies that are managed into and out of an equipment area can be intermingled with other types of equipment providing a compatible standard front and rear aisle space requirements
e) The equipment minimum aisle spacing requirements are always identified during the product selection process and are available from vendor's product documentation
f) Aisle spacing <u>may</u> also be related to location of equipment lineups to building features such as perimeter wall, partitioning walls, building columns, cable floor openings, caged partition, electrical equipment, etc.
g) A BDFB is usually wider and deeper that normal telephone equipment bay. Placing BDFB in regular lineups <u>may</u> cause blockage to aisle space or ladder paths. Hence <u>should be</u> placed in column lineups.

### 4.7 Equipment heat dissipation

4.7-1 Allocating floor space and engineering equipment to minimum aisle space requirements is not practical due to the need to more effectively manage equipment heat dissipation and to "open up" equipment areas for easier human access and network management purposes. The use of aisle space larger than those previously allowed for older equipment will help enable CRE as well as Network to achieve better cooling, easier equipment handling, installer access to overhead cable distribution systems, equipment maintenance (refer to section 4.7-2 for objective for newer equipment installations and section 9.5 for recommended standard aisle spacing).

4.7-2 Heat dissipation characteristics of newer equipment will dictate minimum aisle spacing required at many sites. This shall be in conformance with company policy of "maximum space utilization." Actual equipment spacing may change from the one previously planned due to the change from acceptable heat limit to a high heat dissipation (greater than 100 watts/sq. ft.).

— Minimum front/rear aisle spacing of 2'-6" and 2'-0" respectively are no longer sufficient for *planning equipment space of newer generation products,* since equipment reliability (high heat equipment) <u>may</u> be impacted with the continued application of the minimum aisle spacing dimension.
— The defined *minimum* aisle space requirements of equipment are for equipment engineering purposes when it is necessary because of an unusual office condition.
— Space planner and implementation engineers <u>shall insure</u> that minimum aisle is not used to maximize the number of equipment installed in a CO.
— The "objective" for aisle spacing <u>shall be</u> **3'-0" front and 2'-6" rear** because of building column sizes and spacing. This is somewhat less than the recommended front aisle space of 4'-0" and 3'-0" rear by vendors for high heat dissipating equipment

- A minimum of 4 feet shall be provided as a main cross aisle or walk way between adjacent equipment areas. Main cross aisles are required between switching and other types of equipment and as necessary to limit the overall length of equipment aisles as discussed in 4.4-2 & 3. The 4 foot dimension is the distance between any apparatus such as end guards and equipment covers mounted on the end of equipment frames.
- *Refer to section 9 for more detail and site specific application.*

## 4.8 Thermal management (space planning for equipment with high heat dissipation)

4.8-1 Thermal Management of high heat dissipating equipment is covered in the BSP 800-003-101MP, issue A, June 2001 *"Thermal Management Requirements- High Heat Equipment in the Central Office."* This BSP sets total heat release limit of electronic equipment deployed in a traditional CO and recommends environmental guidelines for the installation of high heat equipment.

4.8-2 Equipment identified as "high heat" when evaluated for AT&T TP76200 (environmental and safety) compliance will be listed on a common systems database. The database is accessed on the Common Systems internal website at

http://ebiz.sbc.com/commonsystems/products/index.html

4.8-3 All high heat equipment shall be provided enough floor space to manage the heat density limits (i.e., to keep the equipment surrounding area within 100 Watts/square foot limit).

4.8-4 Floor space provided adjacent to equipment framework to maintain heat density shall be defined as "thermal management space" and *becomes non-assignable or not available* for installation of future equipment so long as the high heat equipment is in service. Refer to the thermal management BSP for floor space management.

4.8-5 Example of High Heat Dissipating Equipment Placement
Some pictorial examples shown below illustrate how to use equipment footprint to maintain heat density within limits. Depending upon the high heat dissipation level, newer generation telecommunication equipment may be deployed in any manner described below, and is not limited to the following:

a) placing spacer between two high heat equipment when placed adjacent to each other
b) placing no more than two or three shelf level equipment on the same rack
c) leaving an empty equipment bay space between two high heat equipment
d) leaving an empty equipment bay space on either side of the high heat equipment
e) placing an individual high heat odd size equipment in a separate area to satisfy required cooling needs
f) placing a bunch of high heat equipment in a separate room to satisfy required cooling needs.

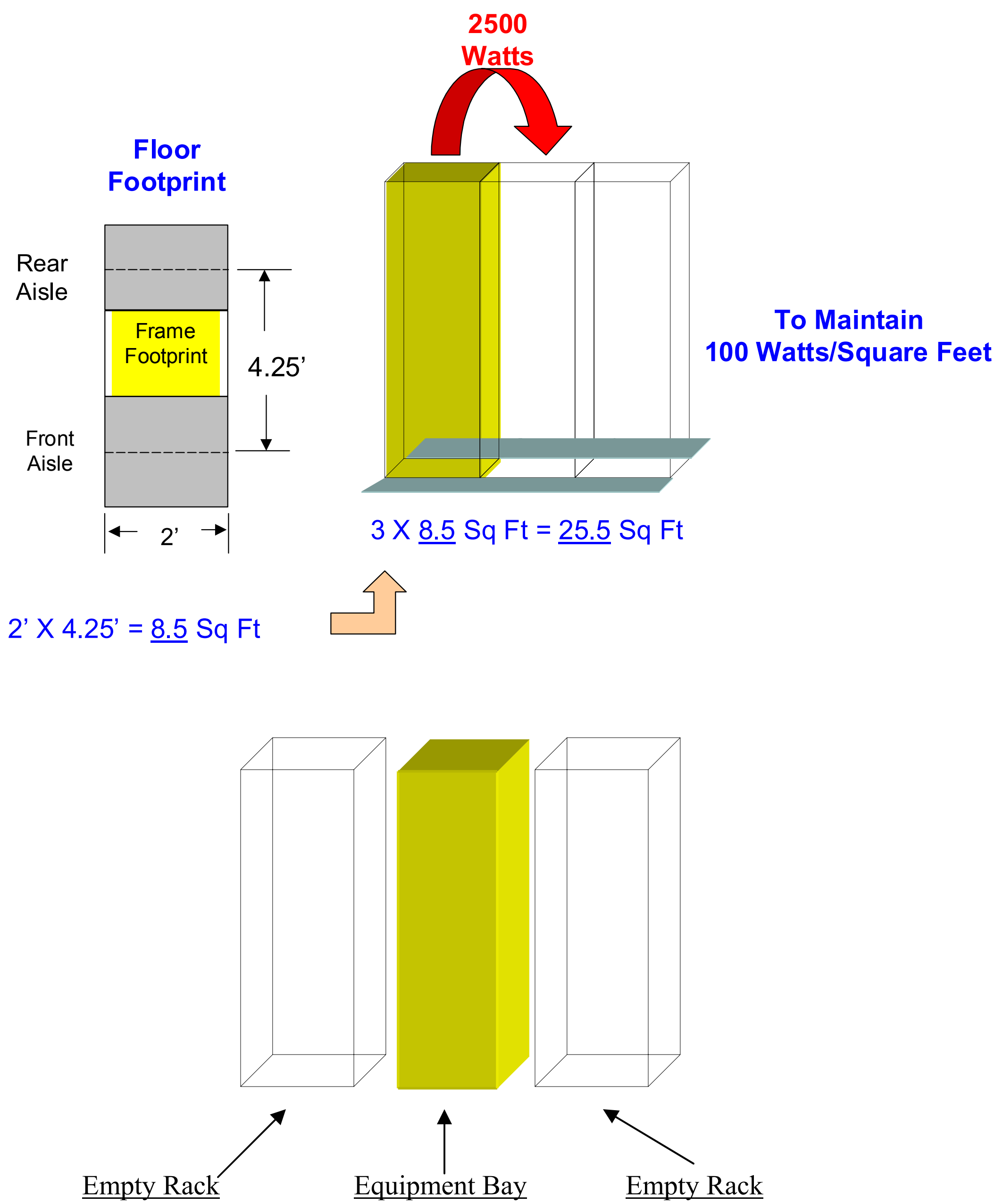



**Fig 4-1 Examples of High Heat Dissipating Equipment Placement**

## 4.9 Site specific floor plans

Relative Equipment Locations:

4.9-1 Figures 4-2 through 4-4 are generic office floor plan models provided to assist planners with developing site specific floor plans and managing equipment growth and rearrangements in existing network facilities. The generic models represent the optimum *relative* location of network technologies with regard to each technology's *primary network interface*. Figure 4-1 illustrates a medium sized single story equipment office (± 20 to 40k residence lines) incorporating all technologies. Figures 4-3 and 4-4 illustrate a large two story office (± 60K residence lines) requiring an entire building floor be devoted to a specific network technology (switching or transport). Figure 4-3and 4-4 could also represent an office predominantly serving a business community with large amounts of interoffice transport equipment. The most common deviations from the generic models will be that the office dc power plant is located in a basement which would mean the switch, transport or administration areas of Figures 4-2 through 4-4 would be appropriately larger. Using Figures 4-2 through 4-4, the knowledge of how network elements interconnect, and the justifications provided in this part, equipment engineers and space planners should be able to develop a comprehensive ideal floor plan for new or existing network facilities.

4.9-2 *It is important to understand the amounts and types of cable that are required to place equipment into service when making space planning and equipment location decisions.* New equipment should always be placed as close as possible to its primary network interface to minimize the length of interconnection cable and the cable's resulting impact on the overhead equipment environment. The volume and type of cable associated with the various equipment technologies is generally what adversely affects an equipment environment the most. Equipment interconnection requires overhead cable racks and raceways which require a supporting superstructure which in turn requires substantial amounts of diagonal earthquake bracing apparatus.

4.9-3 *Some types of equipment require that special purpose or restricted use cable racks be engineered into the equipment's overhead environment.* This equipment or technology requirement must be considered hand-in-hand with the amounts of cable required when developing floor plans and assigning equipment locations. Locating equipment so that the use of special cable racks is confined to the smallest area possible generally enables a less complicated overhead equipment environment. The less complicated an overhead equipment environment is, the less costly it is to create, the easier it is to provide for any special cabling requirements of future equipment, and the easier it is to provide for and manage equipment cooling requirements for the building (more room for HVAC ducts). It can also be generally expected that the more complex a cable distribution scheme is within a building or area, the more cumbersome and potentially costly it will be for the cable installation/removal activities associated with network management.

4.9-3.1 The office distributing frame (copper or fiber) is a good technology to illustrate the potential affects of *special cable racks* on office overhead environments. If an office distributing frame (ODF) is remotely located from the CEF, a special cable rack must be engineered for routing the OSP cable from the CEF to the ODF because OSP cable can not be routed with other office cabling. This Entrance Cable Rack will occupy approximately 1'-4" of vertical space along its path across the room for the life of the ODF. The 1'-4" of space which consists of 4" for rack and framing and 12" for cable pileup will be located approximately 1'-0" above other office cable racks so as not to restrict their cable pileup capacity. The loss of space caused by the presence of the OSP cable rack will eventually undermine the efficient engineering and installation of any additional equipment cable paths and/or superstructure arrangements.

4.9-3.2 Switches, ODF's, fiber optic termination equipment, battery distribution fuse bays, head end equipment, and collocation areas all have *special cable rack* considerations associated with them. Some equipment like digital cross-connect frames may not have a need for special cable racks, however, they usually have special cable pileup considerations. Data communications technologies have unique space planning considerations because of their unusually deep construction.

4.9-4 It may often be impossible or impractical to locate *everything* adjacent to its primary network interface. The below considerations should be used when it is necessary to select which technology will be located remote from its preferred relative location in building.

a) Remote that which has the least special cable rack requirements;

b) Remote that which has the least interconnect cable requirements;
c) Remote that which has the least life expectancy;
d) Remote that which has the least maintenance requirements.

### 4.10 Cable entrance facilities (CEF)

4.10-1 The cable entrance facility is the physical location where network cables originating outside of a building enter for interconnection with network equipment. A CEF may be a dedicated above or below ground room (vault) or an area within the building's equipment space that is dedicated to OSP cable management (such as a wall paralleling the location of the office distributing frame).
4.10-2 Because the construction techniques used in the manufacture of OSP cables cause them to be difficult to bend and work with, the CEF is the pivotal consideration used when developing new network facility construction designs. Where possible, new construction designs shall provide for the direct routing of OSP cable from the street to and along the building's CEF.

4.10-3 All OSP cable entering a building that is not "riser rated" shall transition to an approved riser rated cable or a properly firestopped metallic raceway prior to leaving the CEF. All exposed lengths of non-riser rated OSP cable entering a CEF within an equipment area shall be wrapped with overlapping layers of aluminum duct tape to protect the cables from exposure to an equipment room fire.

### 4.11 Power equipment

4.11-1 Although the primary network interface of the office dc power plant is the office switch, the requirement for interconnection to commercial and backup ac service determines where office power plants are located. Office dc power plants shall be located *as close to* the house service panel and the backup ac source as possible to minimize the length and routing of ac conduits between commercial and backup ac service and the office power plant. This is necessary because the power plant's ac service conduits are in affect permanent installations in the overhead environment and can potentially interfere with the efficient use of that space similar to the ODF example referenced in 4.6. The ac interconnection requirement usually places office power plants in a building's basement or in a corner of single floor buildings.

4.11-2 The "as close to" requirement in 4.9-4 may be a substantial distance from the building's source of ac service when additional power plants are required in a building and must be located in areas normally reserved for network equipment (2nd floor or above and/or in the transport equipment area). For such office conditions power plants shall be located in an area adjoining a building's perimeter wall so that required ac conduits, bus duct, and unfused battery cables will not have to be installed above network equipment areas.

4.11-3 An integral component of an office dc power plant and an equipment powering scheme is the equipment used to incrementally distribute dc power to various network elements. For the purposes of this section the equipment used to distribute dc power to and among network elements is referred to as a battery distribution fuse bay or BDFB which is an extension of the office dc power plant in larger wire centers. The space planning considerations for BDFB’s are provided in the technology specific parts of this section.

### 4.12 Office distributing frames (ODF)

4.12-1 The ODF is where the individual lines of customers served by an office terminate for subsequent interconnection with the network elements installed inside the building. ODF's interfacing with copper OSP cables are referred to as main distributing frames or the MDF, and ODF's interfacing with fiber optic OSP cables are referred to as fiber distributing frames or the FDF. Accordingly, the primary network interface of an ODF is the OSP cable entering the building via the CEF. Therefore ODF's shall be located at or directly above the CEF to minimize the length of OSP cables and the need for special entrance cable racks. This is especially important for the MDF because of the potential for foreign voltages entering the building via induction onto the copper cable pairs (hence the use of electrical protectors on MDF's).

### 4.13 Switching equipment

4.13-1 The term switching equipment refers to equipment entities that perform call management for the individual business and residence customers served by the office and should not be confused with data type switching equipment which have a bulk signal processing function. The primary network interface of switching equipment is the ODF and is why switching equipment is located adjacent to the ODF. Although switching equipment does interconnect with transport equipment for interoffice call and data processing reasons, the bulk of the cable from a switch terminates at the ODF.

### 4.14 Transport Equipment

4.14-1 For the purpose of developing office floor plans and allocating equipment space, transport equipment is defined as all technologies other than power or switching. It is in the transport equipment area that new technologies and network capabilities are located. For some network applications, locating a technology in the transport equipment area means dedicating or subdividing the equipment space for other than core network equipment installation. Collocation, voice mail, and consumer broadband are examples of how a transport equipment area may become subdivided. For the aforementioned reasons transport equipment areas should be as large as economically practicable yet tempered by the expected general purpose and use of the network facility. The transport equipment area required for a network facility serving an area predominantly devoted to multi-family residences should be less than that required for one serving a commercial business community or area.

4.14-2 The primary network interface for transport equipment in general is considered to be the ODF (MDF or FDF) for CO planning and layout purposes. Of importance also is the relationship of the transport equipment area to the office switch because of the need to interconnect the switch to transport equipment. The transport equipment area should be positioned to maximize access (simplify cable routing) to both the office ODF and switch. For some network facility designs, interconnection access is accomplished as illustrated in Figure 4-2, 4-3 and for others as multi-floor buildings it is accomplished by placing the transport area including its FDF above the switch as illustrated in Figure 4-4. Many subgroups of network functionality that do not physically interconnect with an ODF are also located within the transport equipment area, which make the transport area more difficult to plan and manage.

4.14-3 Consideration may be necessary to plan an equipment area within the transport equipment space for new technologies due to the significant differences in product footprint, heat dissipation and operating characteristics. These new products are typically deeper in footprint, and the greater heat release load may affect the reliability of adjacent equipment if placed in a traditional manner.

4.14-4 Proper space planning based on new footprints makes it easier to transition to wider when need arises. If you plan for traditional 12 inch depths and 2'-0" and 2'-6" aisles it will not be possible to utilize deeper dimensions of new technologies. Equipment packaging may also be considered as the new technologies are housed in cabinets rather than open frames (refer to section 9).

### 4.15 Network Administration Area

4.15-1 The amount of total floor space allocated to network equipment for a given office shall include sufficient space for equipment operations and maintenance personnel to comfortably perform their respective tasks. The Maintenance Administration Personnel (MAP) area standards for switching equipment are contained in the equipment supplier's space planning documentation and are usually dependent on the ultimate size of the installed switch. The below administration area sizes may be used for initial office planning purposes in lieu of product specific information furnished by an equipment supplier.

| Power Equipment | Switching Equipment | Transport Equipment |
|---|---|---|
| 100 $ft.^2$ | 640 $ft.^2$ (#5ESS)<br>400 $ft.^2$ (DMS-100) | 200 $ft.^2$ |

4.15-2 Equipment administration areas shall be located along building walls and as close to the employee's building entrance as possible. A common rather than technology specific equipment administration areas should be used where practicable so that building services can more efficiently be provided to these employee work areas. It is acceptable and usually more appropriate to have more than one equipment administration area in larger network facilities so that employees can be close to the equipment they manage and maintain.

4-15-3 Carpeting in the MAP area
Carpeting in switch room and MAP area is undesirable because of:

1) The dust collecting properties of the carpet, which when distributed by walking across, may redistribute particulate matter into the air in a concentrated "puff"
2) The potential for shedding of fiber from the carpeting, leading to increased contamination levels on the switch and/or premature clogging of frame filters
3) The potential for release of conductive particulate matter from static control carpeting that typically contain embedded carbon particles in the fibers.
4) The inability to clean carpets within the switch room without releasing a without releasing a large amount of particles into the airborne environment
5) The concern with the static properties of carpeting material.

### 4.16 Equipment Staging Area

4.16-1 A minimum of 200 $ft.^2$ shall be dedicated to equipment staging and uncrating at each building equipment entrance door or equipment access provision. Equipment staging areas shall extend a minimum of 10 feet from and to either side of the equipment entrance locations.

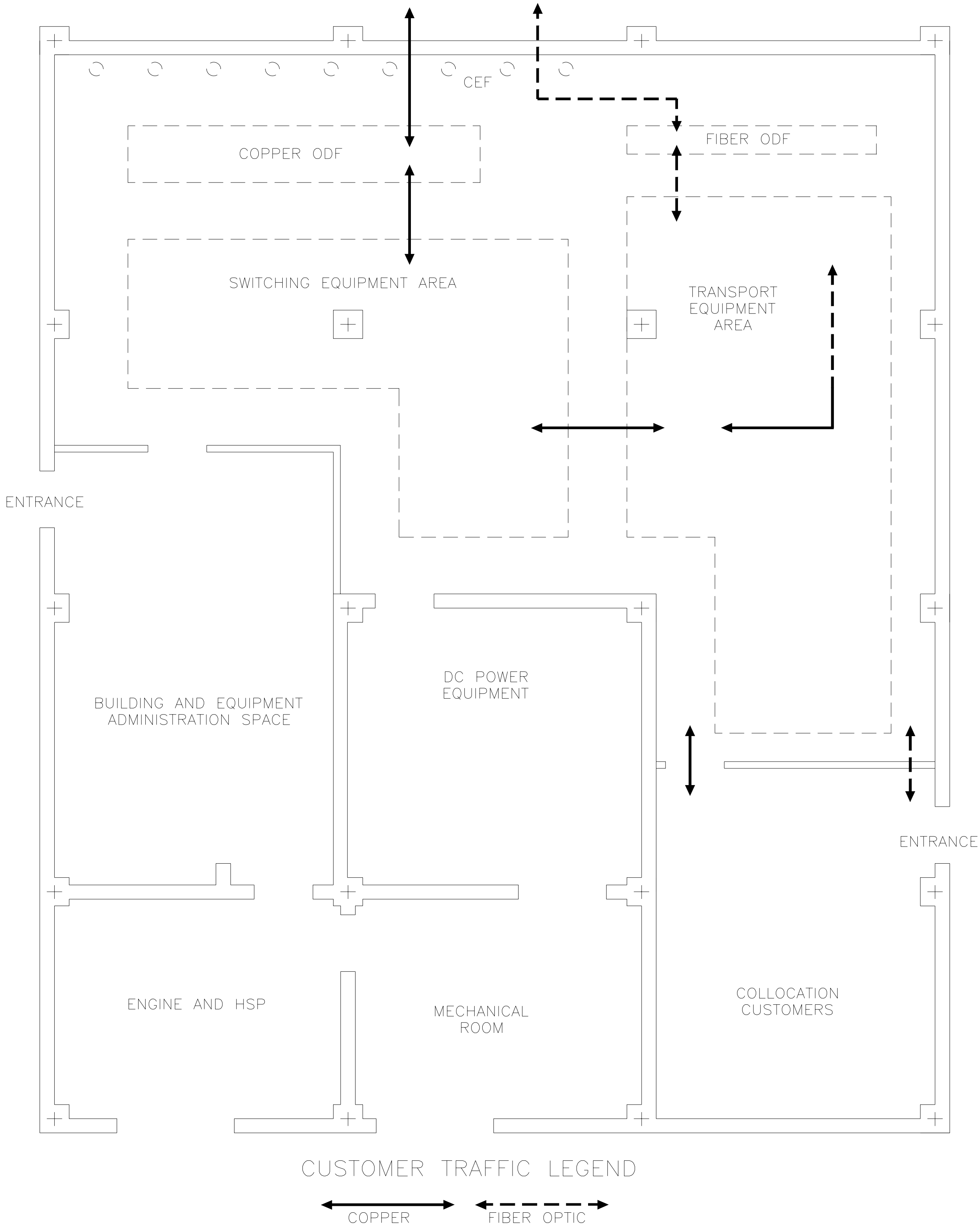



**Figure 4-2**- Generic Model Of Single Story Network Equipment Building

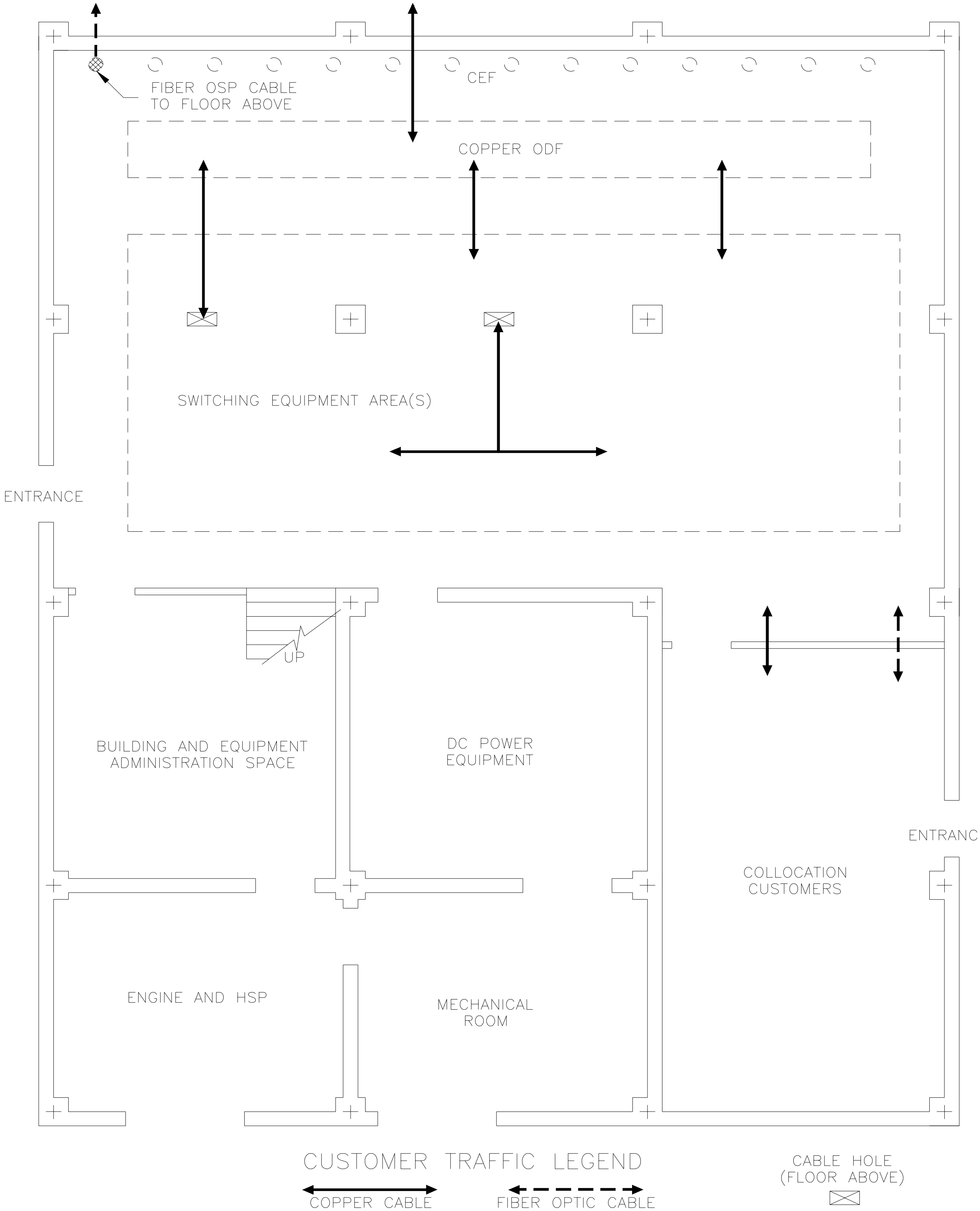



**Figure 4-3 -** Generic Model Of Multi-Story Network Equipment Building
Switching Equipment Located On 1st Floor (see Fig. 4-4)

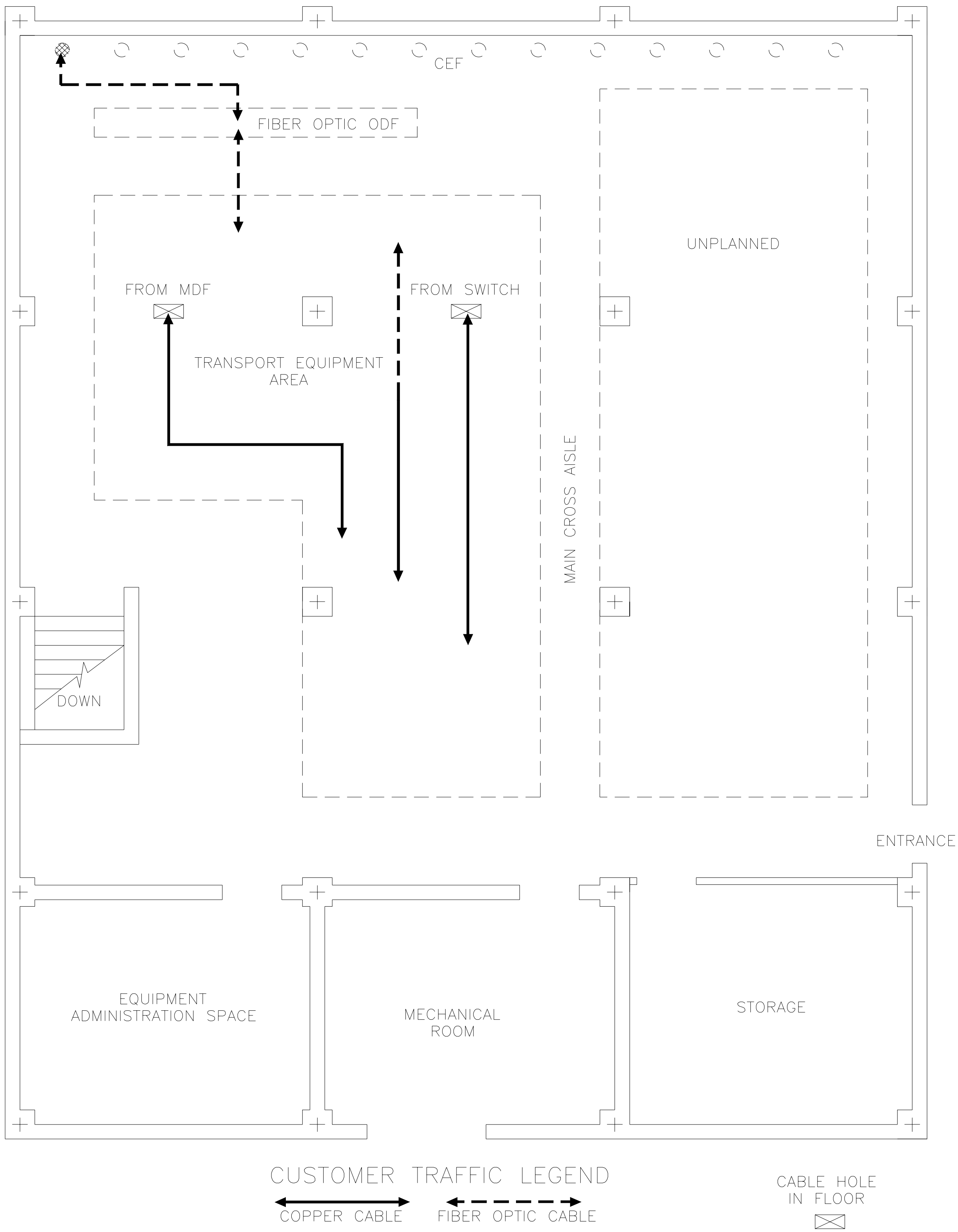



**Figure 4-4-** Generic Model Of Multi-Story Network Equipment Building
Transport Equipment Located On 2nd Floor (see Fig. 4-3)

# Section 5
# COMMON SYSTEMS

## 5.1 General

This part provides the standards for equipment related engineering matters that are common to network equipment systems (technologies) within a building or equipment areas within a building. This part primary addresses the physical environment provided for and above network equipment. Where appropriate the subjects covered by this part are addressed in more detail within the technology specific parts of this section.

## 5.2 Equipment Height

All new technology and most, if not all existing network technology, is manufactured for installation in 7'-0" or less equipment environments. Accordingly, 7'-0" (*standard*) equipment environments shall be established so that new equipment can be purchased and deployed without a need for subsequent engineering and installation effort to adapt equipment to the traditionally taller 9'-0" and 11'-6" (*non-standard*) equipment frame environments. 7'-0" environments shall be created whenever it is necessary to extend the boundaries of an existing non-standard environment.

5.2-1 The practice of engineering network elements and functionality using equipment frameworks taller than 7'-0" (new or reused) and installer mounted equipment unit configurations taller than 7'-0" shall be discontinued so that non-standard environments can be conditioned for transition to the standard. Additionally, engineering new equipment into non-standard environments shall only be done when it is necessary for the functionality of the equipment (interconnection/operability reasons), it is appropriate for the comprehensive master plan of the office, or there is a lack of physical space to establish a standard environment.

5.2-2 Conditioning a non-standard environment for transition to the standard shall be accomplished by engineering new equipment into non-standard environments WITHOUT the use of taller framework assemblies or framework extensions. This practice requires that a means for supporting the equipment's interconnection cable be provided between the top of the equipment frame and the overhead cable racking arrangement. This can be accomplished by extending the overhead cable rack down to the top of equipment frames using "waterfall" type cable rack arrangements, or by suspending a cable support apparatus such as a tubular bar or pipe from the overhead auxiliary framing. Optimistically and overtime, the non-standard environment will become suitable for conversion to a standard 7'-0" equipment environment (replacement of interim cable support apparatus with an appropriate lower level superstructure and/or cable distribution system).

5.2-3 In CDO's (Community Dial Office) where 9'-0" environments are common and overhead auxiliary framing does not exist, new equipment additions shall be of 7'-0" freestanding configuration, except for frames that are used to support overhead cable rack. The exception for frames supporting cable rack requires those frames to be height of cable rack runs. Interval for cable rack support shall be between 5'-0" to 6'-0" and only the number of frames to provide that support interval shall be of taller configuration. Taller frames shall be provided with full height frames or with company approved height extenders. All frames, regardless of height, in CDO's are installed in freestanding configuration with four floor anchors. Frames shall be junctioned to adjacent frames except where space of 5 inches or greater is provided.

5.2-4 Transition plans in central offices for an equipment lineup other than 7'-0" may include limited continual growth of existing 11'-6' or 9'-0" environments only to complete a lineup. The limited continual growth plan may be used for a lineup that is 75 percent populated for total number of frames with only 25 percent more frames to finish the ultimate growth. This non-standard application of taller frames is intended only to provide lineup continuity. This exception shall never be used to avoid corporate policy of transitioning all equipment areas to 7’-0” height.

### 5.3 Equipment Protection

5.3-1 All installed equipment frameworks shall be configured so that installed equipment and equipment cabling is protected from contact with apparatus transported through equipment aisles. This is usually accomplished by ensuring the base of equipment frameworks are at least as deep as the equipment and cabling installed in the framework. When it is necessary for equipment protection purposes that an intermediate equipment frame have a deeper foot print than its adjacent equipment frames, the adjacent frames shall be equipped with wedge shaped guard rail extensions to transition the shallower framework depth to that of the deeper framework.

5.3-2 The sides of all open-rack type equipment frameworks shall be equipped with end guards so that installed equipment and equipment cabling is protected from contact with people or apparatus movement at the ends of equipment frames. End guards having a height equal to that of the equipment framework shall be used when the distance between the end of an equipment framework and an adjacent framework or building surface is greater than 2’-6”. Frame height end guards should be as deep as the installed equipment and equipment cabling they are protecting. It is acceptable however to use bolt-on apparatus to extend the base of less than equipment depth end guards to equal the overall depth of installed equipment and cabling. Frame height end guards shall have a minimum width (end of frame to outer edge of end guard) of 1 inch. End shields are to be used at the end of frames when that frame is not at the end of the line up.

5.3-3 Guard rail closing details (end guards equal to the height of a framework’s guard rail) or a frame height end guard shall be used when the distance between the end of an equipment framework and an adjacent framework or building surface is more than 1’-0” but less than 2’-6”. Guard rail closing details shall have a depth equal to the equipment and installed cable it is protecting and a minimum width of 1 inch. Gaps of less than 1’-0” between frames interior to an equipment lineup should be closed at the floor level (floor to guard rail height) only if suitable space closing hardware is readily available from the framework supplier.

5.3-3.1 Equipment frameworks installed close to building columns require a guard rail closing detail for that portion (front and/or rear) of the framework that extends more than 5 inches beyond the face of the column.

### 5.4 Equipment Lighting

5.4-1 General

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 management activity shall be accomplished with the use of portable light fixtures appropriate for the activity being performed. Accordingly, unless otherwise specified for a particular network element or technology, equipment lighting shall be provided above equipment front / maintenance aisles only.

5.4-2 For a given network equipment installation work order, superstructure mounted equipment lighting shall be provisioned only as needed for the equipment being engineered into an equipment area. This equipment lighting provisioning standard is applicable to equipment front aisle lighting only and is intended to minimize the need for rework should the planned use of an equipment area change.

5.4-3 Single tube fluorescent lighting fixtures comprised of electronic ballast's and energy efficient lamps (T8 technology) shall be used as the means of lighting equipment areas in general. Fixtures containing two or more parallel lamps are acceptable for use only above network administration work areas requiring higher levels of light output. All equipment lighting apparatus including wire and electrical raceways shall be listed for its purpose by a nationally recognized testing laboratory.

5.4-4 "Low intensity" equipment lighting practices shall be used in all equipment areas larger than 2000 $ft.^2$ and where multiple equipment areas are contained on a single building floor. Low intensity lighting consists of assigning the end fixtures of alternating rows of equipment lighting to a separate circuit and control switch so that a person can pass through an equipment area without having to turn on all of the equipment lighting fixtures.

5.4-5 Control of equipment lighting fixtures shall be accomplished by the use of "area switching" so that the lighting fixtures above an equipment area can be incrementally turned off and on as and where equipment illumination is needed. Area switching should be engineered so that lighting is controlled on a building bay basis. No more than approximately 1000 $ft.^2$ of floor space (equipment lineups 50 feet long and one 20 foot building bay wide) should be controlled by a single light switch. Lighting control switches shall be located on building surfaces rather than equipment frames where possible to minimize the need for ac electrical work during equipment installation, removal and rearrangement efforts.

5.4-6 Illumination

Table 5-1 contains the minimum levels of illumination that must be provided for network equipment and equipment administration areas. The values given are relative to measured light on the equipment and work surfaces indicated by fluorescent lamps having at least 100 hours of operation. Illumination measurements of a new lighting system are expected to be higher than those indicated in Table 5-1. Part 5 of GR-63-CORE shall be used as reference when it is desired or necessary to measure equipment lighting relative to the minimum values given in Table 5-1.

| Lighting For | Level - lux (foot-candles) |
|---|---|
| Equipment Frames | |
| Front Aisles | 160 1x (15) |
| Office Copper Distributing Frames | |
| Front and Rear | 215 1x (20) |
| Power Equipment Areas | |
| Aisles and Open Spaces | 320 1x (30) |
| ac Switchboards and dc Distribution Bays | 220 1x (20) |
| Cable Entrance Facility | |
| Vaults | 55 1x (5) |
| Area In Equipment Room | 215 1x (20) |
| Control Test & Maintenance Areas | |
| Shelf At Center Of Test Frame | 540 1x (50) |
| Desk Top Writing Surface | 540 - 750 1x (50-70) |

**Table 5-1 -** *Minimum Levels of Equipment And Area Lighting*

## 5.5 Equipment Superstructure

5.5-1 Auxiliary Framing And Bracing

The primary reference standards for the equipment superstructure used above network equipment areas are contained in BSP800-006-150MP *Central Office Auxiliary Framing And Bracing Requirements* which covers paired channel iron superstructure arrangements. Except for some raised floor equipment environments, a minimum of one layer of ceiling supported superstructure is required above all network equipment areas for the support of equipment lighting and office cable racking arrangements, however, it usually takes *three layers* of superstructure to accommodate the special cabling and cable rack needs of network equipment. The three layers of structure are generally designated as *Low Type* (directly above equipment frameworks) *High Type* (all layers ± 1'-6" above the low type).

5.5-1.1 For light reflectance and commonality in appearance purposes, equipment superstructure structural members and arrangements shall be light gray in color.

5.5-1.2 Provisioning of equipment superstructure arrangements shall be done in building bay (400 ft.$^2$) increments except when it is known in advance that more or less superstructure is ultimately required in the immediate future. This superstructure provisioning standard is intended to minimize the need for rework activity should the planned use of an equipment area change, or should the superstructure requirements of a technology actually deployed in the area be different than that originally provisioned.

5.5-2 Floor stanchion Systems (also refer to section 2.4-5)

5.5-2.1 A floor stanchion system eliminates structural attachments to building surfaces except at the building's floor while providing a means to support equipment cable racking when the standard overhead superstructure arrangement is not possible due to ceiling design or loading restrictions. The approved floor stanchion system is intended for 7'-0" and 9'-0" equipment environments only and

5.5-2.2 Floor stanchion systems may be used for 7'-0" and 9'-0" equipment environments only with the explicit approval of and coordination with 's seismic protection engineer.

Refer to BSP 800-006-152MP *"Floor Stanchion Supported Cable Rack System Requirements"*

5.5-3 Cable Distribution

The primary reference standards for office cable distribution systems used above network equipment areas are contained in BSP 800-006-151MP *Central Office Cable Racking Requirements* (general purpose cable racks).

5.5-3.1 For light reflectance, cleaning considerations, and commonality in appearance purposes, general use cable distribution systems and products shall be light gray in color. Fiber optic cable distribution products and systems shall be bright yellow in color.

5.5-3.2 Except as covered in BSP800-006-151MP, the provisioning of equipment cable racking shall be limited to the needs of the actual equipment being engineered into an equipment area. This cable rack provisioning standard is applicable to equipment *lineup* cable racks and is intended to minimize the need for cable rack rework activity should the planned use of an equipment area change.

5.5-3.3 Special purpose cable racks (restricted use) shall be engineered at a level or levels above twisted pair and coaxial (miscellaneous signaling) cable racks to facilitate equipment cabling in general. It is acceptable and appropriate for a special purpose cable / cable rack to be engineered directly above an equipment area (lowest level of rack) if the predominant cabling for the area is that of the special purpose cable. Such cable rack engineering practices shall be applied on a building bay basis rather than an equipment lineup basis.

5.5-3.4 Except for unfused and primary power distribution cabling, the decision to use secured or unsecured cabling practices within a network equipment building or equipment area is determined at the local people. Unfused and primary power distribution cabling are always installed using secured cable cabling practices.

Such decisions should include the following considerations:

a) Secured cable is more suitable for public viewing,
b) Secured cable is generally more suitable for smaller more static equipment installations (switching equipment areas and rural wire centers) where equipment and technology change less frequently,
c) Unsecured cable tends to promote premature exhaustion of available cable pileup space than does secured cable
d) Refer to the latest issue of TP76300 (Section J) for more detail on Cabling Policy.

## Section 6
## Dc POWER EQUIPMENT

### 6.1 General

This part provides the planning and engineering standards specific to power equipment and power equipment areas within a network equipment building. Generally, the power equipment of each network equipment facility may be equipped with an approved power monitoring and control system, and shall employ the use of dc distribution single line diagrams as covered in the latest standard "*Central Office 48 Vdc Power Distribution System - Single Line Diagram Office Record Guidelines,"* and "*Central Office 48 Vdc Power Distribution System - Single Line Diagram Marked Print Requirements."*

### 6.2 Basic Telephone Power Plant

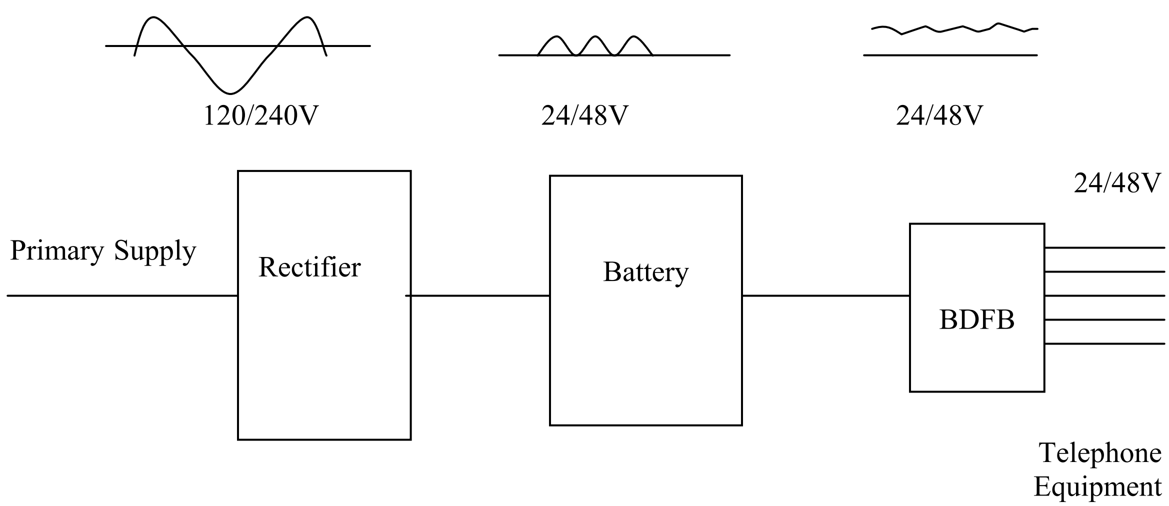



**Figure 6-1** Basic Telephone Power Plant

6.2-1 The office dc power system including standby power sources shall provide protected ac power for network operations support systems installed in the building. The amount of protection provided shall be based on the requirements of the installed system(s) rather than a generic value.

6.2-2 Electrical circuits used for office dc power plant lighting shall be connected to the office backup/standby power system equipment.

### 6.3 Superstructure

Unless otherwise specified by the system engineering documentation of a specific dc power plant, the bottom of primary runs of auxiliary framing shall be installed at 9'-2" above the floor in power rooms and equipment areas. Secondary runs of framing shall be installed above the primary. This is to ensure adequate space for the engineering of power plant bus bar arrangements.

### 6.4 Engine Alternators

Commercial ac backup power sources shall be located in environmentally controlled rooms having a size appropriate for the specific power source as specified by the equipment manufacturer. *The exhaust system of backup power sources shall be engineered so that engine* *exhaust occurs external to the building down wind and more than 20 feet from any HVAC air intake ducts.*

### 6.5 Ac tap boxes

Ac tap boxes may be required in each Company owned / leased network equipment building to facilitate access to a portable power source should the building's primary and backup power systems for network equipment fail. Tap boxes shall be located so that standard portable power sources can be placed into service without blocking or otherwise hindering access to the building. Temporary Emergency Engine connections shall meet the guidelines as defined in BSP 155-002-900MP.

### 6.6 Uninterruptable Power Supplies (UPS)

With consideration to the impact commercial ac conduits serving UPS systems may have on network equipment overhead superstructure arrangements, uninterruptable power systems should be located near the equipment they are associated with in rooms designed to mitigate any excessive equipment operating noise.

### 6.7 DC Power plants

6.7-1 Power Control and Distribution Bays

The recommended minimum front and rear aisles of dc power control and distribution bays are 3'-6" and 3"-0" respectively. *Equipment requiring additional spacing due to heat dissipation will be identified in the Product Approval Notice (PAN).*

6.7-2 BDFBs (Battery Distribution Fused Bay)

BDFBs shall be dispersed throughout transport equipment areas so they are *individually* centrally located to the equipment they serve. Recommended practice is to provide one BDFB per building bay. Where possible, BDFB shall be located at equipment main cross aisles or end aisles in-line with building columns to minimize the use of the special purpose primary distributing cable racks above equipment areas. Whether BDFB's are located at main cross aisles or at end aisles depends on the relative location of the dc power plant the BDFB's are fed by. If the BDFB is located on a main or end aisle the average distance from the BDFB to equipment is 40 to 50 feet. Most facilities bays have drains between 10 and 25 amperes. The size of the wire/cable from the BDFB to the equipment will determine the number of cables on the brackets. Although the fronts of equipment lineups should be in alignment, the large bending radius requirements of power cable make it appropriate that BDFB's be set back from the front of adjacent equipment to facilitate transitioning power distribution cable from overhead cable racks.

When locating BDFBs considerations must be given to the location and distance to equipment they will serve.

6.7-3 Separation of Secondary Power Distribution

The concept of separating secondary power distribution from transmission is not new and was recognized when digital cableway system was developed. Thus a new cable management system with a separate bracket for secondary power distribution was included. These brackets are used to support the bare number 6 wire under the bracket and secondary power distribution on the brackets.

6.7-4 Cross Aisle Power Cable Rack

Cross aisle power cable racks are required at the BDFB and at approximately twenty foot intervals. A power cross aisle racks at the switch bays of DACS II & IV are also required. This cross aisle cable rack are used to connect the power feeders to the drop cables. A good cabling arrangement is dependent upon a good equipment floor plan.

### 6.8 Batteries

6.8-1 Refer toTP76300MP AT&T Local Exchange Carriers, Installation Requirements - Section M item 5 for detailed information regarding the placement of office dc batteries.

6.8-2 Refer to section 4.11 of this BSP for floor loading considerations when it is necessary to locate dc power plant batteries on upper floors in network equipment buildings. Upper floors of a building may not conform to the same criteria due to floor loading limitations.

### 6.9 References

| | |
|---|---|
| BSP-790-100-651MP | Introduction to Power Systems Engineering Manual |
| BSP-790-100-652MP | Planning |
| BSP-790-100-654MP | DC Plants |
| BSP-790-100-655MP | Batteries |
| BSP-790-100-656MP | DC Distribution |
| BSP-790-100-659MP | Standby AC Plants (and DC Generators) |
| BSP-790-100-660MP | AC Power |
| TP76300MP | Installation Requirements |
| TP76400MP | Detail Engineering Guidelines |

### 6.10 Forecast M&P

Refer to the Power Engineering Forecast Method & Procedure for power equipment forecasting.

## Section 7
## DISTRIBUTING FRAMES

### 7.1 General

This section provides the standards for distributing frame equipment space within network facilities. Distributing frames are discussed according to the type of facilities terminated on them (copper or fiber optical) and their functional purpose (subscriber and/or trunk cabling).

### 7.2 Distributing Frames Category

7.2-1 Distributing frames are categorized into the six basic functionalities described below in Table 7-1.

| Generic Reference | Functionality |
|---|---|
| MDF | Main Distributing Frame, aka, CMDF, SMDF. Primary function is to provide a termination and cross-connect point for OSP copper loop facilities, OE/LEN and tie pairs. May also contain trunk cable terminations. As the single copper distributing frame in an office, the Combined Main Distributing Frame (CMDF) will be used for various other miscellaneous network elements that would generally be found on the IDF. |
| IDF | Intermediate Distributing Frame. Functions as a cross-connect point for miscellaneous network elements, such as, D4 channel banks, CLEC terminations, range extenders, inter-office trunk cables, etc. |
| PDF | Protector Distributing Frame. Not a functional distributing frame. Interconnect point for providing electrical protection and isolation, for OSP copper loop facilities entering the CO, and tying to the MDF. |
| DSX-1 | Digital Cross-Connect Frame for T1/T1C/T2 services. This frame provides a manual interconnection point between network equipment and other network elements or frames. |
| DSX-3 | Digital Cross-Connect Frame for DS3/STS-1/E1 services. This frame provides a manual interconnection point between network equipment and other network elements or frames. |
| FDF | Fiber Distributing Frame. The FDF is a cross-connect point for network elements with one another and outside plant fiber optic facilities within a wire center. |

**Table 7-1 Distributing Frame Categories By Function**

### 7.3 Location, frame lineups, Universal Modular Distributing Frames, Hard-wired network elements, and Frame administration area

7.3-1 To minimize the number of subscriber and interoffice circuit termination points and the potential for circuit degradation, the use of multiple copper and multiple fiber optic distributing frames in network facilities shall be avoided unless absolutely necessary. Intermediate distributing frames that must be located on upper floors of a building shall be located above and parallel to the office's main distributing frame to minimize the length and routing of OSP and any required distributing frame tie cables.

7.3-2 Conventional main distributing frames tend to be long because of the "continuous" nature of their design, functionality and interconnectivity requirements, but should not extend beyond 300 verticals of continuous length. The emergency egress requirements referenced in 2.15, 4.2, and 4.5-2 shall be taken into consideration when the expected or potential ultimate length of a DSX or fiber optic distributing frame may restrict people from access to an emergency exit. In such cases, DSX and fiber optic distributing frame lineups shall be interrupted to enable required access to a building or area emergency exit. DSX and fiber optic distributing frames shall have a distinctive break in the framework installation to form a passage way for people, and modular distributing frames shall make use of "walk-through" used with the particular framework design.

7.3-3 Specific equipment space and aisle width requirements for distributing frames are determined by the particular distributing frame technology and by the projected ultimate subscriber and trunk termination capacity requirements for a particular office. Minimum 4'-0" front and rear aisles shall be used for conventional and modular copper distributing frames and 3'-0" front and 3'-0" rear aisles shall be used for fiber optic distributing frames, DSX-1, and DSX-3 frame lineups.

7..3-4 Universal Modular Distributing Frames
The use of conventional distributing frames is required for low and medium sized offices having a planned capacity of approximately 50,000 copper based customer lines or less. Universal Modular Distributing Frames (including their associated mechanized jumper assignment capabilities) may be considered for large offices having planned capacity requirements of more than 50,000 copper based customer lines. Placement of a Universal Modular Distributing Frame requires an economic study of all reasonable alternatives and is funded by an approved business case prepared by Fundamental Network Planning – Switch and a One Time Approval through AT&T Services Inc., Network Planning & Engineering – Common Systems. For further information, refer to the Frame Forecast Planning M&P, ATT-002-316-003, and Tab 11, of the Infrastructure Deployment Guidelines (Switching).

> *7.3-4.1 Due to the exceptionally high cost of Universal Modular Distribution Frames and their limited applicability with regard to spectrum interference, Common Systems Staff does not recommend the deployment of new UMDF frames at this time.*

7.3-5 Hard-wired network elements *shall not be installed in the same lineup* as DSX or fiber optic distributing frames unless the ultimate length of the distributing frame has been definitely determined. When it is deemed appropriate to install hardwired network elements in the same lineup as a DSX or fiber optic distributing frame, the equipment shall be engineered to grow towards each other from opposing ends of the lineup. *This should be the LAST strategy.* This same equipment growth pattern may be used when DSX and fiber optic distributing frames are located in the same equipment lineup. *Again, this should be the LAST strategy.*

7.3-6 Frame administration area
Distributing frames require service order and frame administration people space like other network elements. *A minimum of 75 $ft^2$ shall be allocated for distributing frame administration.* This space may be dedicated floor space adjacent to the distributing frame(s) (preferred), or included with the total floor space requirements allocated for network administration personnel. How and where distributing frame administration space is allocated is determined at the local level, based upon the specific office and equipment configuration conditions.

## 7.4 Copper Distributing Frames

7.4-1 The main distributing frame serves as the primary point of termination for OSP copper loop facilities. Accordingly, the main distributing frame is commonly located at and parallel to building cable entrance facilities.

7.4-2 The main distributing frame is an integral component of the Central Office. Should the MDF exhaust with no possibility of growing further, the office could be considered exhausted, triggering the need for a new wire center. For this reason, the growth path of the MDF must be kept open for all possible future growth.

It is understood that State Utility Commissions may require a reduced interval in the forecast planning from the standard projection timelines. When this occurs, the floorspace layout should reflect maximum permissible sizing available.

### 7.5 Conventional Distributing Frames

7.5-1 Conventional distributing frames are a skeletal framework of horizontal and vertical steel angles and flat bars on which OSP and network equipment cable termination apparatus is mounted. *Low profile conventional distributing frames having a height of 8'-10" shall be used for all new conventional distributing frame requirements.*

7.5-2 The conventional frame is typically a single structure that is a double sided, manually operated, interconnection device with horizontal wire carrying shelves backed by vertical uprights. *It is permitted to continue to grow tall conventional distributing frames within the existing architecture ( i.e., 11'6" or 14'-feet high) to complete a lineup.* Refer to the recommendation made in section 7.5-1 about low height conventional frames.

7.5-3 Except for small rural office applications requiring less than 50 verticals of framework, conventional distributing frames shall be incrementally "zoned" and engineered into an office, as service demands require, rather than engineering and installing the projected ultimate frame requirements initially. Conventional distributing frames shall be equipped with cable connector blocks and terminal strips in a manner that utilizes all available vertical or horizontal shelves and levels. OSP copper cable and DLE terminations will only be placed on the vertical or cable side. OE/LEN, tie cables and miscellaneous network elements will be placed on the horizontal side of the frame.

7.5-4 The frame should be grown once either the vertical or horizontal side of the frame has reached 95% of capacity. Minimum frame growth increments should be sufficient to support 5 years of growth and not be less than 6 contiguous verticals of ironwork. All horizontal and vertical troughs and levels must match evenly and provide for a continuous jumper placement route on all levels. Refer to the Frame Forecast M&P, ATT-002-316-003, *for block placement strategies.*

### 7.6 Modular Distributing Frames

7.6-1 Universal modular distributing frames have a unitized framework construction similar to that of network equipment frameworks and generally require substantially more office floor space than conventional distributing frames due to the fact that they require an accompanying conventional IDF to become fully functional. Although they are manufactured and installed in modular fashion, the layout of loop and equipment cable termination apparatus and the mechanized jumper management feature of modular distributing frames usually require that modular frames be installed in their ultimate configuration initially.

7.6-2 To mitigate the difficulties of renumbering a modular frame due to non-linear growth, it is recommended that the ultimate frame growth pattern be determined at the initial design stage. This would include projecting future frame growths into future building growths. Once the total frame growth is identified, with "dotted line" representation on the floorplans, the proper frame numbering can be described.

7.6-3 When a universal modular frame replaces a conventional Main Distributing Frame, the function of the conventional frame will change from that of an MDF to become the IDF for the wire center. The vertical side of the conventional IDF will function as the Protector Frame, and continue to be the termination point for all cable facilities and protectors. The horizontal side of the IDF will provide the termination points for the miscellaneous network elements, as described in section 7.3-3.

## 7.7 Assignment Alternatives

Provided in the algorithms that determine frame length, jumper pileup, zone requirements, peak pileup, etc., many different combinations of DF layout and assignment configurations can be developed. Assignment strategies can affect jumper congestion. The two basic assignment strategies are:

a) Random assignment, - followed most commonly when making manual assignments.
b) Preferential assignment, - uses a search algorithm in a zoned universe to minimize the jumper length on the frame, and can best be realized by mechanized administration systems.

## 7.8 Layout Alternatives

The success of the preferential assignment depends directly on termination layouts. For example, if a given equipment type does not appear in each zone, preferential assignment success is affected. Types are layout are:

a) Non Spread Layout, - are found on many older frames because the frames grew as terminations were added, and a particular facility or equipment was terminated in the growth area of frame at the time it was added.
b) Uniform Spread Layout, - each equipment type is spread uniformly over the length of the frame. If the quantity of a certain type of equipment is insufficient to fill a complete shelf, uniform spread implies terminating that equipment in as many locations as possible along the length of the frame (e.g., every fourth bay)
c) Zone Spread Layout, - this alternative is one in which the frame is divided into a number of mutually exclusive zones of equal size and each facility and equipment is terminated proportionally among the zones. Zone spreads(depending upon zone size) results in varying degrees of preferential assignment success. MDFs use only zone spread layout combinations.

## 7.9 DSX Frames

7.9-1 General
The planning and engineering of cross connect system is a specialized function. The replacement and rehabilitation of a DSX can involve millions of dollars and <u>may</u> create a serious service problems. Hence putting this under a single control (planning and engineering) to monitor actual conditions plus identification and evaluation of alternative courses of action is important.

7.9-2 The DSX Cross-Connect Frame architecture serves as the primary interface between a DS1/3 generating Network Element (NE) and a Digital Cross-Connect System (DCS). The DSX Cross-Connect Frame provides a centralized point for the organization and administration of the DS1/3 Copper Facility and provides for rearrange able connections between any two terminations or appearances. A DSX Cross-Connect Frame serves as a manual method of cross connecting DS1, DS1C, and DS3 services, in addition to Digital Cross-Connect Systems. Space planning and equipment engineering of the DSX1/3 frame <u>should be</u> accomplished using the same or

similar practices established for fiber distributing frames (see 7.3-3).

7.9-2 DSX-1 Frames

7.9-2.1 Planning of the DSX-1 lineup will dictate careful consideration of the Central Office layout. It is important to place the DSX-1 lineups (if multiple) in a parallel arrangement in a contiguous arrangement with appropriate troughs for adequate jumper placements. The length of the lineup <u>may</u> be up to 85 feet with the correct provisions for trough and routing layouts and <u>may</u> have up to 4 parallel lineups.

7.9-2.2 Refer to the DSX-1 Frame Forecast M&P, ATT-002-316-041, for additional space planning information.

7.9-2.3 The following identify general rules to follow when placing DSX-1 lineups in an office.

- Initial DSX-1 deployments will be in 5-bay increments with a forecasted space identified for the lineup to grow to 40 potential bays.
- Grow existing DSX-1 lineups in 5-bay increments.
- Begin a second lineup when the initial lineup grows beyond 20 bays.
- Begin a third and a subsequent fourth lineup when the previous lineup reaches a length of 30 bays.

7.9-3 DSX-3 Frames

7.9-3.1 Planning of the DSX-3 lineup will dictate careful consideration of the Central office layout. It is important to place the DSX-3 lineups (if multiple) in a parallel arrangement in a contiguous arrangement with appropriate troughs for adequate jumper placements. The length of the lineup may be up to 88 feet with the correct provisions for trough and routing layouts and may have up to 4 parallel lineups.

7.9-3.2 Refer to the DSX-3 Frame Forecast M&P, ATT-002-316-042, for additional space planning information.

7.9-3.3 The following identify general rules to follow when placing DSX-3 lineups in an office.

- Initial DSX-3 deployments will be in 5-bay increments with a forecasted space identified for the lineup to grow to potentially 12 bays.
- Grow existing DSX-3 lineups in 5-bay increments.
- Begin a second lineup when the initial lineup grows beyond 10 bays.
- Begin a third lineup when the previous lineups reach 11 bays in length.

### 7.10 Fiber Distributing Frames

7.10-1 Fiber distributing frames (FDF) are an arrangement of fiber optic terminating equipment panels usually mounted on traditional network bay equipment assemblies. A module of FDF consists of a frame used for terminating OSP cables (OSP) or network equipment elements (FOT), which allows for cross connection flexibility between the different panels. Space planning and equipment engineering of the FDF should be accomplished using the same or similar practices established for DSX1/3 distributing frames (see 7.3-3).

7.10-2 A Fiber Distributing Frame (FDF) architecture serves as the primary interface between outside plant (OSP) fiber optic facilities entering a Central Office structure and the fiber optic equipment installed within that same location. The FDF provides a centralized point for the organization and administration of the fiber optic facility and intrabuilding fiber equipment cables, provides a flexible platform for future fiber growth, and provides rearrangeable connections between any two terminations or appearances. Refer to the FDF Deployment M&P, ATT-002-316-043, for additional space planning information.

7.10-3 Relative to other transport equipment, the FDF should be the closest equipment lineup to the building's Cable Entrance Facility (CEF), if possible. It is imperative that the FDF be located as close to the network elements that it will support as feasible. This will reduce the length of interconnect fiber patch cords that need to be placed each time a piece of equipment is installed.

7.10-4 Connection of new network technologies to customer-serving fiber optic OSP cables shall be accomplished via the FDF rather than via equipment and apparatus installed in other office equipment frames and locations. *The full cross-connect architecture will be utilized by the AT&T Local Exchange Carriers through the placement of Fiber optic Terminals (FOT) and bays* *for the termination of all Network Fiber Equipment.* The purpose of this requirement is to ensure that OSP cable appearances within a building are commonly located for test and access purposes, and that the use of special purpose OSP entrance cable racks are minimized.

### 7.11 Fiber Distributing Frames (FDF) Planning Considerations

7.11-1 It is crucial that the FDF be properly planned for growth. The floor plan layout of the FDF should be placed in an alternating pattern of FOT and OSP bays providing for a logical growth pattern, e.g. OSP-FOT-OSP-FOT-OSP-FOT-OSP-FOT…In exceptionally dense outside plant fiber optic facility Central Offices, space may be further condensed to a OSP-OSP-FOT-OSP-OSP-FOT… pattern on an exception basis. In small wire centers, the first FDF bay can be used in a combination mode with the FOT panels on the bottom and the OSP panels on the top.

Any growth beyond the first bay will require the standard FOT and OSP bay topology to be followed. *In any case, Fiber equipment will not be directly terminated on the front access ports of the OSP panels but will be terminated on FOT panels and will be subsequently cross-connected to another FDF panel.*

Refer to the IDG, Transport, Tab 4, Fiber Distributing Frames, and the FDF Deployment M&P, ATT-002-316-043, for more details.

### 7.12 T-140 Drawings

T-140 distributing frame drawings are maintained by the frame planners.

#### 7.12-1 Distributing Frame Records

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 |

7.12-2 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.

7.12-3 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.

7.12-4 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.

7.12-5 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 01, 02, 03, etc. in the opposite direction.

7.12-6 COSMIC and modular ESS Distributing Frame Records are tabular and the records shall be maintained in Frame Mate. There is no graphical/mechanical CO base record.

### 7.13 References

1. *MDF/IDF Frame Forecast M&P,* ATT-002-316-003, dated 7/2001
2. *DSX-1 Frame Forecast M&P,* ATT-002-316-041, dated 11/2001
3. *DSX-3 Frame Forecast M&P*, ATT-002-316-042, dated 10/2001
4. *FDF Deployment M&P,* ATT-002-316-043, dated 1/2002
5. *Fiber Distributing Frames (FDF), Fiber Protection System (FPS) and Fiber Termination Equipment*, IDG, Transport, Tab 4, dated 1/2002
6. *Digital Cross-Connect Frames (DSX-1 & DSX-3)*, IDG, Transport, Tab 16, dated 1/2002
7. *Subscriber Main Distributing Frame (MDF)*, IDG, Switching, Tab 11, dated 12/2001
8. *Fiber Optic Splitters,* IDG, Transport, Tab 12, dated 1/2002
9. *Dense Wave Division Multiplexing (DWDM),Wavelength Division Multiplexing (WDM), Optical Frequency Division Multiplexing (FDM) and Optical Amplifiers,* IDG, Transport, Tab 13, dated 1/2002
10. BSP 636-299-900MP *FDF Fiber Distributing Frames and Miscellaneous Apparatus* , dated 1/2002

For Frame Forecasting refer to "*Frame Forecast Method and Procedures"* Infrastructure Deployment Guidelines

# Section 8
# TRANSPORT EQUIPMENT

## 8.1 General

8.1-1 It is important to keep in mind that everything *but* switching equipment is installed in the transport equipment area(s) of a network facility (see 4.14). Therefore, substantial growth capability for future equipment and technologies should be allocated within the various network element areas comprising a building's transport equipment area(s). Figure 8-1 and 8-2 illustrates the various network elements that are generally installed in transport equipment areas and their relative interconnection relationships.

8.1-2 Figure 8-1 illustrates the generic interconnection relationship of network elements at their fundamental level. Configuring network equipment arrangements according to the *primary network interface methodology* of Figure 8-1 will minimize interconnection cable lengths, office cable congestion and the amount of special purpose cable racks required above the equipment area in general. It should also facilitate people movement among related technologies for test and maintenance purposes. Assuming the total area allocated to each network element shown in Figure 8-1 is appropriate for long range purposes, it should be relatively simple from a network management or engineering perspective to migrate technology into and out of such equipment configurations.

8.1-3 With regard to the cabling media used to distinguish the various transport technologies in Figure 8-1 (DS-0, DS-1, etc.), network elements should be treated as entities when available office space dictates that transport equipment be located in multiple areas within a building. Locate like technologies in a common area unless their fragmentation supports an overall office equipment or technology configuration plan (see 8.1-4). If in a Figure 4-4 scenario, equipment must be located in the unplanned area, the equipment placed in the unplanned area should be all of a particular technology such as all of the office's DCS and/or DS-1 elements. An acceptable alternative in Figure 4-4 scenarios is for a particular technology to span both sides of the main cross aisle.

8.1-4 **Figure 8-2** generically defines further the network functionality of the various technologies comprising the transport network elements shown in Figure 8-1. Figure 8-2 may be an appropriate floor plan for small metropolitan offices, however, it is overly simplistic for larger network facilities because each of the individual network elements require multiple equipment frames or multiple lineups of equipment frames to provide the indicated functionality. Except for the office distributing frames and fiber multiplexing equipment, it may be appropriate that multiple Figure 8-2 equipment configurations be used in a large network facility having multiple switches serving multiple geographical areas. With regard to Figure 8-2, the interconnection media should be seen as rubber bands when it is necessary to fragment network technologies and elements within a technology.

a) To avoid the use of entrance and tie cable special purpose cable racks, the office distributing frame function should not be dispersed throughout a building. Entrance cable can not be mixed with other office cabling and distributing frame tie cables should not be mixed with other office cabling.

b) To avoid having to engineer and route fiber optic cable throughout a building and especially between floors, fiber multiplexing equipment shall be located in a common area adjacent to the office fiber optic distributing frame.

8.1-5 The HDT and ATM elements are shown in the fiber area of Figure 8-2 because they require the use of fiber optic cable raceways (special purpose cable racking). This equipment configuration restricts the use of fiber optic cable raceways to a relatively small area of the office, depending on the amount of fiber optic technology actually required. The video element(s) are shown away from the fiber area even though they also require the use of fiber optic cable raceways. This is because video and radio technologies use waveguide and/or heliax cable to channel signals to and from an office microwave antenna via a CEF in the roof or an exterior wall. Video and radio equipment elements are located as close as possible to their CEF to minimize waveguide and heliax cable lengths and the extent of the internal ring ground system required for these technologies.

8.1-6 For some network elements, actual equipment placement is controlled by "cable distance" restrictions to their associated network elements. Such restrictions, if any, further define where within a technology area some network elements must be placed, and if multiple areas of a particular technology need to be established.

## 8.2 BDFBs

8.2-1 Except as noted below BDFBs <u>shall be</u> located at the end of an equipment that is closest to the office power plant and <u>should be</u> centrally located among the equipment lineups they serve. This arrangement minimizes primary and secondary cable lengths and the presence of dedicated cable racks interior of equipment areas.

> *Note: In some cases BDFBs will be fed from a floor above or below and the primary distribution cable rack will or must enter the equipment area between columns interior of an equipment lineup. In such cases BDFBs <u>should also be</u> located interior to an equipment lineup to minimize cable lengths and avoid dedicated racks extended to the end of equipment lineups. The location of BDFBs in this scenario <u>should</u> based on the minimum cable route and racking needed to transition primary cables from the cable hole to the BDFB. Ideally a BDFB fed from a floor below would be located directly over a cable hole. A BDFB fed from above would be located 3 or so feet away from the cable hole in both directions.*

## 8.3 Forecasting M&Ps[12] (Transport / IOF, Data Engineering, LOOP Equipment)

8.3-1 For transport equipment forecasting refer to *"Transport Engineering Space Reservation Process."*

8.3-2 For Data Engineering forecasting refer to *"Data Engineering Space Reservation Process."*

8.3-3 For Outside Plant Equipment forecasting refer to *"Documentation of Loop Requirements For Wire Center Space Planning."*

[12] Forecasting M&Ps listed here are not maintained by the Common Systems Group. Each department staff supports their own forecasting M&Ps.

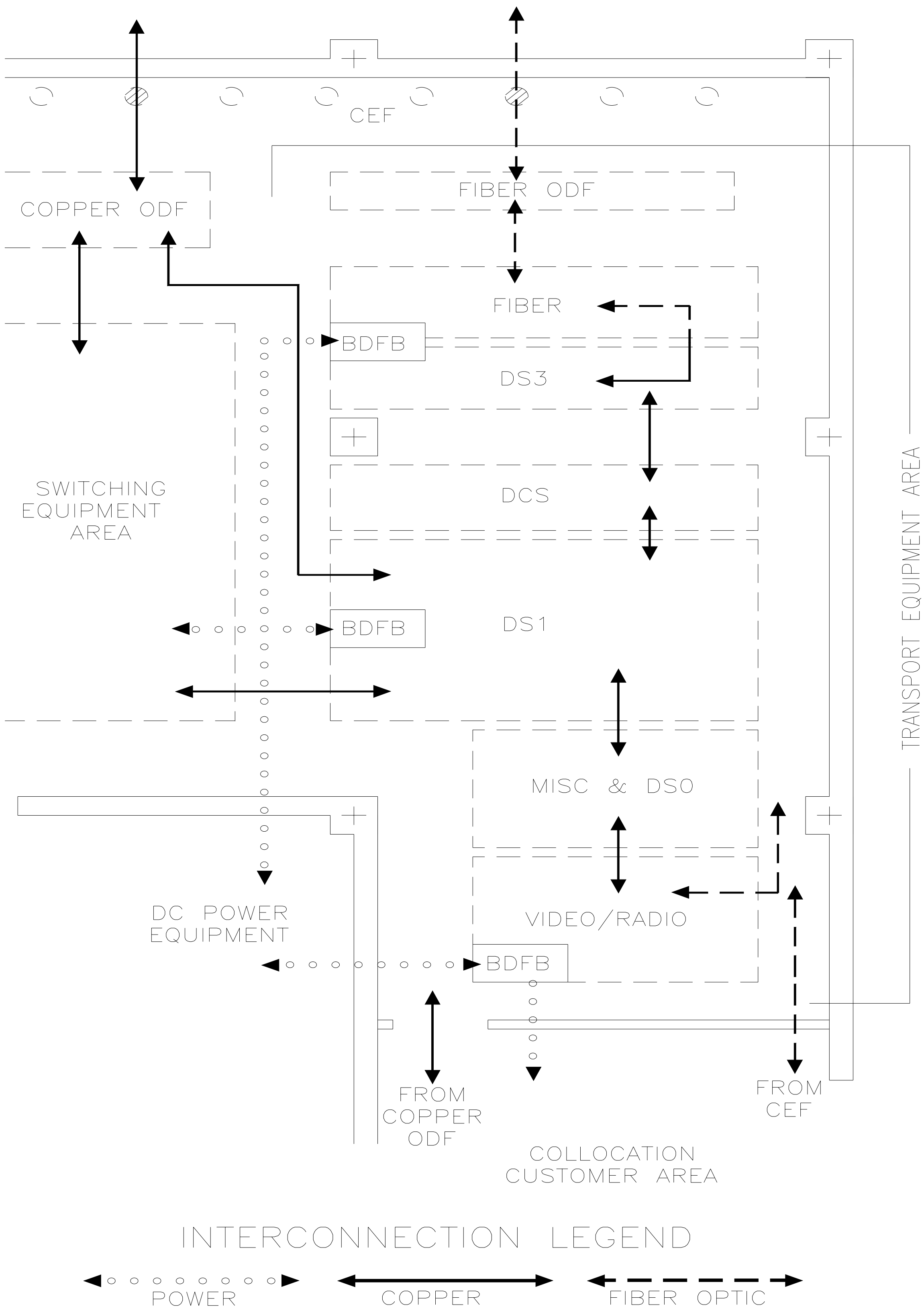



**Figure 8-1 - Generic Relationship Of Network Technologies**

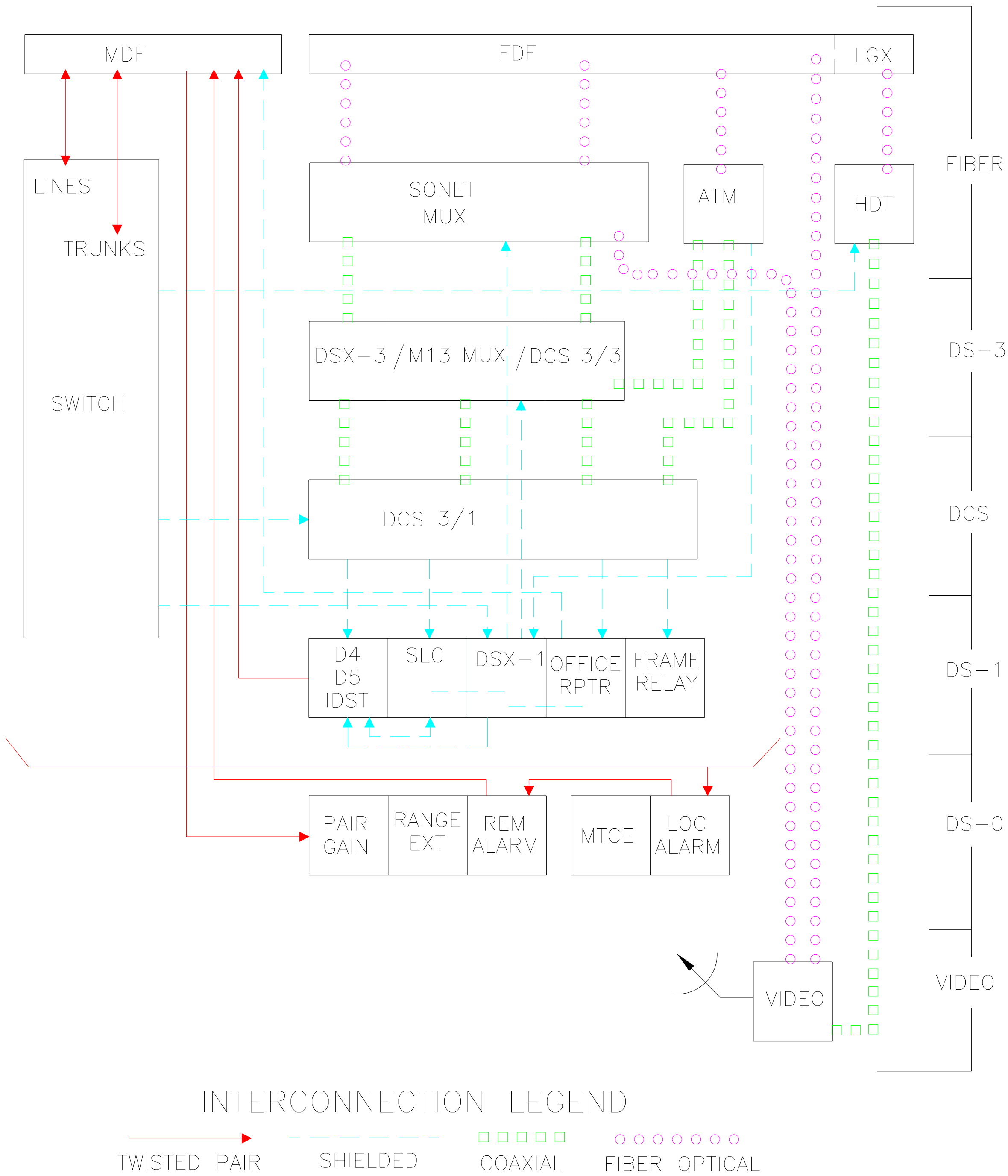



**Figure 8-2 - Generic Functionality Of Transport Equipment Network Elements**

# Section 9
# EQUIPMENT AISLE SPACING

## 9.1 General

Refer to sections 4.6 and 4.7 for an initial discussion on equipment aisle spacing.

## 9.2 Width and Location of Lineup Cable Racks

The width and location of required overhead lineup cable racks must be considered when establishing equipment aisle spaces to ensure overhead cable capacity, physical access to office cable racks, and equipment cooling capabilities are not compromised. As illustrated in Figure 9-1, lineup cable racks should be located to the front of equipment lineups to facilitate more effective equipment cabling arrangements. This is because transport equipment is generally cabled at the rear of equipment frames and units. Lineup cable racks for open rack type and equipment having a shallow depth (15" or less) are in actuality located above the equipment's front aisle space. Accordingly, the narrower the front aisles are for open rack type equipment, the closer the lineup racks will be to equipment lighting fixtures installed along the center of each front aisle. This means that the narrower equipment front aisles are;

- The less room there is for people access to the cable racks,
- The less room there is for equipment cooling air flow and/or air distribution apparatus, and
- The narrower lineup cable racks must be which may accelerate cable pileup (cable rack congestion).

9.2-1 Also illustrated in Figure 9-1 is that lineup cable racks for equipment mounted in cabinets should be located above the front portion of equipment cabinets. *This cable rack arrangement minimizes the impact of lineup cable racks and their associated cabling on aisle widths and the equipment environment in general.* Theoretically, narrower aisle widths can be used with deep cabinetized equipment without affecting an area's overhead environment, however, the heat dissipation, floor loading, and door swing requirements of cabinetized equipment generally require the use of wide equipment aisles.

## 9.3 Equipment Depth

Figures 9-2 through 9-6 illustrate how various equipment depths can be configured in traditional network equipment environments having 2'-0" x 2'-0" columns spaced on 20 foot centers. The aisle spaces indicated are preferred and need to be appropriately adjusted in buildings having other than the traditional column size and spacing, and when dictated by product specific space planning and engineering information. In some cases the number of equipment lineups may have to be reduced to accommodate actual building dimensions.

## 9.4 Aisle Space Illustration

9.4-1 Figure 9-2 (A) illustrates classic transport area aisle spaces using standard telecom *minimum* aisle sizes and 1'-0" deep equipment frames. Although Figure 9-2 (A) makes maximum use of available floor space, it *effectively eliminates the deployment of equipment deeper than 1'-0" and it makes access to overhead cable distribution systems and equipment cooling air flow management difficult.*

9.4-2 Figure 9-2 (B) illustrates the preferred aisle spaces for equipment areas where 1'-0" equipment frames will be deployed. The *wider aisle spaces enable more efficient equipment heat dissipation,* should mitigate equipment floor loading considerations, enables the use of wider lineup cable racks to control cable pileup, maximizes access capabilities to the overhead environment, and provides plenty of room for equipment and network management activities. Figure 9-2 (C) aisle spaces may be used when available equipment floor space is limited.

9.4-4 Figures 9-3 and 9-4 provide the preferred aisle spaces for areas dedicated to equipment having those overall depths. The technologies used to provide new network services make it a rarity that an equipment area can be planned using a single equipment depth. Actual equipment deployment generally requires intermixing equipment of different depths into a common area and sometimes a common lineup. For this reason, the use of 1'-0" deep equipment lineups for space planning purposes is not recommended except when it is known that only a technology of that depth will be installed in a particular area or lineup. General space planning should be predicated on the use of Figure 9-3 (C), especially when the actual depth of network elements is not known. This practice should ensure adequate floor space is available to effectively manage the network's evolution over time.

9.4-5 Figure 9-4 illustrates aisle spaces for data communications technology (traditional computer and cable TV type equipment) which is generally packaged in relatively deep equipment cabinets. Figure 9-4 (A) presumes such equipment will be used in conjunction with another network equipment technology and will not require floor space on a building bay basis. The aisle spaces used in Figure 9-4 (A) are based on lineup number 3 being 1'-0" deep. Figure 9-4 (B) should only be used after equipment floor loading, heat dissipation and access (door swing) requirements have been verified to support such a concentration of equipment.

9.4-6 Figure 9-5 provides a typical application of the aisle spacing guidelines provided in this part to the office layouts illustrated in Figures 4-2 and 8-1. As shown in Figure 9-5, transport equipment lineups should parallel the office FDF, and MDF where applicable. This is to minimize the amount of interconnection cable installed in equipment *lineup* cable racks. Figure 9-6 illustrates how office cable racks would generally be provided for the Figure 9-5 equipment configuration.

## 9.5 AT&T Aisle Spacing Standards*

| **AISLE** | MINIMUM | MAXIMUM | STANDARD (recommended) |
|---|---|---|---|
| **Maintenance (Front)** | 2' – 6" | 4' – 0" | **3' – 0"** |
| **Wiring (Rear)** | 2' – 0" | 3' – 0" | **2' – 6"** |
| **End (from nearest object)** | 2' – 6" | ------- | **3' – 6"** |

**Table 9-1 represents generic Aisle Spacing criteria**

** Notes: Refer to Figures 9-1 to 9-6 as examples for required clearances for Telecommunications equipment*
*Refer to section 9.5-1 for required clearances from Electrical equipment*

9.5-1 The minimum distance equipment shall be placed from active AC Power equipment per 2002 National Electrical Code (NEC) Section 110.26(A)(1) is:

a) 36 inches when the nominal voltage to ground of the AC equipment is 0-150
b) 42 inches when the nominal voltage to ground of the AC equipment is 151-600 (e.g., PDSCs serving DC Power Plants)

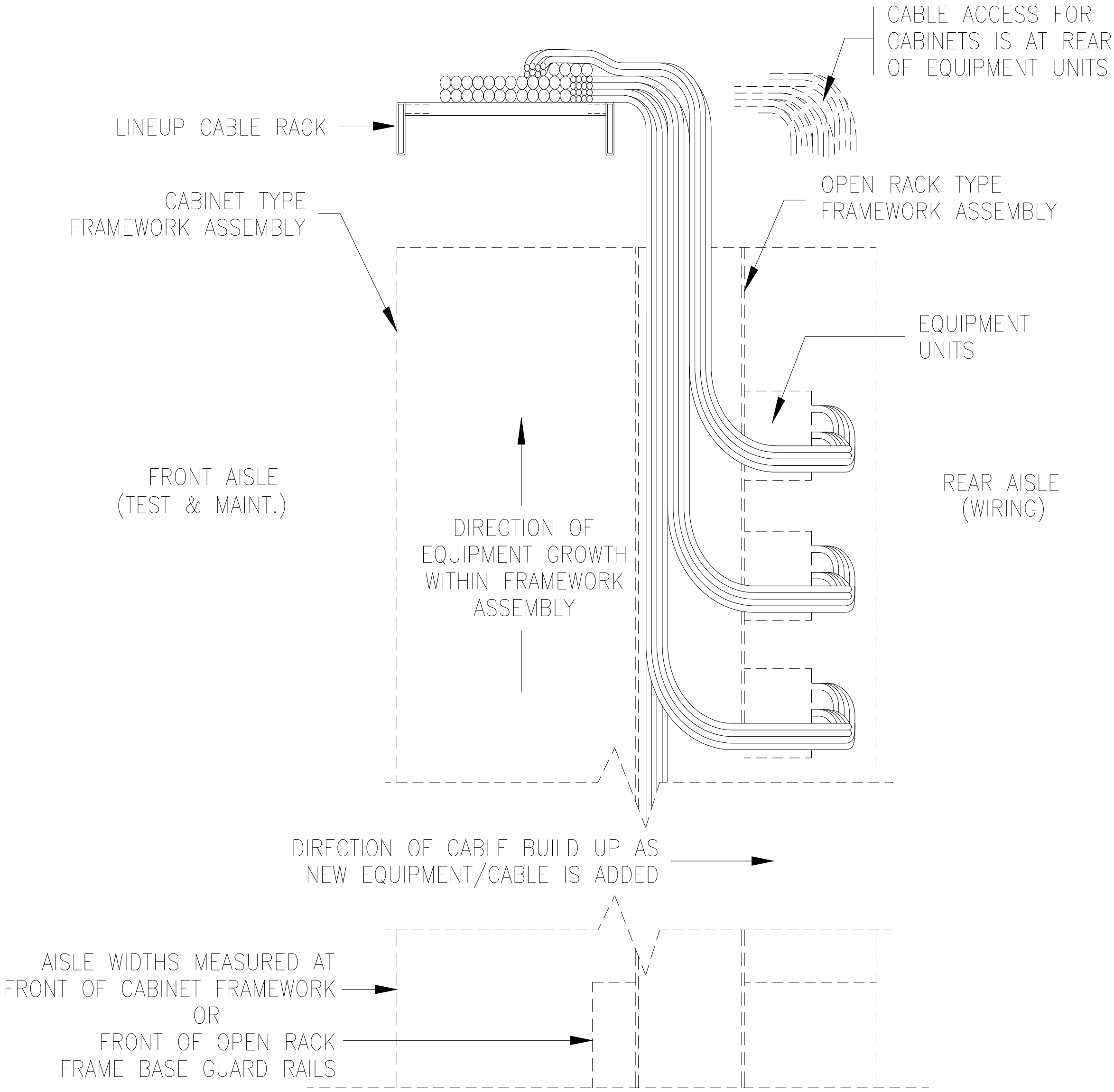
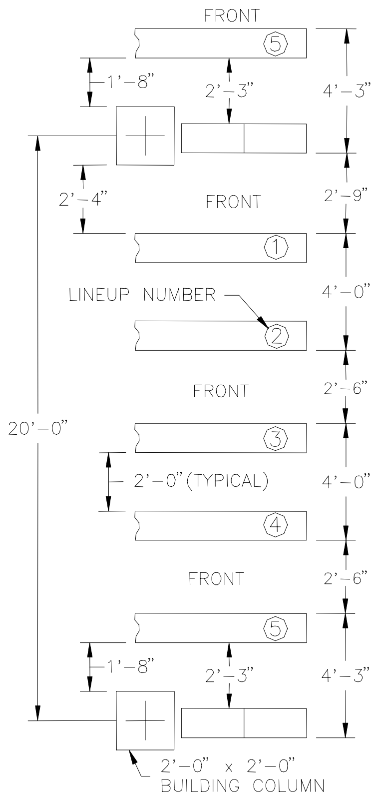
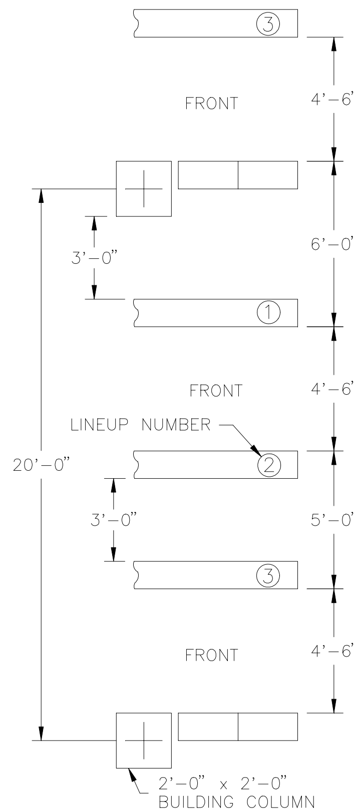



**Figure 9-1 Generic Method Of Cabling Plan For Transport Equipment Frames And Cabinets**



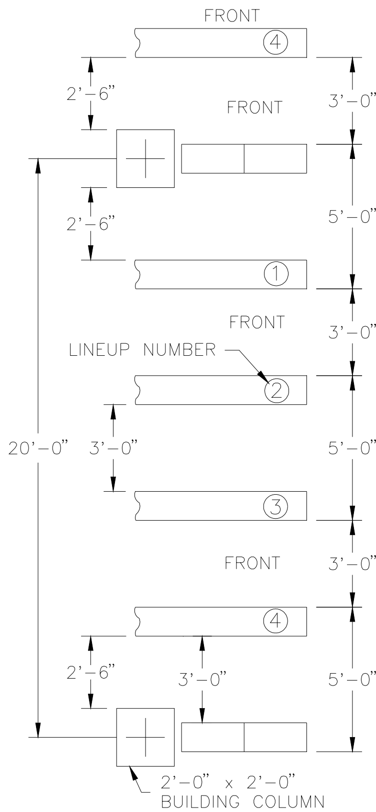

**(Figure 9-2A)**
**Traditional Telecom (Minimum) Aisle Spacing**




**(Figure 9-2B)**
**Preferred - Large Overhead Cable Capacity**

**<u>Figure 9-2</u>**

**Aisle Spaces for Traditional, Preferred Large Cable, Lightly Cabled Equipment Lineups (This page and the following page)**

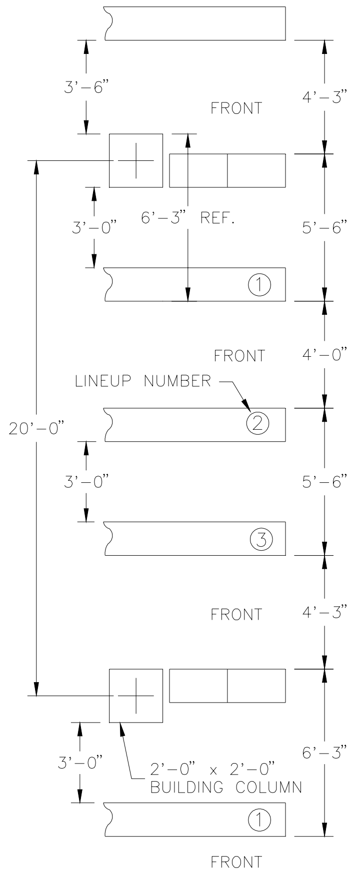



**(Figure 9-2 C) Lightly Cabled Equipment And Limited Floor Space Applications**

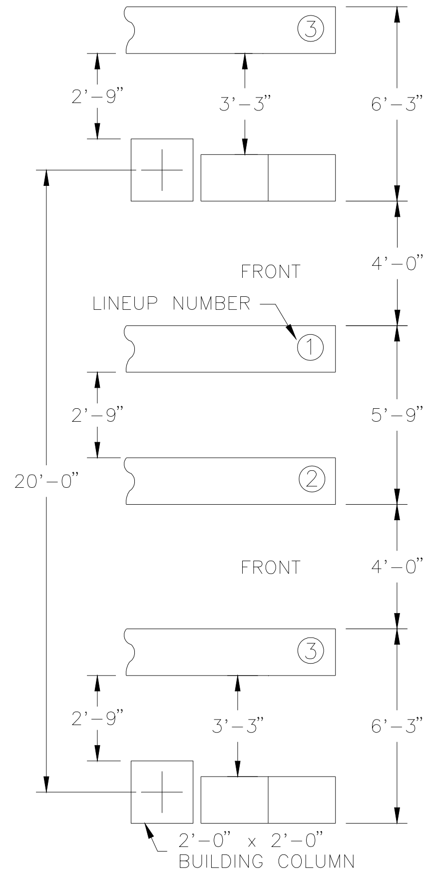
**<u>Figure 9-2</u>**

## Aisle Spaces for Traditional, Preferred Large Cable, Lightly Cabled Equipment Lineups (This page and the previous page)

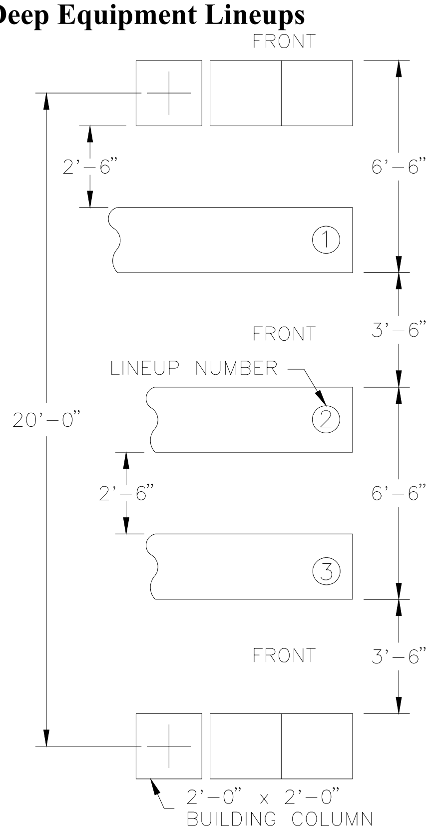
**Figure 9-2 Typical Aisle Spaces For 1'-0" Deep Equipment Lineups**




**(Figure 9-3A)**
**1'-3" Deep Equipment Lineups**

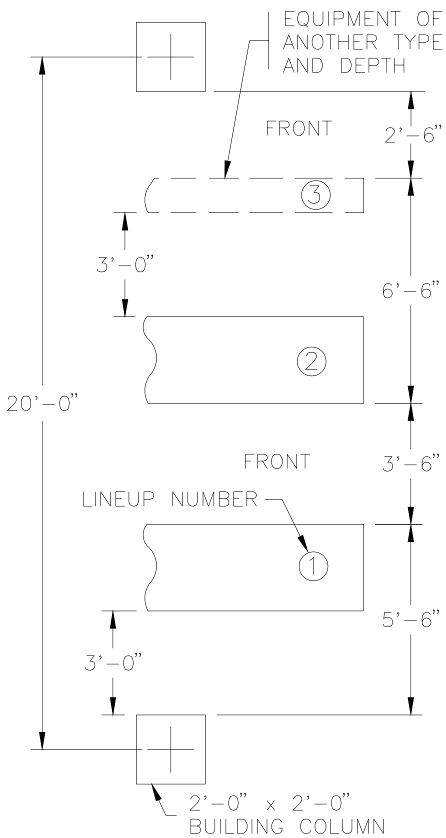



**(Figure 9-3B)**
**1'-6" Deep Equipment Lineups**

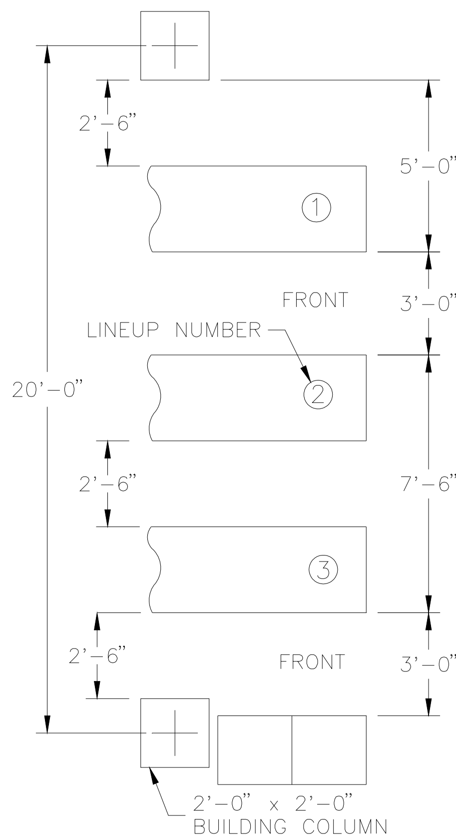


**(Figure 9-3C)**
**2'-0" Deep Equipment Lineups**

**Figure 9-3 Typical Aisle Spaces For 1'-3", 1'-6" and 2'-0" Deep Equipment Lineups**
**(This page and the previous page)**




**(Figure 9-4A)**
**Preferred**




**(Figure 9-4B)**
**Limited Floor Space Applications**

**Figure 9-4 Typical Aisle Spaces For 2'-6" Deep Equipment Lineups**

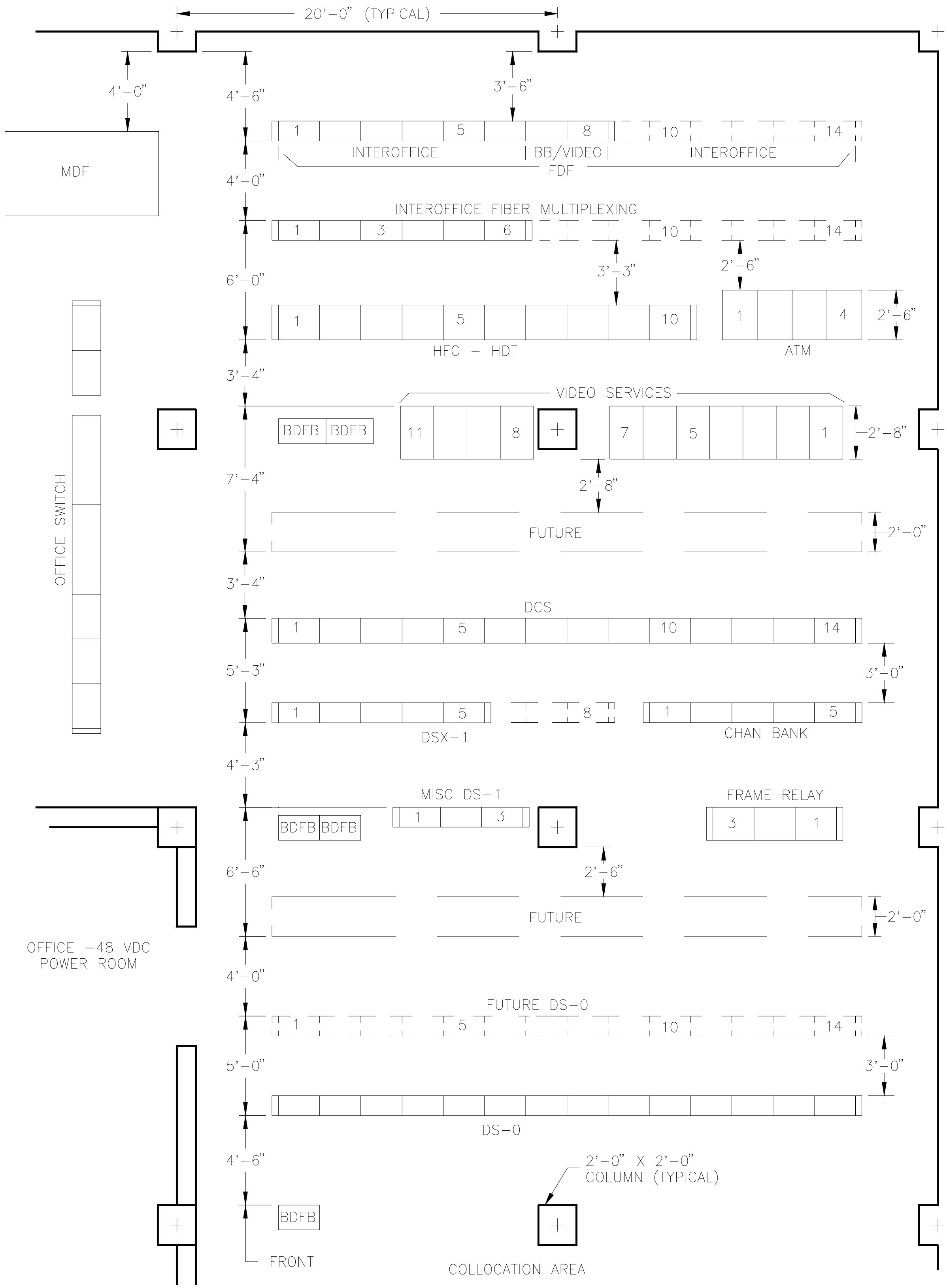



**Figure 9-5 Typical Application Of Aisle Spacing Guidelines**

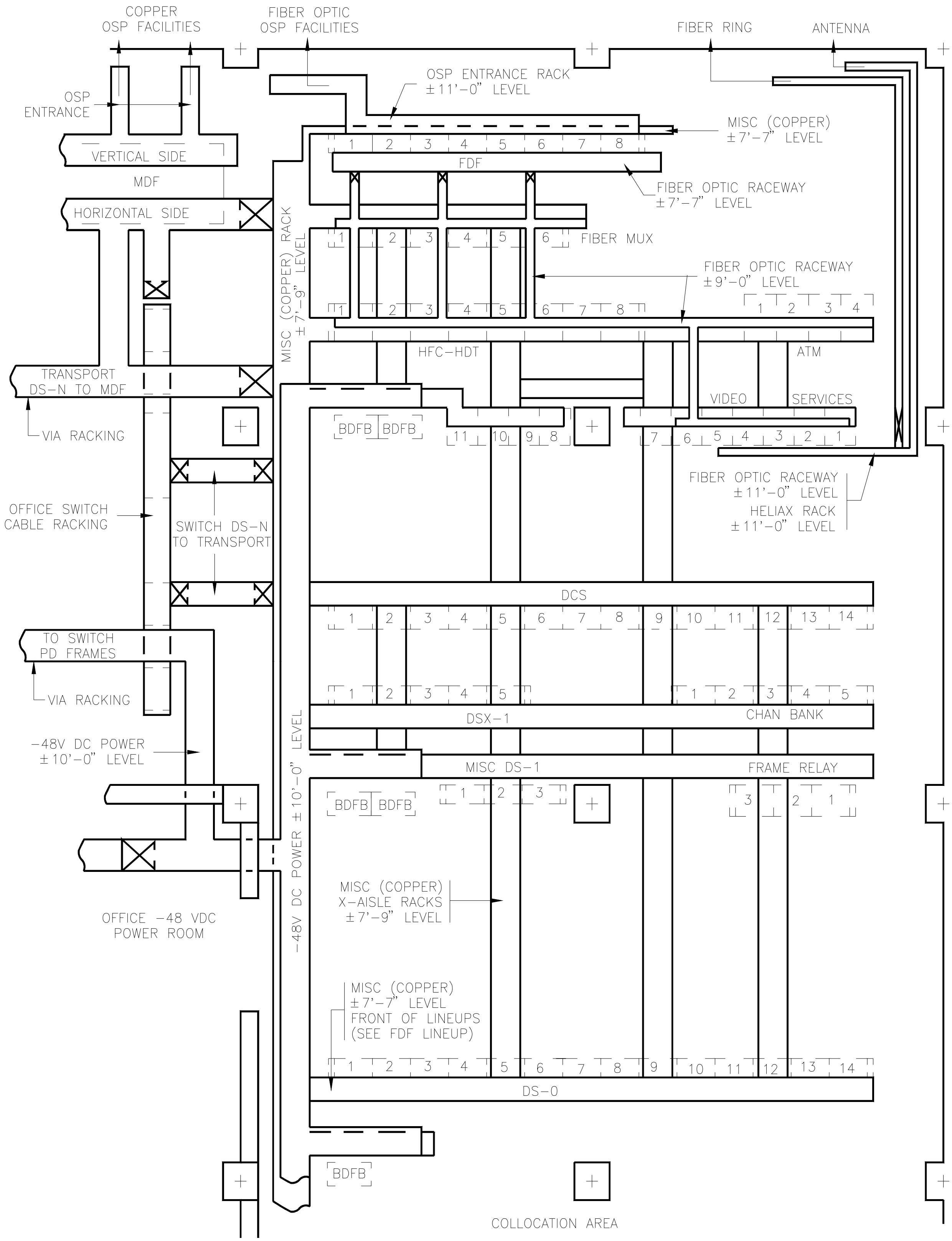



**Figure 9-6 Typical Application Of Office Cable Racking To Figure 9-5 Floor Plan**

# Section 10
# SWITCHING EQUIPMENT

## 10.1 General

10.1-1 Office switching equipment entities shall be located as close to the office distributing frame as possible to minimize the lengths of customer line interconnection cables. The physical arrangement of equipment within switching equipment areas shall be in accordance with the floor space and system planning documentation provided by the equipment vendor. *Switching equipment is usually configured perpendicular to the office MDF.*

10.1-2 Switching equipment designs include a cable distribution system that will accommodate the amounts of cable needed to interconnect the various elements of the switch, and the switch to the office distributing frame(s). The capacity of switching equipment cable distribution systems are not intended to accommodate network cabling in general. For this reason, network interconnection cable not terminating at the office switch shall not be routed in the switch's cable distribution system. Via cable racks shall be engineered above switching equipment areas when it is necessary to interconnect network elements that are physically separated by switching equipment and areas (refer to Figure 9-6, generic).

## 10.2 Forecasting M&P[13]

For Switch Equipment Forecasting refer to *"Switch Forecast to frame Floorspace," and "Switch Floorspace Footprint Reservation Responsibility."*

[13] Forecasting M&P listed here is not maintained by the Common Systems Group. Each departmental staff supports their own forecasting M&Ps.

# Section 11
# COLLOCATION

## 11.1 General

FCC and/or PUC mandates that Incumbent Local Exchange Carriers (ILEC) provide space to Competitive Local Exchange Carriers (CLEC) for physical collocation of CLECs' equipment in eligible structures (Wire Center, CEV, Huts) on a first come first served basis. To apply for a space in an eligible structure, CLEC shall provide a completed physical collocation application form found in the External Collocation Handbook, and, shall pay the associated initial application fee. The collocators shall include in each application a prioritized list of its preferred methods of collocating, e.g., caged, shared, cageless, or others. Upon receipt of collocator's application and initial application fee payment, ILEC shall notify the applying CLEC within 10 days whether the request for space has been granted or denied for lack of space.

**11.2** Cages and other floor space arrangements for collocation shall be in accordance with the AT&T LEC Interconnectors' Technical Publication for Collocation. (TP76400 section 5-3.1.1)

## 11.3 Related Documents

Many other documents may cover specific legal and regulatory requirements for a collocated equipment in a central office. Please refer to them for appropriate application. Wire Center Space Planning M&P refers to space assignment process for CLEC and ILEC in a central office.

**Section 12**

## EQUIPMENT REMOVAL

### 12.1 General

All equipment and network related apparatus whose function is no longer required shall be identified, and, if appropriate physically removed from network facilities to ensure the equipment does not hinder the deployment of new network technologies and services. Preferably, removal shall occur when the equipment or apparatus is taken out of service. Removed equipment shall be shipped to an equipment reuse facility if all or part of the equipment's functionality is appropriate for reapplication elsewhere in the network, otherwise, it shall be disposed of as junk.

### 12.2 Removal Policy

Refer to TP76300 Section Q for more detail on equipment removal policies. Equipment and apparatus is considered appropriate for reapplication and warehousing at local reuse centers if the functionality is used in the same or another network facility and;

a) The product's manufacture has been discontinued, or
b) The product is only available via special procurement arrangements, or
c) The product has an undesirable shipping interval, or
d) Desired stocking quantities of the product are not available at local reuse locations.

### 12.3 Reuse

For the purpose of the above reuse requirements, the word *apparatus* as used in 12.1 is defined as electrical and mechanical products not normally installed as or in equipment framework assemblies. Included in this category of products are superstructure mounted audio and visual alarm products, ladders and their associated hardware and support products, trolley type ac distribution ducting/raceways, and in general anything that meets the reapplication criteria of 12.2 (a) to (d).

### 12.4 References

Refer to BSP 812-000-017 *Central Office Cable and Wire Installation and Removal Requirements* for removal of cable associated with equipment taken out of service.

## Section 13
## EQUIPMENT CONSOLIDATIONS

### 13.1 Circuit Concentration

It is essential to effective network service provisioning and maintenance that data and communications service circuits have minimal cross connect appearances and that they be efficiently grouped and organized. It may be convenient that circuits be accessible in multiple locations within an equipment building, but each access point is a potential source for circuit degradation, accidental disconnect, and can complicate trouble isolation. *For these reasons the use of multiple office distributing frames and their associated tie cables, and circuit cross connection apparatus must be eliminated where possible.* This shall be accomplished by:

- Not wiring new technology into non-essential equipment or a technology the new equipment can or is intended to replace or serve in place of, and
- Distributing circuit appearances on office distributing frames and digital cross connect systems in a "zoned" fashion so individual circuits can be more easily located and managed.
- Refer to BSP 201-222-900MP for specific details. Recommendations in this new BSP shall prevail over all items mentioned in this section related to MDF or FDF.

### 13.2 Equipment Concentration

13.2-1 It is essential to effective equipment space management that equipment configurations also be *efficiently grouped and organized to optimize use of available equipment space and network management* (rearrangement and maintenance). Older network technologies were often deployed as long lineups of the same equipment because of the number of equipment frames required to provide a particular functionality (individual equipment lineups were dedicated to a technology/network functionality). Newer technologies were/are generally installed in a new equipment lineup and sometimes in a new area also dedicated to that particular functionality (sometimes because of equipment frame space requirements). Older equipment is generally incrementally removed as its functionality is enhanced or replaced by a newer technology.

13.2-2 The above scenario of network functionality being incrementally removed is also applicable to some equipment at the individual equipment shelf level. As a result, partially equipped equipment frames, short lineups of old technology, and under utilized power and circuit distribution equipment can be found throughout equipment areas. Such equipment configurations are usually an inefficient use equipment space and can be a hindrance to equipment maintenance and trouble isolation.

### 13.3 Consolidation Policy

Where possible and appropriate, equipment units and circuit termination apparatus should be consolidated onto appropriately located common frames to ensure the foregoing examples of less than optimum equipment scenarios do not hinder the deployment of new network technologies and services or adversely affect network management.

# Section 14
# RAISED FLOORS ENVIRONMENTS

## 14.1 General

A change to the physical configuration of telecommunications equipment areas from equipment to a floor slab to a raised floor environment is as a means of improving the operational reliability of the network while reducing maintenance and operating costs.

## 14.2 Current CO Configuration

The configuration of our central offices has not changed since our network was made up of N-carrier, crossbar, 1ESS switching technology. The technology deployed in today's telecommunications network is radically different from the mechanical relay, vacuum tube technology of the past. The room configuration developed for past technologies required that tall frames be used to distribute the large number of cardcages over limited floor space. Cables were routed overhead as the only means to accommodate the volume of cables. The current digital, fiber optic and microprocessor technology requires less frame space and operating needs differ from previous equipment. These needs include an environment that must dissipate a greater amount of waste heat, it must provide a cleaner environment and it must reduce risks of electrostatic discharge damage.

## 14.3 Raised Floors Configuration

New CO equipment areas can be configured for improved air-flow, tighter temperature control, reduced airborne contamination, improved illumination, shorten cable runs while improving maintenance access, all by simple changes to the equipment space. Through compartmentalization, the vertical space can be separated into three zones to provide areas for specific functions. The lower floor area would be reserved for cable routing, a mid-zone area for electronics and a zone near the room's ceiling for building services. Utilizing an access floor system and a suspended ceiling system compartmentalizes the equipment areas. *The raised floor should not be used as an air plenum to deliver cooling air to equipment.*

Moving cables from overhead to under the floor removes airflow obstructions and creates greater options for air diffuser placement. Improved distribution of air in the equipment area will reduce temperature variations and permit lower room temperature settings. Room lighting opportunities created by an open ceiling allows use of more efficient lighting fixtures and layout. Traditional center-aisle light fixtures will be replaced with fewer fixtures integrated into the ceiling. Fewer lamps produce less heat, which reduces initial installation costs and lamp replacement, costs.

## 14.4 Benefits and Limitations of Raised Floors Configuration

Whereas the new architecture will not be fully cost effective for some circumstances, a study comparing a trial office to a conventional office has confirmed operational savings potential. Though initial construction costs may be slightly greater for installation of floors and ceilings in the trial office, those costs are recovered within two years of operation in the study conducted by AT&T Common Systems Staff. For offices with existing overhead auxiliary framing, cost recovery interval may be longer because no ironwork preconditioning costs exists to offset floor and ceiling costs.

Constructing a new wire center or expanding an existing facility presents a greater opportunity for raised floors architecture since building design and construction costs could be reduced with no overhead cable loads. Offices with vacant space and no auxiliary framing or where ironwork must be replaced are candidates for the new architecture. This would be especially true where building ceiling load limitations exist, where moving cables under floor may be more cost effective than reinforcing the building.

### 14.5 Recommendations

It should be noted that raised floor is an approved architecture by the NP&E Leadership Team and Corporate Real Estate. NP&E recommendation is to deploy the "Office of the Future" equipment environment in all new wire centers and building expansions. Raised floors architecture must be considered as a first choice when alternatives are evaluated. *When deployment of the raised floors environment is not possible for small or medium size new wire centers due to specific circumstances, the justification for non-compliance should be documented.*

### 14.6 Application

14.6-1 For applications within AT&T, the floor system will not be used as an air plenum.

14.6-2 The raised floor system is considered as an extension of the network equipment and an integral part to equipment framework, not subject to building code requirements. The floor system is considered a part of the network equipment as we treat auxiliary framing. The floor system installation should be handled as we currently handle auxiliary framing. Installation may be contracted by network installation vendors or subcontracted to floor system installers that have performed similar functions in our data centers, administrative centers and network sites. The floor system and auxiliary framing does not enhance or affect the building's integrity.

14.6-3 Figure below provides generic model of equipment layout on raised floors

### 14.7 References

14.7-1 Please refer to BSP 800-000-103MP, Issue B for "Technical Requirements For Raised Floor Systems - Network Equipment Application."

14.7-2 The following sections are part of the BSP 800-000-103MP.

Section 1, GENERAL
Section 2, SITE REQUIREMENTS
Section 3, FLOOR SYSTEM
Section 4, FLOOR ACCEPTANCE
Section 5, EQUIPMENT FRAMEWORK
Section 6, OFFICE DISTRIBUTING FRAMES
Section 7, SPACE PLANNING
Section 8, DC POWER
Section 9, BONDING AND GROUNDING
Section 10, LIGHTING
Section 11, CABLE MANAGEMENT
Section 12, FIBER MANAGEMENT
Section 13, WORK PROCEDURES
Section 14, COLLOCATION
Section 15, REFERNCES

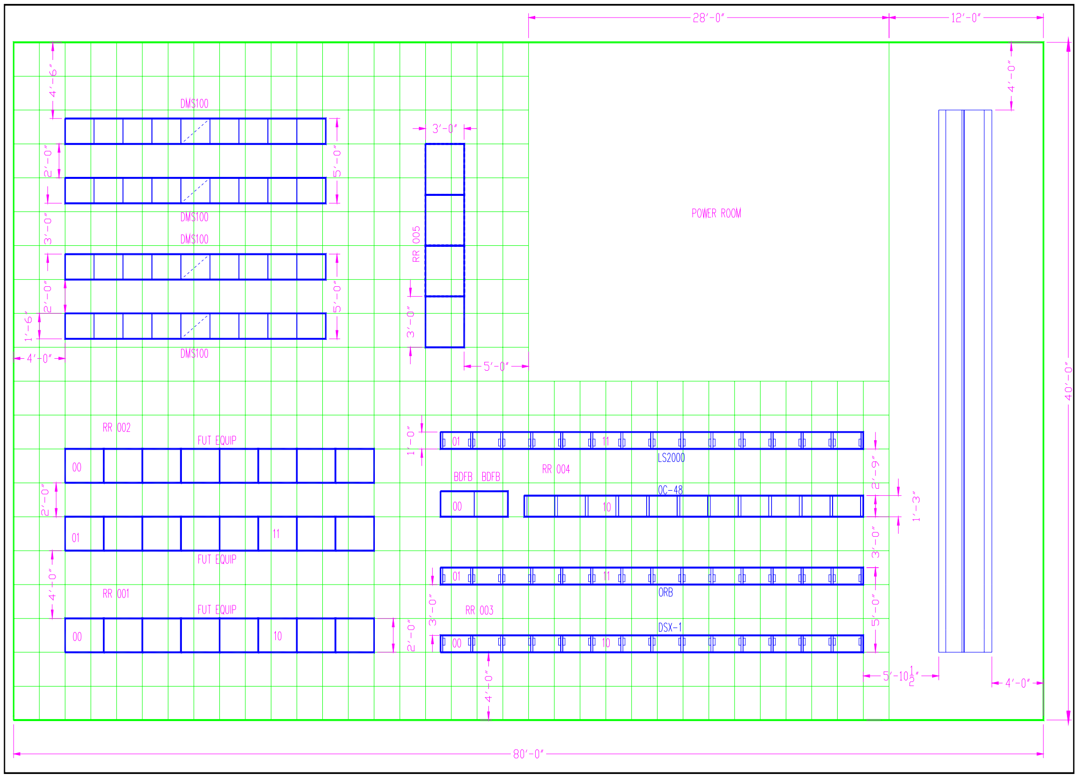



**Figure 14-1** Generic Model of Equipment Layout on Raised Floors

# Section 15
# TRANSITION PLANS

## 15.1 General

It is essential that each network facility have an overall plan for space usage and equipment deployment. Having such plans available for use and review by the various network technology disciplines should enable effective and efficient technology deployment and network management. It is also important to effective network management that office plans and layouts be periodically reviewed to ensure developed master plans are still appropriate for current business objectives.

## 15.2 Formalized Plan

To accomplish this, a detailed understanding of how each facility is configured and should be configured must be formalized. The below overview is provided as a generic means of developing office master plans and managing transitions of network equipment environments.

1) Establish a clear understanding of how existing network elements (by technology) are physically configured in the office. This understanding should include a simplified sketch of how the various network elements are interconnected, and a feel for the current configuration impacts local operations people.
    a. Use the office survey process to gather data on existing equipment configurations. Data to include what equipment is currently out of service, and there are no plans to use those equipment in the near future.
    b. Using office floor plans, draw colored boxes around major technologies to define their relative relationships in the office.
    c. Connect each box to its primary network interface(s) to illustrate how the technologies are primarily interconnected.
2) Determine where 7' 0" environments have been established, and where new or additional environments should be established to accommodate the new technology plans for the office.
3) Determine what equipment needs to be removed because it is:
    a. No longer in service.
    b. Scheduled for retirement or removal.
    c. Old technology which should be replaced by newer technology.
4) Determine what equipment should be relocated because of its function, use or location.
5) Determine the short and long range plans for technology deployment in the office. Extrapolate this information into projected floor space and building infrastructure requirements for each technology the office is expected to accommodate.
6) Determine if the existing equipment relationships are appropriate for growth of existing and deployment of new technologies relative to:
    a) Locating equipment where it should be located,
    b) Minimizing interconnect cable lengths and cross-connect points, and
    c) Accessibility by operations and maintenance personnel.
7) Based on Items 5 & 6, document the order, timing of events and expected resources required to effectively and efficiently manage the facility going forward.
8) Socialize the developed transition plan with those involved with and affected by it.

# Section 16
# REFERENCES

## 16.1 Figures/Drawings

Table below provides a list of drawings used in this BSP



## 16.2 Tables

Table below lists the reference tables used in this BSP

## 16.3 ACRONYM

| | |
|---|---|
| ac | Alternating Current |
| ACH | Air Change per Hour |
| ACI | American Concrete Institute |
| ANSI | American National Standards Institute |
| ASHRAE | American Society of Heating, Refrigeration and Air Conditioning |
| BSP | Bell Service Practice |
| CDO | Community Dial Office |
| CFM | Cubic Feet per Minute |
| CLEC | Competitive Local Exchange Carrier |
| CO | Central Office |
| CRE | Corporate Real Estate |
| CV | Cluster Vendors |
| dc | Direct Current |
| DESP | Detail Engineering Service Provider |
| GR | Generic Requirement (Telcordia) |
| HVAC | Heating Ventilation & Air Conditioning |
| IAQ | Indoor Air quality |
| ILEC | Incumbent Local Exchange Carrier |
| LFO | Local Field Officer (old -Switching Manager) |
| NEBS | Network Equipment Building Standards |
| NEC | National Electrical Codes |
| Network | Network Line Organization |
| NFPA | National Fire Protection Agency |
| NP&E | Network Planning & Engineering |
| OSP | Outside Plant (Loop) |
| AT&T | AT&T Corporation |
| TEE | Telephone Equipment Engineer |
| TEO | Telephone Equipment Order |
| UBC | Uniform Building Code |
| METS | Maintenance Engineering and Technical Support |
| ESAC | Engineering Support Center |

## 16.4 Definitions

The following terms are used in this section as indicated:

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| **Acoustic Noise** | The sound-level limits apply to the operating conditions, whether loaded or unloaded, partial or full power, that produce the loudest noise. The maximum indoor level limit is provided in the NEBS document. |
| **Allocation** | The assigning of space to wire center tenants in defined general terms. |
| **Airborne Contamination** | The concentration of indoor pollutants in a wire center is a function of outdoor pollutants and indoor generation rates. Indoor particulate levels are function of the degree of air filtration of the outdoor air and the recirculated air. The guidelines for acceptable levels are provided in the NEBS document. |
| **Air Filtration** | All outside air must be filtered before introducing into the equipment area |
| **Alarm System** | An alarm system is provided for fire detection, emergency exit doors, failure of ac power, high/low temperature/humidity in the building. It is connected to normal and emergency power source. |
| **Aisle Space** | Front and rear minimum aisle space measured between front and rear guard rails. If the guard rails are not provided, vendor will show the point on the frame where the dimensions were taken (refer to sections 4.12 to 4.16 and Section 9 for specific applications |
| **Building Areas** | Consists of sum of areas of all floors of the building, measured to the nearest inch from the exterior faces to the exterior walls, or from the center line of common walls separating buildings. This includes basements, cable vaults, balconies, mezzanines, penthouse, and other spaces having 6 foot minimum ceiling height. |
| **Building Design Load** | Heating and Cooling Loads for telephone Buildings, Floor Design Load, NEBS Standards, Earthquake Design Loads, Wind Design Loads, Local Vibratory Source Loads, etc. |
| **Building Elements** | Structural Floors, Raised Floors, Column Designations, Column Spacing in Equipment Buildings, Ceiling Height for Equipment Buildings |
| **Building Bay** | An area enclosed by four columns. For a 20 ft. spaced columns, building bay is 400 Sq. Ft. (20’x20’) |
| **COE -** | Central Office Equipment |
| **Common Systems** | Common Systems should be used as the common identifier for the work groups responsible for distributing frame and floor space planning and the power planning and engineering functions. |
| **Common System Space Planner** | The term Common System Space Planner should be used in reference to the function of *floor space planning* because it more accurately describe the current scope of the job function. The term “CSPEC” will no longer be used |
| **Collocation** | Collocation is a procedure for implementing the interconnection of a CLEC with an incumbent local exchange carrier (ILEC) networks. CLEC is a carrier that provides local exchange or exchange access service in competition with an ILEC. Generally, collocation takes place in the following ways:<br>a) by placement of CLEC owned and maintained equipment in a CO,<br>b) or by placement of CLEC-specified but LEC-owned and maintained equipment in a CO. |

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| **CEV, Hut or Cabinet Collocation** | A CLEC may lease space in two vertical inches of spare rack space in a standard equipment mounting for the placement of CLECs telecommunications equipment and facilities necessary for interconnection. This type of Collocation may be available in Physical or Virtual Collocation arrangements to the CLEC, to the extent technically feasible. |
| **Collocation – "Adjacent Off-Site Collocation"** | CLEC built structure not on AT&T property but within one city block of AT&T property in which CLEC's equipment is located. CLEC shall provide both the AC and DC power required to operate its off-site collocation facility. |
| **Collocation – "Adjacent On-Site Collocation"** | CLEC built structure within AT&T property adjacent to an Eligible Structure (Housing Transmission Facilities, e.g. wire center, CEV, Hut). Permitted when the space is legitimately exhausted inside the eligible structure |
| **Cross- Connections** | Wired connection (pairs, triples, etc.) run between terminated apparatus on a DSX frame; commonly referred to as a "jumper" |
| **Cross-connect Systems** | Cross-connect systems provide the flexibility required to evolve the network technologically and architecturally. Without cross-connects, network components are (by definition) hired wired. Evolution would then require wholesale disruption of service to existing customers as components are removed from service and replaced with newer equipment |
| **Ceilings, Walls, Partitions** | Ceiling and partition material finishes should be of the type that does not dust or flake, and must be fire resistant. |
| **DSX** | A family of frames that provides for digital system facility/equipment cross-connections and access for test/maintenance |
| **Equipment** | Digital equipment terminated on a DSX. Examples are channel banks, multiplexers, and digital switch interfaces |
| **Equipment Bay** | That portion of a frame between any two adjacent uprights of the frame framework |
| **Equipment- Building Interface** | Cable Entrance Facility (CEF), CEF Conduit Entrance, Risers, and Holes, Cable Openings, Floor and Ceiling Anchors, Equipment Support |
| **Equipment Space Requirements** | Known or approximate total number of equipment frames by technology to be installed and removed during the forecasted time frame |
| **Environmental Control** | Atmospheric Environment for Telecommunication Equipment Space - Equipment temperature and humidity control, CO Ventilation Requirements, Fire Alarm System, Noise Control |
| **Equipment Heat Release** | Equipment heat dissipation, the data generally available from vendor component data sheet. The heat dissipation for a given installation will, of course, depend upon the combination of components selected and layout configuration. It general, heat release densities can be as high as 100 Watts per square foot of floor space. |
| **Electrical Protection** | Protection from RFI, EMI, ESD, Grounding & Bonding |
| **Efficiency of Equipment Use** | Efficiency of use refers to the equipment's capability versus current functionality |
| **Facility** | A general term for the communication transmission pathway and associated equipment, e.g., Office Repeater bay (ORB) |
| **Framework** | The structure composed of uprights, base assembly, and top member |
| **Frame** | Equipment frames, as defined here, include relay racks, bays, and floor-supported cabinets comprised of a structural framework, and all equipment mounted thereon. (The use of the term "frame" is also understood to apply to cabinets that usually mount power or other equipment. Similarly, it applies to other equipment such as consoles, and tape and disk drives that occupy floor space |

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| **Frame Dimension** | Height, Depth, Effective Frame Width. Also includes weight and circuit capacity. |
| **Frame Width – "Effective Frame Width"** | This the "frame width" plus one "mortar space." A mortar space is 1/16-inch. Thus a frame with 2 feet, 1-15/16 inch width, will have and effective width of 2feet, 2 inches. The effective width is shown on vendors' sketches or notes or both |
| **Frame – "Main Distributing Frame (MDF)"** | Point of interconnection of outside copper plant and inside network equipment. |
| **Frame – "Intermediate Distributing Frame (IDF)** | A supplemental point of cross-connect between an MDF and network equipment. Generally used to minimize equipment termination clutter on MDFs |
| **Fire Protection & Detection** | Smoke Detection Systems, Fire Extinguishers, Fire Alarm System |
| **Floor Loading** | For new construction, 150 pounds per square foot, includes both live load and dead loads. |
| **Guidelines** | Preferred practices to be used when managing network equipment environments when there is more than one acceptable way. The word ***should*** is used to convey guidelines. |
| **IP** | Integrated Planning (Integrated = affects two or more disciplines (i.e. Switch, Loop, Real Estate, Marketing, etc.). Formulation of detailed, implementable, and geographically specific network direction resulting from the interpretation and application of strategic plans, and/or from economic analysis of alternative solutions to a problem/opportunity. |
| **Implementation** | The utilization or detailed assignment of allocated space on a job-by-job basis to the extent necessary for a person to install network elements and connectivity. |
| **Interexchange Carrier (IXC)** | A carrier that provides interLATA long distance service. |
| **List 1, List 2 drain** | See section 3.10 for definitions |
| **Maximizing Space Utilization** | Configuring equipment environments so that network elements are located in their most appropriate physical relationship *electrically* as opposed to simply placing as much equipment in as little space as possible, or arbitrarily placing like equipment together. |
| **NEBS** | Network Equipment Building System, – Generic Environmental Requirements for a CO Equipment contained in TP76200 |
| **NEBS Compliancy** | Conformance to AT&T's minimum physical and electrical protection, and reliability requirements relative to the equipment's application and location within a wire center. |
| **Network Facility** | A building or area within a building where network equipment is installed. The term network facility is synonymous with the traditional terms central office (CO) and wire center. |
| **Obsolete Equipment** | a) Manufacturer discontinued item, b) No longer supported by the vendors/suppliers, c) Equipment completely out of service, No live connection, d) No plan to use for the next 5 years. All of the above.<br>Note: Equipment retired in place ( but may or may not be obsolete depending upon its future use) |
| **Operation at High Altitudes** | Operation of the newer generation equipment at altitudes greater than 8000 feet sea level may require additional precautions and restrictions, as specified in manufacturer's literature. |
| **Objectives** | Targets for which definitive requirements and guidelines may not exist or for which achievement is at local level discretion. Objectives will be identified as such. |
| **Physical connection** | Cross-connect systems provide physical link between equipment and facilities |
| **Raised Floor** | Generally not required in a conventional wire center. However, "office of the |

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| | future" utilizes raised floor concepts for new smaller buildings. |
| **Room Lighting** | Should be designed to have illumination levels and direction depending upon the guidelines provided in the NEBS document. |
| **Retired in Place** | Equipment not being used at all is also referred to as *cut-dead* and Retired In Place (RIP) equipment |
| **Requirements -** | Practices that must be adhered to when managing network equipment environments. The words *shall* and *must* are used to convey requirements. |
| **Standards** | Practices to be followed as a normal course of doing business. Standards include requirements, guidelines, and objectives that are applicable to specific subjects, situations and conditions. |
| **Seismic Requirements** | During an earthquake, network equipment can be subjected to motions that may over-stress equipment framework, circuit boards, and connectors. Network equipment must be tested to determine its resistance to seismic requirements as specified in the NEBS. |
| **Space** | Room allocated for network functionality. Space may be equipment floor space, overhead space, cable installation/termination space, or people space. |
| **Space Planning** | The strategy used to manage available space within a wire center. |
| **Space Reservation** | Space reserved for ILEC, CLEC, Affiliate, etc.<br>A space will be reserved for CLEC or Affiliates only after the application is received and money is deposited. |
| **Space Dedication** | A space will be dedicated (allocated) for CLEC and Affiliate based on forecasted information. |
| **Tenants** | Organizations occupying or requiring space in a network wire center. Typical wire center tenants are, IOF/Transport, LOOP, Switch, Power, Data Engineering, Collocation, Real Estate, etc. |
| **Telephone and Building Power** | DC Power Plants, Building Power, Standby Power, AC Power distribution |
| **Technically Infeasible Space** | a) encroach upon space reasonably set aside for equipment staging areas, cable holes, b) be physically impossible due to height restrictions, egress restrictions, seismic restrictions, c) violate NEBS or OSHA safety code and local building codes, d) pose a legitimate threat to network reliability and security, e) be technically impossible given the current state of the art. |
| **Tie Cable -** | A cable connected between DSX lineups or frameworks |
| **Unused Equipment** | a) No plan to use for next 5 years, b) No live connection, c) No piece part working (not even a single card within a bay |
| **Underutilized Equipment** | Those equipment whose functionality are not effectively/efficiently utilized. Efficiency of use refers to the equipment's functional capability versus how it is actually being used (underutilization). |
| **Vibration & Shock** | Network equipment may be subjected to a low level vibration in service that is typically caused by nearby rotating equipment, outside rail or truck traffic, or constructions work in adjacent buildings. Network equipment must be tested to determine its resistance to office vibrations and shock as specified in the NEBS |
| **Wire Center** | An eligible structure in which the local loop and/or interoffice network facilities terminate. An office at which transmission facilities converges, and related equipment systems are located. Sometime referred as "central office" or "network facility." |

## 16.5 Methods and Procedures

| S.No. | Title | Apex # | Author |
|---|---|---|---|
| 1 | Wire Center Planning M&P, Issue 9 | ATT-002-316-101 | S. Hoda |
| 2 | Frame Forecast M&P, Issue 9 | ATT-002-316-003 | Mark Powers |
| 3 | DSX-1 Frame Forecast M&P, Issue 5 | ATT-002-316-041 | Mark Powers |
| 4 | DSX-3 Frame Forecast M&P, Issue 7 | ATT-002-316-042 | Mark Powers |
| 5 | Distributing Frame Standards, Issue 1 | ATT-002-316-018 | Mark Powers |
| 3 | Collocation Provisioning Guidelines, Issue 13 | ATT-002-316-002 | S. Weinert |
| 4 | Collocation Space Requirements Forecasts | | Kara Lisa Danter |
| 5 | Data Engineering Equipment Forecasts | | David Norris |
| 6 | Switching Equipment Forecasts | | Mike Shelton |
| 7 | Transport Equipment Forecasts | | David Sakamoto |
| 8 | Outside Plant Equipment Forecasts | | Peter McNeill |
| 9 | Power Requirements & Equipment Forecasts | | Bob Burdett |

## 16.6 Planning & Engineering Quick Reference

http://ebiz.sbc.com/transdata/quickref/

## 16.7 Communication

Transport
Switch
Power

## 16.8 BSP and TP

| S.No. | Title | Document # | Author |
|---|---|---|---|
| 1 | AT&T NEBS Requirements | TP76200 | AT&T NP&E |
| 2 | Hardware Products and Material | TP76201 | AT&T NP&E |
| 3 | Installation Requirements | TP 76300 | AT&T NP&E |
| 4 | Cable Installation, Removal and Mining | TP76305 | AT&T NP&E |
| 5 | Detail Engineering Requirements | TP 76400 | AT&T NP&E |
| 6 | Auxiliary Framing and Bracing | TP76408 | AT&T NP&E |
| 7 | Cable Rack Requirements | TP76409 | AT&T NP&E |
| 8 | Ethernet Standards for AT&T LEC | TP76412 | AT&T NP&E |
| 9 | Transport Process – Common Systems | TP76450 | AT&T NP&E |
| 10 | Electrostatic Discharge Control | TP 76306 | AT&T NP&E |
| 11 | DC Power Plants | BSP 790-100-654MP | AT&T NP&E |
| 12 | Batteries | BSP 790-100-655MP | AT&T NP&E |
| 13 | DC Power Distribution | BSP 790-100-656MP | AT&T NP&E |
| 14 | Standby AC Plants(DC Generators) | BSP 790-100-659MP | AT&T NP&E |
| 15 | AC Power | BSP 790-100-660MP | AT&T NP&E |
| 16 | Equipment Anchoring Requirements | BSP 800-000-101MP | AT&T NP&E |
| 17 | CO Equipment Framework Design | BSP 800-000-102MP | AT&T NP&E |
| 18 | Raised Floor Systems -TR | BSP 800-000-103MP | AT&T NP&E |
| 19 | Bracing for Network & Data Equipment on Raised Floors | BSP 800-000-104MP | AT&T NP&E |
| 20 | Thermal Management Requirements | BSP 800-003-101MP | AT&T NP&E |
| 21 | Floor Stanchion Supported Cable Rack | BSP 800-006-152MP | AT&T NP&E |
| 22 | CO Equipment Framework Support | BSP 800-068-150MP | AT&T NP&E |
| 23 | Consideration for Determining the Affects on Floor Loading of Equipment Superstructure Suspended from Building Ceilings | ATT 812-000-016 | AT&T NP&E |
| 24 | Central Office Cable and Wire Installation and Removal Requirements | ATT 812-000-017 | AT&T NP&E |
| 25 | Through-Penetration Firestopping | ATT-812-000-032 | AT&T NP&E |
| 26 | Network Facilities Cable Mining | TP 76305 | AT&T NP&E |
| 27 | Electrostatic Discharge Control | TP 76306 | AT&T NP&E |
| 28 | Auxiliary Framing & Bracing Requirements | TP 76408 | AT&T NP&E |
| 29 | Cable Rack Requirements | TP 76409 | AT&T NP&E |
| 30 | Grounding and Bonding Requirements | TP 76416 | AT&T NP&E |
| 31 | Grounding and Bonding Design Fundamentals | TP 76416-001 | AT&T NP&E |
| 32 | Ventilation of Central Office Buildings | BR-781-810-880 | Telcordia |
| 33 | NEBS | GR-63-CORE | Telcordia |
| 34 | IDG - Switching | ATT-002-216-025 | APEx |
| 35 | IDG - Transport | ATT-002-203-001 | APEx |

## 16.9 Wide Band Temperature Checklist

- Wide Band Temperature Checklist below describes audit procedures of the facility that must be performed by CRE[14] before the ambient temperature in a CO is changed to the Wide Band[15] range (65°F to 78°F).

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| 1 | Check door and window seals and cracks in outside wall(s) and repair if needed. |
| 2 | Check air filtration of office. Minimum level is 65% AHSRAE level. Clean, repair or replace as needed. |
| 3 | Check overall operation ability of HVAC system and correct any apparent problems. |
| 4 | Ascertain that equipment space is under positive pressure. Adjust intake/exhaust dampers as necessary. |
| 5 | Recalibrate, move or replace or add thermostats as needed. |
| 6 | If excessive modifications are needed, remove from implementation list and add to infrastructure capital improvement list. |
| 7 | Measure and record temperature of each aisle, 5 feet high, center of aisle. See notes 1 & 2 below. |
| 8 | If any aisle temperature is above 85 degrees rebalance. |
| 9 | If any aisle temperature is greater than +/- 5 degrees of the average rebalance air distribution system. |
| 10 | Calculate average temperature for office from item 8 above. |
| 11 | Measure and record humidity of each aisle, 5 feet high, center of aisle. |
| 12 | If humidity is above 55 %, adjust. |
| 13 | Test temperature sensor and alarm. Repair or add as needed. |
| 14 | Test humidity sensor and alarm*. Repair or add as needed. |
| 15 | Verify alarm sensors are within footprint of switch/transport Equipment |
| 16 | When items 1 to 16 have been completed forward and review with METS/ESAC and agree on plan to incrementally increase temperature to 78F. |
| 17 | Implement plan |

[14] Agreement has been reached by CRE to perform an audit when wideband temperature range is instituted

[15] As soon as temperature plan is implemented, Network Operations is to initiate a monitoring plan and track temperature-related events for 30 days. If increased temperature causes trouble calls or outages, lower temperature and reassess. Temperature readings should be taken after 30 days to verify that no hot-spots are existing within the switch area after Wide Band implementation.