



# STANDARDS FOR NETWORK EQUIPMENT ENVIRONMENTS AND SPACE PLANNING CONSIDERATIONS

## Network Planning & Engineering Common Systems Standards



## **STANDARDS FOR NETWORK EQUIPMENT ENVIRONMENTS AND SPACE PLANNING CONSIDERATIONS**

### **1.0 INTRODUCTION**

#### **General**

1.01 This Practice is not intended for establishing design criteria for construction purposes, but provides standards for planning, engineering, and managing the physical and operational environments in which network equipment is housed. Refer to appropriate Practices and specific vendor requirements/criteria for actual design, installation and operational considerations. 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 SBC Local Exchange Carriers so that network technology can be efficiently deployed and maintained. This section is applicable to new and existing network equipment installations.

1.02 The Practice shall be used in conjunction with other published standards having jurisdiction (building, electrical, and mechanical codes, etc.) to achieve in detail the standards provided in this document. 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.

1.03 This practice shall be used in harmony with the latest edition of the "Wire Center Planning M&P," which is a living document. Refer to Common Systems Web Page (see section 16 C) for a copy of the document.

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## 2. EQUIPMENT OPERATING ENVIRONMENTS

### A. General

2.01 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.

### B. Construction

#### General

2.02 The construction of telecommunications equipment has evolved from *overhead supported and braced* equipment framework designs to *self supporting* framework designs. This evolution in the framework design of telecommunications equipment, as well as 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 2.05).
- e) Building service facility and apparatus shall not be attached to the superstructure provided above network equipment areas. Such attachments may inhibit the to efficiently provide and manage the equipment interconnection and migration within a building.
- f) Building floor shall have minimum thickness and concrete strength for the embedment of deep floor anchors. Anchors will be drilled as necessary to accommodate varying equipment types.
- g) Building floors shall not be constructed of, covered with, or otherwise contain any material that would be considered environmentally hazardous. The floor will be drilled by equipment installers and the floor or covering cannot introduce hazardous materials into the room.
- h) Areas not permitting future coring or cutting operations due to concentrations of reinforced rod or structural members shall be noted on the Real Estate drawings.

#### Floor Construction

2.03 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 trowelings, 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.

2.04 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.

### **Floor/Ceiling Loading**

2.05 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.<sup>2</sup> for equipment areas in general, and 300 lb./ft.<sup>2</sup> for areas intended for office -48 Vdc power equipment.

2.06 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. The self supporting characteristics of newer generation framework assemblies require substantially more floor anchor embedment depth to achieve the desired seismic performance capability. Accordingly, concrete floors shall be suitable for equipment floor anchor embedment of up to 4-1/2 inches.

### **Equipment Superstructure Support Provisions**

2.07 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.

2.08 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.

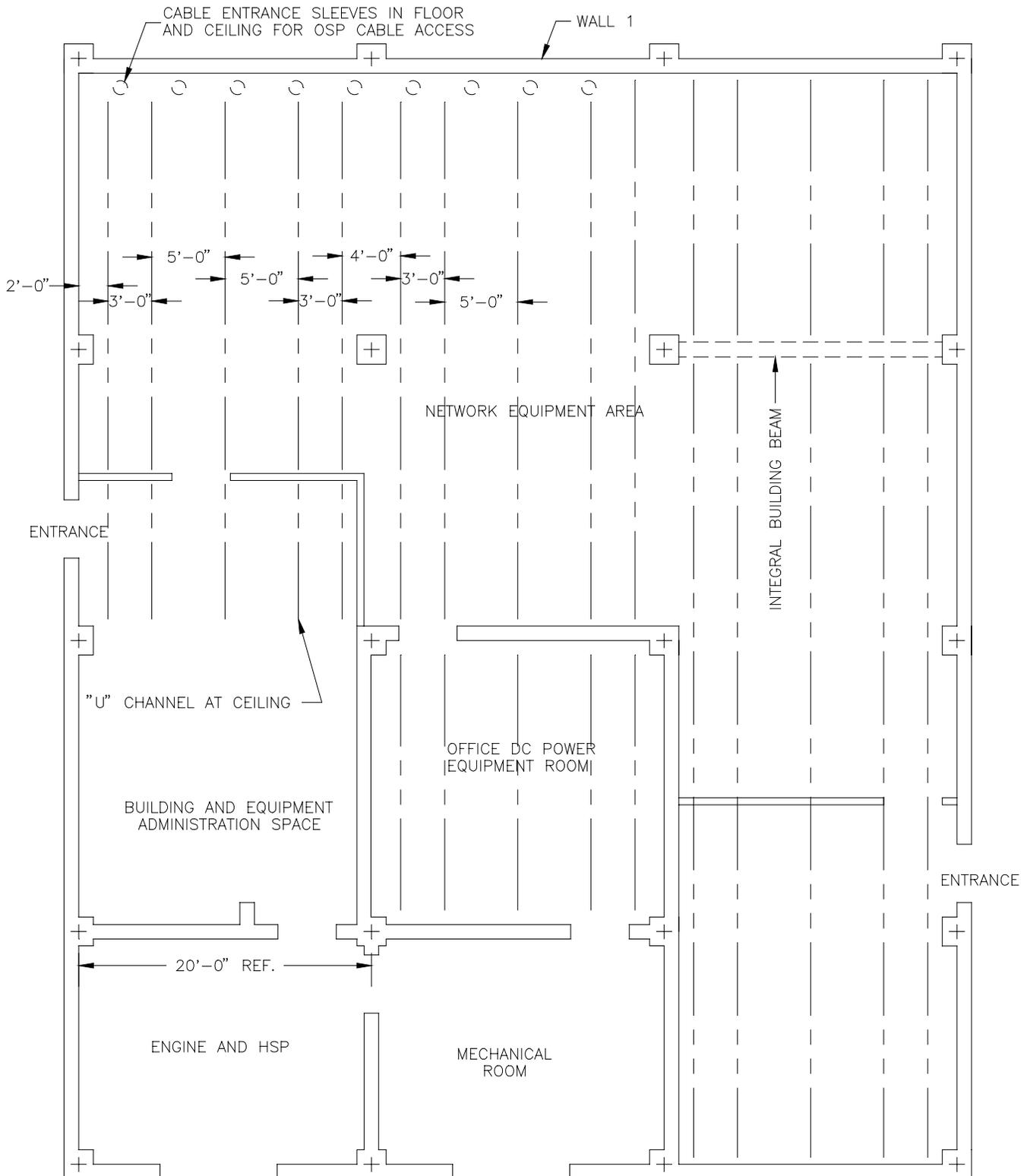
2.09 Surface mounted channel shall be fastened to ceiling surfaces in a manner providing a maximum vertical loading of 4,000 pounds across a 5 foot span of 5/8-11 hangers. Additionally, the surface mounted fastening arrangement shall prevent the U channel from twisting when subjected to a 2000 pound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

2.10 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.

**2.11 Please refer to BSP 800-003-100, Appendix 1 (future) for "Network Engineering Considerations For Determining The Affects On Floor Loading Of Equipment Superstructure Suspended From Building Ceilings"<sup>1</sup>**



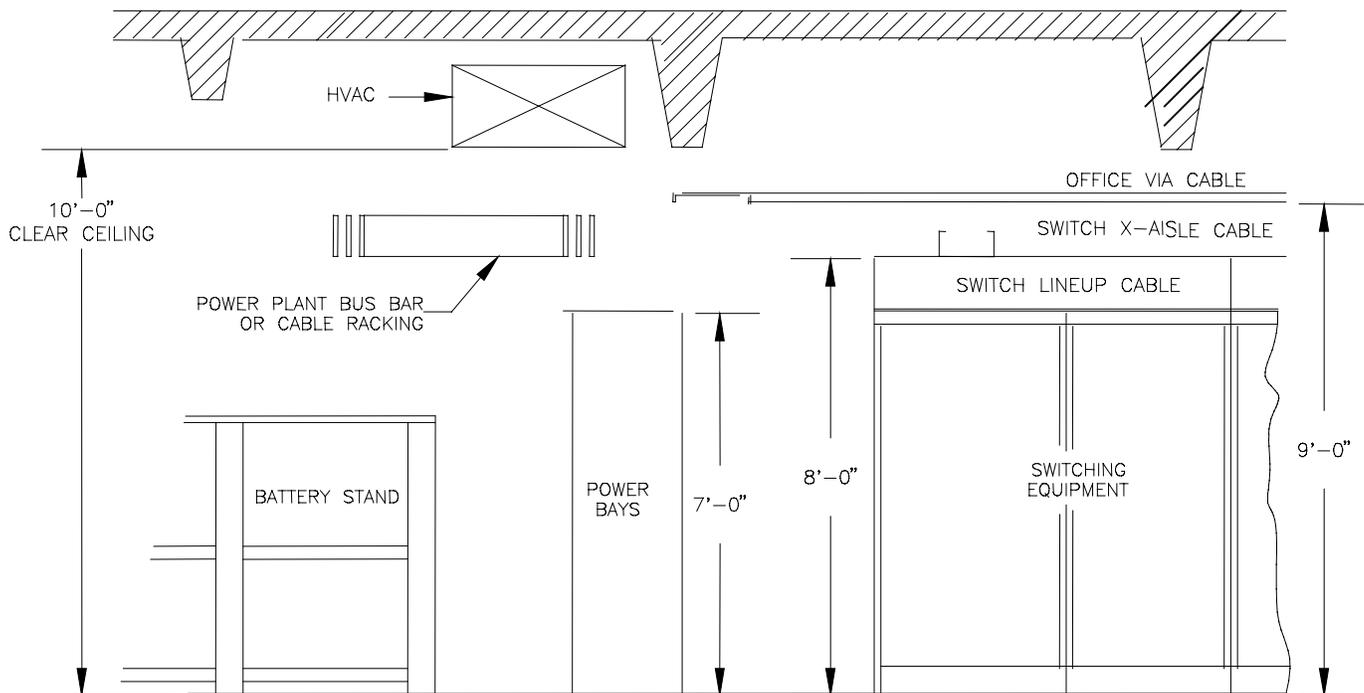
**Figure 2-1 - Generic Layout Of Office Superstructure Support Channel**

<sup>1</sup> This document is in progress and hope to be released by 2Q2000

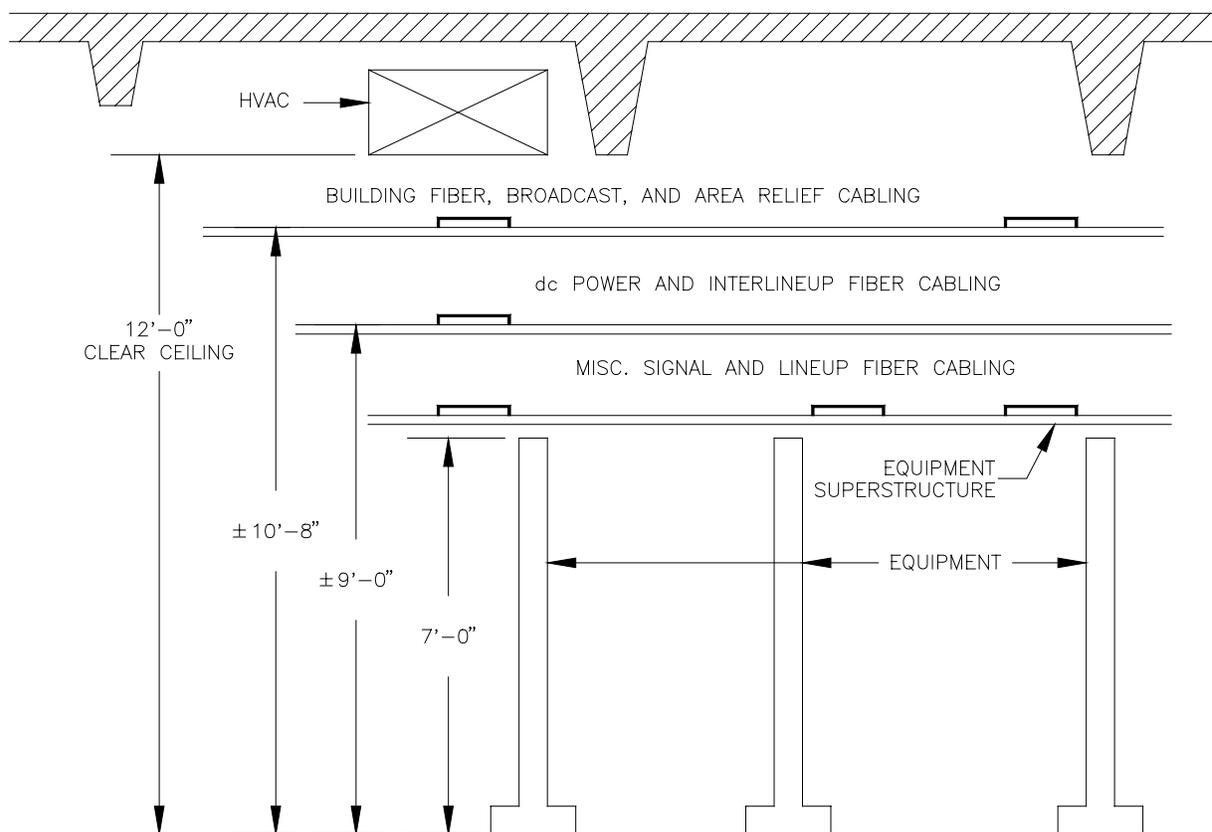
**Ceiling Heights**

2.12 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. For the purpose of defining clear ceiling heights, network equipment is divided into four categories of equipment technology, *Power, Switching, Transport, and Collocation*. See Figures 2-2 and 2-3.

2.13 A clear ceiling height of 12'-0" is generally required above transport and collocation equipment areas in medium and large network facilities. A clear ceiling height of 10'-0" is required above network power and switching equipment areas. 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).



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



**Figure 2-3 - Clear Ceiling - Transport And Collocation Areas**

### **Column Designations, Sizing and Spacing**

2.14 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.

2.15 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.

2.16 Optimum building column spacing is a compromise between wide spacing, which results in less interference with the equipment, and, close spacing which permits lighter floor construction and more slender columns. Traditional wire centers have 2'-0" x 2'-0" columns spaced on 20 foot centers. The maximum that can be used in standard floor plan is 2'-2" x 2'-4". Column placement and size can play a very crucial role in the layout of wire centers. The distributing frame (DF) area is especially critical since the DF is usually located within the first column line directly above the cable vault. The placement of DFs within a single column line is compromised if the columns are placed too close. Similar problem arises if the physical size of the columns were too large.

**C. Building System Design Considerations**

2.17 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 the following equipment heat load criteria shall be used.

For category<sup>2</sup> 1 wire centers use 45 to 50 watts/sq. ft., for category 2 use 35 to 45 watts/sq. ft, and for category 3 use 30 to 35 watts/sq. ft. Space planners must inform the Real Estate about high heat dissipating equipment (beyond 50 watts/ sq. ft), so that air distribution can be properly sized.

**D. NEBS Environmental Guidelines**

2.18 Table 2-1 provides the normal operating temperature/humidity levels and short term operating temperature/humidity levels for wire centers in which network equipment shall operate.

<b>Ambient Limits</b>	<b>NEBS<sup>3</sup></b>
Normal Operating Temperature Range	40° F - 100° F
Maximum Operating Temperature Range	35° F – 120° F
Normal Operating Humidity Range	20% - 55%
Maximum Operating Humidity Range	10% - 80%
Maximum Rate of Temperature Change	15°F/ Hour

Table 2-1  
NEBS Environmental Guidelines

2.19 Refer to latest issue of REAL ESTATE STANDARDS for equipment cooling requirements, the design of ventilation and air conditioning systems, air filtration, and seismic design guidelines for electrical and mechanical systems. All building mechanical and electrical systems (e.g. pipes, chillers, ducts, etc.) shall be secured and seismically braced in accordance with guidelines provided in latest issue of REAL ESTATE STANDARDS. The location of mechanical rooms in new construction shall take into consideration the equipment clear ceiling heights discussed in 2.12 and 2.13. It may be appropriate to locate mechanical rooms adjacent to power and switching equipment areas where larger ventilation ducts can be more easily accommodated.

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<sup>2</sup> Wire Center category is defined in the latest issue of the “Wire Center Planning M&P.”

<sup>3</sup> SBC document TP76200 sets criteria for equipment manufacturers and take precedence over NEBS. Operating ranges are for equipment functionality. Generally the CO equipment area is maintained at 75°F. The wide band temperature control permits us to maintain an aisle temperature around 78°F. Local practice may dictate actual operating conditions.

- a) 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.
- b) 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.
- c) **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.**
- d) Extensions of existing HVAC ducting above network equipment areas shall, where possible, be 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 facility's appropriate CO engineers shall be notified whenever the foregoing cable pile-up clearance is not possible.

2.20 Recently, several radically new concepts are being developed in equipment design, and the trend is headed towards higher heat dissipation rates. Real Estate shall review their current building HVAC system to ensure for sufficient refrigeration and air supply capacities and proper air distribution system. The network in harmony with Real Estate *may* recommend providing a wider aisle spacing. The use of such large ventilation ducts above equipment areas most often interferes with the installation of the earthquake bracing required for equipment superstructure and can hinder equipment cable management efforts. For this reason, 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. Local CO engineers shall be consulted when it is apparent or questionable whether ventilation ducts will encroach the clear ceiling heights mentioned in 2.12 and 2.13 or whether access to ceiling inserts or U channel will be sufficient for earthquake bracing purposes (refer to BSP800-006-150MP for earthquake bracing methods).

- a) Collectively, it should be decided whether equipment frames below the area requiring new ventilation ducts should 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.

2.21 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. (See section 2.17 for heat dissipation data).

## E. Fire Detection

2.22 Fire detection and alarm reporting systems shall comply with the latest standards for "*Operational Guidelines for Fire Detection and Alarm Systems in Telecommunications Buildings.*"

- a) 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.

## F. Compartmentation

2.23 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 Uniform Building Code Zone 4 requirements. Partitioning walls shall not be attached to the overhead superstructure created for network equipment.

2.24 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.

2.25 The primary difference between the construction of fire rated and non-combustible walls is the materials and techniques used to form wall joints, door jambs, and interfaces with other building surfaces. Otherwise, fire rated and non-combustible walls have the same appearance because the building materials used in their basic construction are the same, including the use of fire rated doors. These similarities in appearance can lead to a misunderstanding of a wall's purpose and the permissible use of a compartment constructed within a larger building cavity. Therefore ongoing basis, 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.

2.26 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 also be fire and smokestopped.

## G. Safety

2.27 The following considerations must be given when planning for safety. 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.

1. Egress and Ingress
2. Working Clearances
3. Hazardous Materials

## H. Bonding and Grounding

2.28 Standards for bonding and grounding are contained in BSP802-001-180MP "*Grounding And Bonding Requirements Telecommunications Equipment, Power Systems, Central Offices and Other Structures*." 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.

## **H. Raised Floor Equipment Environments**

2.29 Raised floor systems or access floors are used in the equipment environment for installation of data equipment, network equipment and peripheral equipment with under-floor cable management. Standards for raised floor equipment environments are contained in BSP 800--000-103MP "*Technical Requirements For Raised Floor Systems - Network Equipment Applications,*" and the BSP 800-000-103MP Appendix 1, "*Guidelines For Cable Rack, AC and Alarm Conduit And Framework Installation On Raised Floor Systems.*" 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 and cooling air 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.

## **J. Electrical Protection**

2.30 Electrical protection requirements are contained in 876 Layer of the BSPs.

### 3.1 WIRE CENTER SPACE PLANNING

#### A. General

3.01 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:

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

Wire Center Planning M&P, issue 6, September 20, 1999 contains the guidelines that should be followed for the purpose of identifying network related activities which must take place to provide commonality with network wire centers management. The guidelines presented in the M&P are the foundation to support the network planning and engineering disciplines in SBC.

3.02 A holistic wire center plan is the detailed analysis of how and when the network for a geographic or serving area needs to evolve to meet projected customer demands and to comply with the Company's business strategy. It is an accumulation of relative data gathered from all organizations involved with the design, engineering, maintenance, operation, and use of a wire center's facilities. Integrated tactical planning is the author and steward of holistic wire center plans and is responsible for integrating network growth strategies and supportive tenant requirements into site specific tactical strategies which are periodically reviewed to ensure the local network is being managed appropriately.

3.03 An essential element of wire center planning is maintaining an awareness of the state of affairs of installed network elements relative to their efficiency of use, suitability for replacement, and whether equipment is being used at all. Efficiency of use refers to the equipment's functional capability versus how it is actually being used (underutilization). Suitability for replacement refers to equipment whose functionality can be more effectively/efficiently provided by newer equipment. Equipment not being used at all is also referred to as *cut-dead* and Retired In Place (RIP) equipment. These types of equipment scenarios are usually the result of an expedience associated some other network management driver. The integrated tactical planner together with the affected network technology disciplines determines to what extent a wire center plan needs to be documented for effective planning and management purposes.

#### B. Equipment Forecast

3.04 Each organization requiring space or specific network capability/connectivity in network wire centers is responsible for developing and maintaining a semi-annual 3 year forecast of their space and network connectivity requirements for each wire center they are, or are expected to be tenants in.

For the purpose of the wire center forecasts mentioned above, "*space requirements*" is defined as the known or approximate total number of equipment frames by technology to be installed and

removed during the forecasted time frame. “*Connectivity requirements*” is defined as the approximate impact the forecasted equipment will have on the wire center power plant and MDF. The above information shall be documented whenever network forecasts are compiled and provided to local space planners.

### **C. Common System Organization**

3.05 The Common Systems organizations within Network Planning & Engineering are responsible for:

- a) Allocating and coordinating the utilization of floor space and interconnect capability in network wire centers,
- b) Maintaining accurate records of how available space and connectivity has been planned and allocated,
- c) Compiling forecasted requirements from tenants into an overall impact assessment on available space and connectivity for each wire center, and
- d) Deriving potential date(s) of exhaust of available wire center space and connectivity.

### **D. Roles of a Common System Space Planner** (hereby referred as space planner)

3.06 The common system planner is a single point of contact in all space planning efforts, and plays an important role in all network/real estate activities in the building. The roles and responsibilities of the Space Planner are defined in the latest issue of the “Wire Center Planning M&P.”

### **E. Real Estate Management**

3.07 Corporate Real Estate (CRE) is an essential partner in a successful space planning processes, and, in the implementation of all construction programs. For new buildings and building additions, Real Estate Management is responsible for managing the building design and construction process including chairing periodic review meetings with network engineering and operations organizations. For existing buildings, CRE responsible for ensuring the Common Systems organization is involved with all interior building modifications that will impact the available space for network equipment and its administration. CRE is also responsible for leading the collocation survey team in determining the best possible secured pathway for CLECs, and other building physical security provisions.

### **F. New Technology Introduction**

3.06 The selection and introduction 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 (SBC document TP76200) during the initial product evaluation process shall be made available to line engineering when new products are approved for use. Refer to section 3.08 for more detail.

### **G. Vendor Provided Equipment Space Planning Data**

3.09 A 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

3.10 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:

- (a) Frame dimensions, including guard rail dimensions, aisle spacing, and weight
- (b) Heat dissipation
- (c) 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:

- (a) Door swing clearance
- (b) Protrusions (writing shelves)
- (c) Front and rear aisle minimum space between front and rear guard rails
- (d) Any other information that would be helpful in the development of a layout
- (e) 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**

3.11 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**

3.12 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.

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.

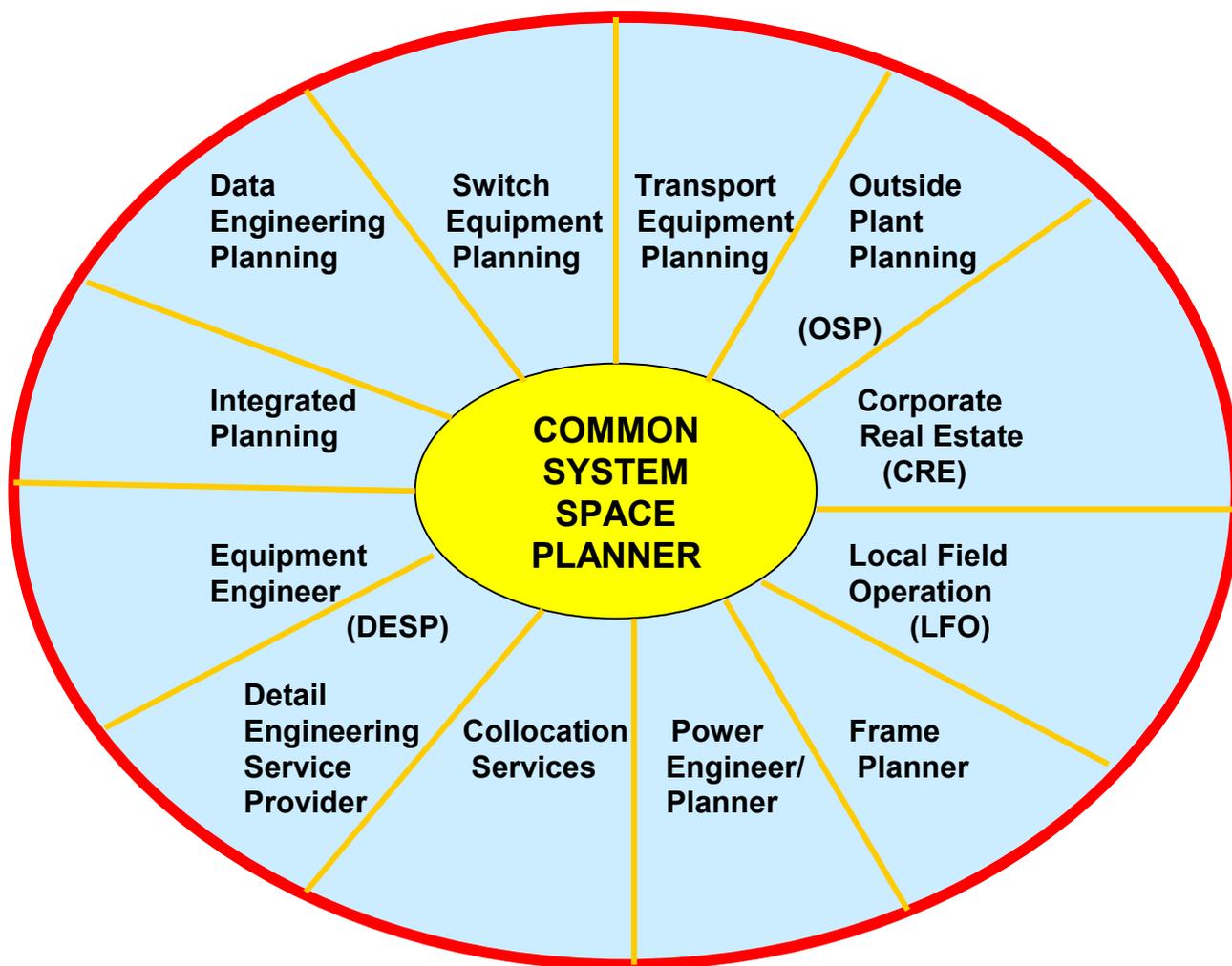
The vendor should provide the effective cross-sectional area of the cable that ends on the frame, and is distributed to other frames in the overhead cable rack. It should include the area for all cable to and

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.

**H. Organizational Interfaces of Space Planners**

3.13 The following Figure 3.1 depicts organizations that interface with Space Planners. Some of these organization are responsible for providing an accurate equipment forecasts for their discipline (by number of required bays) to Space Planners in a timely manner as described in the Wire Center Planning M&P. In addition to the following organizations the Space Planner keeps close contact with Common Systems Standards Team (not shown in Fig. 3.1) for changes in space planning requirements as mandated by FCC or PUC. The space Planners also keep in touch with Detail Engineering Center (DESP) for uploading and downloading of T-Base drawings to/from the DESP Master Plan Server. Often, Frame Planning, Power Planning, and Space Planning work in the same organizational unit.



**Fig 3.1** Organizational Interfaces of Space Planners

## I. Equipment Layouts And Detailed Plans

3.14 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.

3.15 The Control Drawing (CD) is the fundamental reference document used to record space utilization throughout the life of the wire center. CDs, contains pertinent information related to Plot Plan, Planning, Engineering, Cable Entrance Facility, Cabling, Power, and Space Allocation. CDs do not contain specific installation details, day to day changes and notes, that are necessary for space planning purposes. Those are reflected on T-Base drawings. In case of third party audit for collocation space denial, T-Base drawings will be used.

3.16 Space planners are responsible for developing and maintaining T-Base space planning drawing for each wire center that depicts how available space has been planned and allocated.

3.17 **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.

- a) Allocated space for future growth is based on justifiable forecast information as opposed to being arbitrarily determined.
- b) Space for the linear growth of cross connect equipment and systems is not obstructed.
- c) The bulk of equipment interconnection cable lengths are minimized.
- d) Front and rear equipment aisle widths permit the installation of appropriately sized (in width) overhead equipment lineup cable racks.
- e) Equipment lineup cable rack widths permit sufficient HVAC air circulation to equipment frames.
- f) Front and/or rear equipment aisle widths facilitate installer access to the overhead environment for cable installation and removal purposes.
- g) Required types of overhead cable racks (copper, fiber, power, etc.) will not unnecessarily congest/restrict available cable space.
- h) Equipment administrative and maintenance personnel space is not excessive.
- i) 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).

3.18 The below conditions and interactions shall be 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.

- a) Equipment layouts shall be in accordance with the Company's standards for network equipment environments.
- b) Equipment layouts shall be in compliance with published equipment manufacturer's requirements/restrictions relative to actual placement of equipment.

- c) Equipment layouts shall be reviewed by a tenant representative(s) to ensure the physical relationship of network elements is appropriate and efficient from an equipment operations and maintenance perspective.
- d) Equipment layouts shall be reviewed by a person familiar with equipment environment cable management and superstructure engineering to ensure those matters are appropriately incorporated into equipment layouts. It is expected that Transport Equipment Engineers and/or DESP (detail engineering service providers) will perform this function in the Southwest and Nevada regions, and that the Resident Engineers will perform this function in California.
- e) Equipment layouts shall be reviewed by a power engineer or person familiar with dc power distribution to ensure equipment power distribution has been sufficiently planned for and accommodated.
- f) For all new constructions or building additions equipment layouts shall be reviewed by CRE for matters related to code compliance, ac power, and air conditioning requirements.

## **J. Space Planning T-Base Drawings**

3.19 Once it has been determined via the process discussed above that space planning drawings have been sufficiently developed they shall be made available to line engineering for implementation (incorporation into the office T-base floor plan drawings). The line engineering implementation process will further enhance the developed space planning information to include building and equipment specific information necessary to support on-going detailed engineering and installation of network elements.

- T-Base office records shall depict all space available for network equipment use regardless of it's occupancy. Some elements of T-Base space drawing are provided in the latest issue of the Wire Center Planning M&P.

## 4. OFFICE LAYOUTS

### A. General

4.01 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.

4.02 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 section 3.14 to 3.18 for more detail.

#### Recommended Office Layout Development Procedure

- 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.)
- Identify potentially High Heat Release Areas and equipment
- Identify major Cable Path (primary) for power and network interconnection
- Identify Any Physical Special Situations that may impact equipment placement
- Identify primary people Traffic Pattern and work area needs that may affect Aisle Spacing
- Establish people Egress and Ingress Paths.

4.03 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 practicable 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.

4.04 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. Equipment space planners will:

- a) Manage an up-to-date master floor plan for the building or equipment area within a building,
- b) 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, and

- c) Coordinate equipment heat load (2.18, 2.19, 2.20) and space utilization issues with the real estate organization.

4.05 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 shall include the equipment's expected heat load (dissipation) and power drain values. Floor space requirements including front and rear aisle space requirements (individual frames), 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.

4.06 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.

4.07 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

4.08 Generally, *Bell System* network equipment structures have been constructed with floor load capabilities of 150 lb./ft<sup>2</sup> for network equipment areas and 300 lb./ft<sup>2</sup> 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<sup>2</sup> floor area (building bay), including power equipment located on floors above the building's dc power room, should not exceed 80 lb./ft<sup>2</sup>. Likewise, the combined weight of all equipment frames located on a given floor should not exceed 80 lb./ft<sup>2</sup> for the entire floor area. The 80 lb./ft<sup>2</sup> 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<sup>2</sup> in any 400 ft<sup>2</sup> floor area (building bay). Likewise, the combined vertical load applied to a given floor shall not exceed 140 lb./ft<sup>2</sup> for the entire floor area.

4.09 Floor loading of equipment frames is calculated by dividing the equipment's maximum installed weight by the area of a rectangle bounded by the equipment's sides and the center of the equipment's minimum front and rear aisle space. 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. 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.

4.10 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.

### **Equipment Lineups**

4.11 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.

4.12 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 4.09 and Section 7, office distributing frame lineups may be as long as necessary.

4.13 It is no longer predictable what depth the next network element installed in an equipment environment will be. The historic Bell System standard equipment depth of 1'-0" is for the most part only achievable 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 management requires that the functionality of "other" communications industries 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.

### **Equipment Aisles**

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

- a) The physical operating and installation/maintenance space. The space required to properly access the equipment for test and maintenance purposes
- b) 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 minimum front and rear aisle space requirements
- c) The physical safety of the personnel working around the equipment
- d) 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
- 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 may also be related to location of equipment lineups to building features such as perimeter wall, partitioning walls, building columns, cable floor openings, caged partition, etc.
- g) A BDFB is usually wider and deeper than normal telephone equipment bay. Placing BDFB in regular lineups may cause blockage to aisle space or ladder paths. Hence should be placed in column lineups.

## Equipment Heat Dissipation

4.15 Allocating floor space and engineering equipment according to minimum aisle space requirements to conserve floor space is as important as is the need to more effectively manage equipment heat dissipation and to “open up” equipment areas for easier human access and network management purposes. Most if not all network functionality can be accomplished using fewer equipment frames. Additionally, the shorter life expectancy and usefulness of modern technology, and the transformation of the “CO” into a “TC” (technology center) requires equipment environments that are more suitable for migrating equipment into and out of buildings more frequently. The use of aisle space larger than those 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 4.17 for objective for newer equipment installations).

- a) It should be noted that the defined heat load values of network elements is calculated using minimum aisle space values and requirements. Engineering a network element to its minimum space requirements should not affect the equipment's reliability or longevity. Engineering equipment to wider than minimum aisle spaces should increase the cooling capabilities of the equipment and office HVAC systems (refer to section 2.20 for an example of trend in high heat dissipation equipment).

4.16 Network equipment has generally been capable of functioning properly for its intended life using the traditional industry standard minimum front aisle space of 2'-6" and the minimum rear aisle space of 2'-0". This was primarily possible because the electromechanical nature of the equipment's design did not generate significant amounts of heat compared to modern electronics and electronic equipment designs. It can be reasoned that because of the sheer numbers of equipment frames that traditionally have been required to provide a network function, equipment space has been using the equipment's *minimum* aisle spacing requirements to conserve floor space. This equipment planning and engineering mind set has prevailed and equipment administration people have adapted to the resulting working environments created.

4.17 The defined *minimum* aisle space requirements of equipment shall only be used for space planning and equipment engineering purposes when it is necessary because of an unusual office condition, and when the minimum aisle space requirements are significantly greater than 2'-6" front and 2'-0" rear. The “objective” for aisle spacing shall be 3'-6" front and 2'-6" rear, that is somewhat less than the front aisle space of 4'-0" and 3'-0" rear (as recommended by vendors for high heat dissipating equipment) because of building column sizes and spacing.

4.18 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 4.09 through 4.11. 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.*

## B. Site Specific Floor Plans

### Relative Equipment Locations

4.19 Figures 4-1 through 4-3 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 ( $\pm$  20 to 40k residence lines) incorporating all technologies. Figures 4-2 and 4-3 illustrate a large two story office ( $\pm$  60K residence lines) requiring an entire building floor be devoted to a specific network technology (switching or transport). Figure 4-2 and 4-3 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 4-1 through 4-3 would be appropriately larger. Using Figures 4-1 through 4-3, 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.

4.20 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 linear footage of interconnection cable required and the cable's resulting impact on the overhead equipment environment. For some equipment the primary network interface may be a technician's work space, but usually it is the network element to which the bulk of the equipment's interconnection cable will be routed to. 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.

4.21 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.

a) 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.

b) 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.

4.22 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.

1. Remote that which has the least special cable rack requirements;
2. Remote that which has the least interconnect cable requirements;
3. Remote that which has the least life expectancy;
4. Remote that which has the least maintenance requirements.

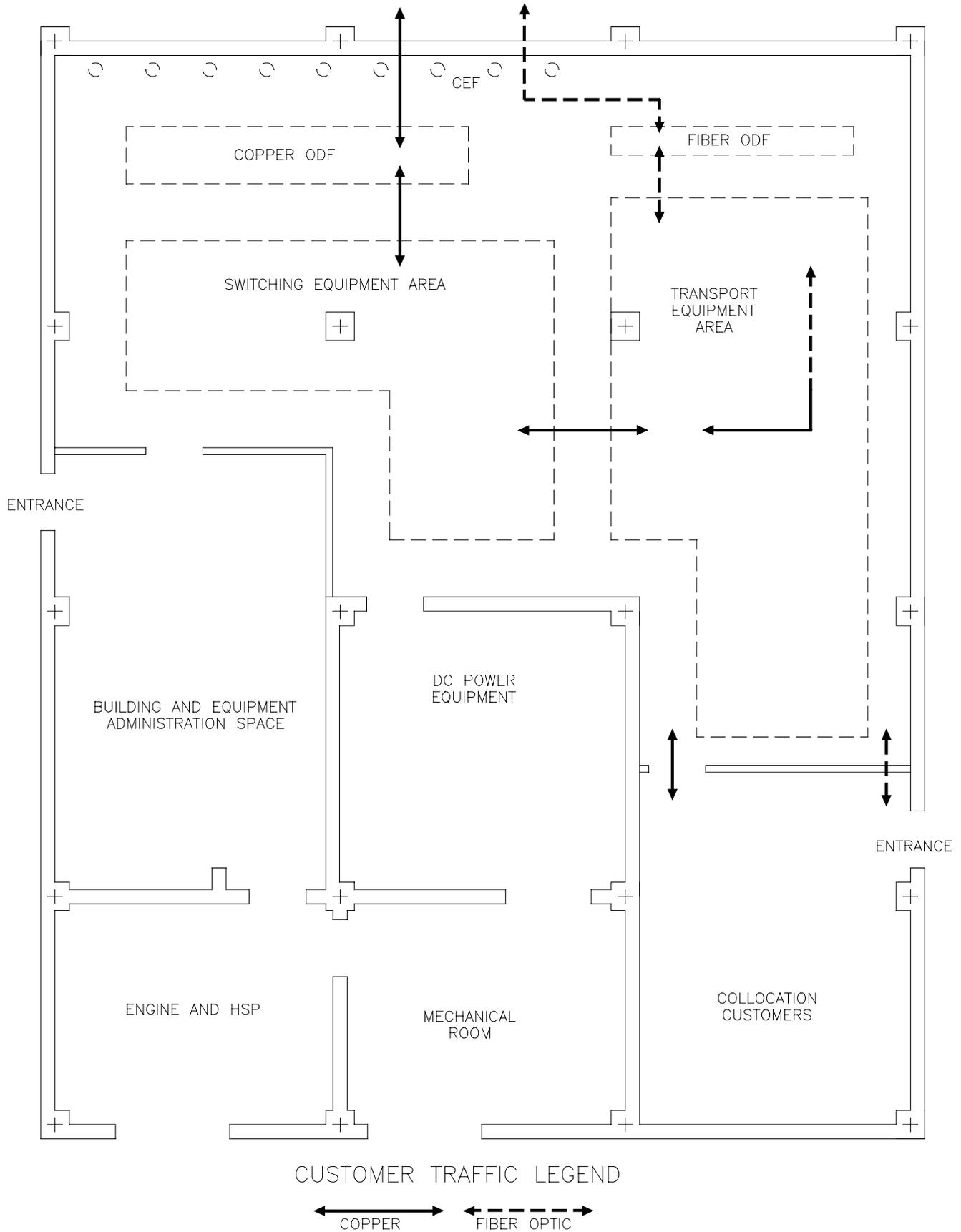
## **D. Equipment Areas**

### **Cable Entrance Facilities**

4.23 The cable entrance facility (CEF) 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).

4.24 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.

4.25 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.



**Figure 4-1 - Generic Model Of Single Story Network Equipment Building**

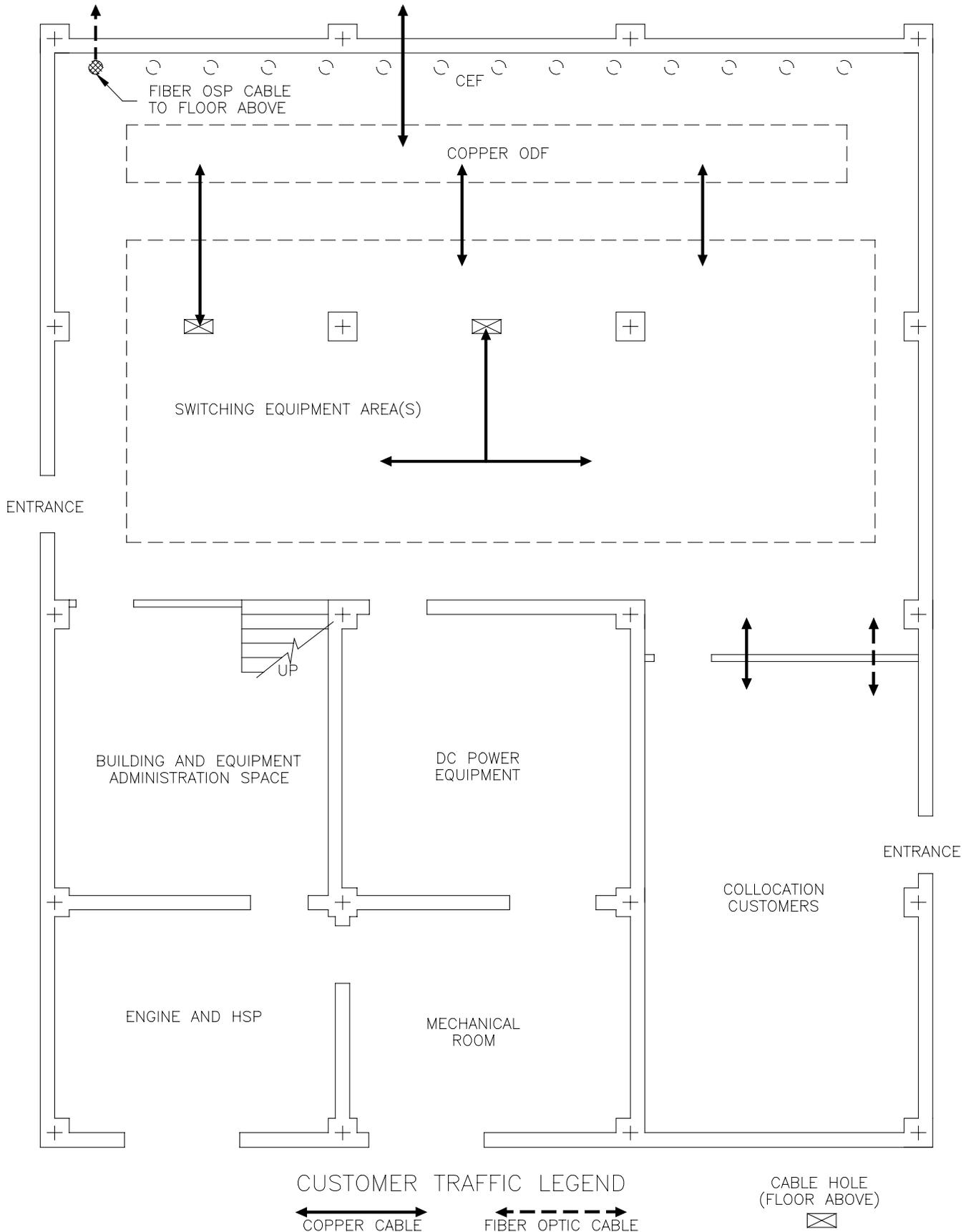
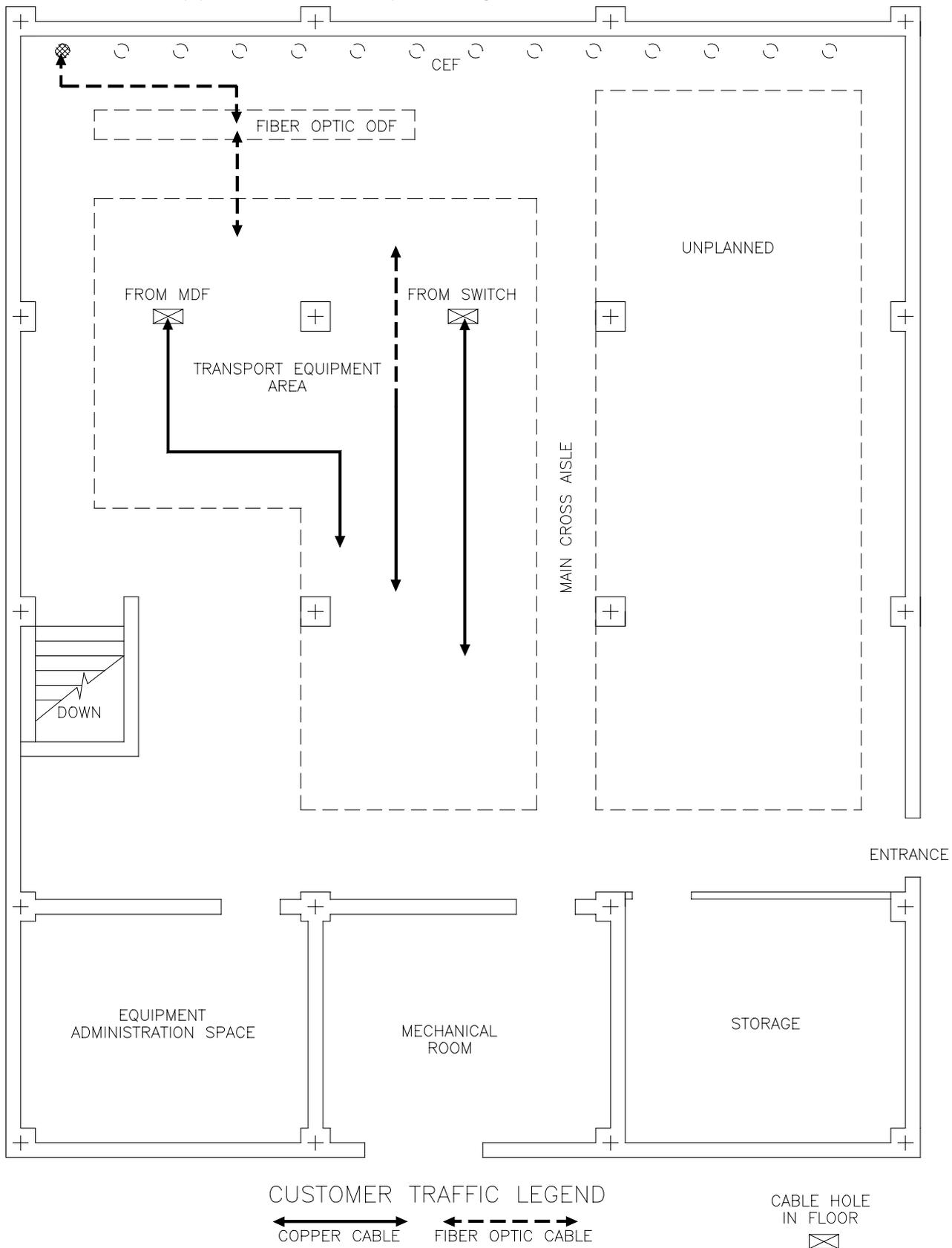


Figure 4-2 - Generic Model Of Multi-Story Network Equipment Building Switching Equipment Located On 1st Floor (see Fig. 4-3)



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

## Power Equipment

4.26 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 4.19(a). The ac interconnection requirement usually places office power plants in a building's basement or in a corner of single floor buildings.

4.27 The "as close to" requirement in 4.26 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.

4.28 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.

## Office Distributing Frames (ODF)

4.29 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).

## Switching Equipment

4.30 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.

## Transport Equipment

4.31 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.

4.32 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 4-1 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 4-3. 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.

4.33 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. 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).

### **Network Administration Areas**

4.34 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 administration area (MAP) 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. <sup>2</sup>	640 ft. <sup>2</sup> (#5ESS) 400 ft. <sup>2</sup> (DMS-100)	200 ft. <sup>2</sup>

4.35 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.

### **Equipment Staging Areas**

4.36 A minimum of 200 ft.<sup>2</sup> 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.

## 5. COMMON SYSTEMS

### A. General

5.01 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.

### B. Equipment Height

5.02 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.

5.03 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.

5.04 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).

5.05 Transition plans for an equipment lineup other than 7'-0" may include limited continual growth of existing 11'-6" or 9'-0" environments 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 and make use of existing cable rack system.

### C. Equipment Protection

5.06 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.

5.07 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.

5.08 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.

a) 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.

## **D. Equipment Lighting**

### **General**

5.09 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.

a) 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.

5.10 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.

5.11 "Low intensity" equipment lighting practices shall be used in all equipment areas larger than 2000 ft.<sup>2</sup> 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.

5.12 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.<sup>2</sup> 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.

**Illumination**

5.13 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

**E. Equipment Superstructure**

**Auxiliary Framing And Bracing**

5.14 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).

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

5.15 Provisioning of equipment superstructure arrangements shall be done in building bay (400 ft.<sup>2</sup>) 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.

### Floor Stanchion Systems

5.16 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

- a) 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. BSP 800-006-152MP "*Floor Stanchion Supported Cable Rack System Requirements*," shall be followed.

### Cable Distribution

5.17 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).

- a) 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.
- b) 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.

5.18 As covered in BSP800-006-151MP, general purpose cable racks shall be of a steel ladder design having 2 inch stringers (side rails). Cable rack designs incorporating fixed uprights or horns for cable organization or confinement purposes shall not be installed above network equipment.

5.19 Sheet metal compartmentalized cable rack designs often referred to as *digital cable ways* shall not be used for office and equipment cabling in general. The use of compartmentalized cable distribution systems is restricted to equipment *systems* such as network switch entities that are installed in dedicated equipment areas. Compartmentalized cable rack designs rely on attachments to equipment framework assemblies to achieve their structural stability, and generally have limited cable pileup capacity relative to traditional ladder cable rack designs.

5.20 In order to condition existing compartmentalized cable rack areas for transition to conventional office superstructure and cable rack usage, new equipment shall not be installed in compartmentalized cable rack areas. Additionally, when it is necessary to interconnect network elements that are separated by a compartmentalized cable rack area, network cabling shall be routed over or around compartmentalized cable rack areas rather than through them.

5.21 As indicated in Figure 2-3, special purpose (restricted use) cable racks 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.

5.22 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:

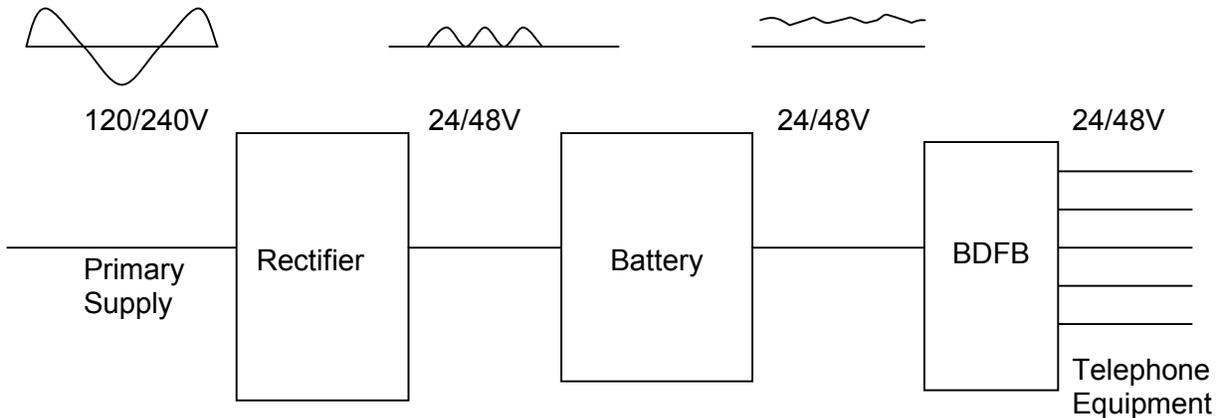
- a) Secured cable is more suitable for public viewing,
- b) Secured cable is generally more suitable for smaller more static equipment installations (switching equipment areas and rural wire centers) where equipment and technology change less frequently,
- c) Unsecured cable tends to promote premature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

**6. POWER EQUIPMENT AND AREAS**

**A. General**

6.01 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."

6.02 Basic Telephone Power Plant



6.03 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.

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

**Superstructure**

6.05 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.

**B. Engine Alternators**

6.06 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.

6.07 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.

### C. Uninterruptable Power Supplies (UPS)

6.08 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.

### D. DC Power plants

#### Power Control and Distribution Bays

6.09 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). BDFBs (Battery Distribution Fused Bay) shall be dispersed throughout transport equipment areas so they are *individually* centrally located to the equipment they serve. 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. 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. 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.

### E. Batteries

6.10 a) Refer to TP76300MP SBC Local Exchange Carriers, Installation Requirements - Section M item 5 for detailed information regarding the placement of office dc batteries.

b) Refer to 4.06(b) 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.

### F. References

6.11 Reference:

- |                      |  |
|----------------------|--|
| 1) BSP-790-100-651MP | Introduction to Power Systems Engineering Manual |
| 2) BSP-790-100-652MP | Planning   |
| 3) BSP-790-100-654MP | DC Plants  |
| 4) BSP-790-100-655MP | Batteries  |
| 5) BSP-790-100-656MP | DC Distribution                                  |
| 6) BSP-790-100-659MP | Standby AC Plants (and DC Generators)            |
| 7) TP76300MP         | Installation Requirements                        |
| 8) TP76400MP         | Detail Engineering Guidelines                    |

### G. Forecast M&P

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

## 7. DISTRIBUTING FRAMES AND AREAS

### A. General

7.01 This part provides the standards for distributing frame equipment and spaces in network facilities. For the purposes of this part office distributing frames are those equipment frames on which OSP cable conductors are terminated for subsequent interconnection to voice/data processing network elements. Distributing frames are discussed according to the type of OSP facilities terminated on them (copper or fiber optical) and their functional purpose (subscriber and/or trunk cabling).

7.02 Distributing frames are categorized into the six basic functionality's indicated in Table 7-1. Except for the protector frame, the functionality of an office distributing frame is applicable to copper and fiber optic OSP facilities. Except for the IDF, DSX-1 and DSX3, the primary network interface for office distributing frames is OSP cable conductors and network equipment located in the wire center. Accordingly, distributing frames shall be located at and parallel to building cable entrance facilities.

Table 7-1  
Distributing Frame Categories By Function

Generic Reference		Functionality
Fiber <u>OSP</u>	Copper <u>OSP</u>	
<b>FDF</b>	<b>MDF</b>	Main Distributing Frame or Fiber Distributing Frame. Terminates both subscriber and interoffice (trunk) cable conductors. The MDF is sometimes referred to as a combined distributing frame or CDF. The FDF is a cross-connect point for all network elements with one another and outside plant fiber optic facilities within a wire center.
	<b>S MDF</b>	Subscriber Main Distributing Frame. Terminates subscriber cable conductors, office equipment and tie facilities to other frames only. The primary frame for indigenous frame terminations.
	<b>T MDF</b>	Trunk Distributing Frame. Terminates interoffice cable conductors only.
	<b>S DDF</b> <b>T IDF</b>	Subscriber Digital Distributing Frame or toll intermediate distributing frame. Terminates multiplexed voice frequency and pair gain circuits. May be a section of the MDF.
	<b>IDF</b>	Intermediate Distributing Frame. A distributing frame that has no direct OSP terminations. IDF's are usually found on upper floors of a building and are interconnected to other office distributing frames via tie pair cable. IDF's are usually only associated with copper based OSP facilities.
	<b>DSX-1</b>	Digital Cross-Connect Frame for T1/T1C/T2 services. This frame performs a manual interconnection function between network equipment and other frames in lieu of a Digital Cross-Connect System (DCS)
	<b>DSX-3</b>	Digital Cross-Connect Frame for DS3/STS-1/E1 services. This frame performs a manual interconnection function between network equipment and other frames in lieu of a Digital Cross-Connect System (DCS).
	<b>PROT</b>	Protector Frame. Not a functional distributing frame. Terminates copper OSP cable pairs and cables to a functional copper office distributing frame.

7.03 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 office distributing frames in network facilities shall be avoided unless absolutely necessary. Office 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.

7.04 Main distributing frames tend to be extremely 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 4.10 shall be taken into consideration when the expected or potential ultimate length of an office distributing frame may restrict people access to an emergency exit. In such cases, office distributing frame lineups shall be interrupted to enable required access to a building or area emergency exit. Conventional copper 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-throughs" used with the particular framework design.

7.05 Specific equipment space and aisle width requirements for office distributing frames are determined by the distributing frame technology selected 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.

7.06 The use of conventional distributing frames is generally preferred for low and medium sized offices having a planned capacity of approximately 50,000 copper based customer lines or less. Modular distributing frames (including their associated mechanized jumper assignment capabilities) is generally preferred for large offices having planned capacity requirements of more than 50,000 copper based customer lines. The determination of which distributing frame technology to use for a given service area shall be decided by network and distributing frame planning activities at the local level. Refer to BSP 201-222-900MP for specific details (Future). Also, refer to the Frame Forecast Planning M&P.

7.07 Hard-wired network elements shall not be installed in the same lineup as distributing frames unless the ultimate length of the distributing frame has been definitely determined. When it is appropriate to install hardwired network elements in the same lineup as an office 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 shall be used when copper and fiber optic distributing frames are located in the same equipment lineup. Refer to BSP 201-222-900MP for specific details (Future).

7.08 Distributing frames require service order and frame administration people space like other network elements. A minimum of 75 ft<sup>2</sup> shall be allocated for distributing frame administration. This space may be dedicated floor space at the office 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 by office and equipment configuration conditions at the local level.

## **B. Copper Distributing Frames**

### **Conventional Distributing Frames**

7.09 Conventional office distributing frames are a skeletal arrangement 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" or less shall be used for all new conventional office distributing frame requirements.

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. For new conventional frame installations, the frame should be a low profile conventional frame (8-feet high). It is permitted to grow tall conventional frames within its' existing architecture, i.e., (11'6" or 14'-feet high).

7.10 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 termination blocks and terminal strips in a manner that utilizes all available vertical or horizontal shelves and levels. Cable terminations will only be placed on the vertical or cable side while all other terminations to the MDF/S MDF will be made on the horizontal levels only. Refer to BSP 201-222-900MP for specific details (Future).

Add verticals for the placement of copper outside plant facilities in five-year increments based upon a 95% fill rate. The vertical side of the frame is the only side where cable facilities will be terminated. The horizontal portion of the frame is the termination point for network elements and is typically placed in 89 type connecting blocks. Minimum frame growth increments should 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 Planning M&P for block placement strategies.

### **Modular Distributing Frames**

7.11 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 frame 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. Modular distributing frames may also require the use of separate and parallel distributing frames, one for OSP cable pairs and one for network equipment cable pairs.

When a universal modular type frame replaces a conventional frame, the vertical side of the conventional Main Distributing Frame will become the Wire Center Protector Frame. This conventional frame will continue to be the termination point for all cable facilities and protectors.

7.12 Because of their large floor space requirements, significant initial higher cost than conventional distributing frames, and the increasing use of fiber optic and wireless technology in our OSP environment, modular distributing frames should only be used with reasonable assurance that the serving area of a wire center will be predominantly copper based for more than 10 years.

### **C. Fiber Distributing Frames**

7.13 Currently, fiber distributing frames (FDF) are a predetermined arrangement of fiber optic terminating and cross connect equipment units usually mounted on traditional network equipment framework assemblies. A module of FDF consists of a frame used for terminating OSP cables and a frame used for terminating network equipment elements which are cross connected to the OSP cable conductors. Space planning and equipment engineering of the FDF should be accomplished using the same or similar practices established for copper distributing frames (see 7.10).

A Fiber Distribution 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) a centralized point for the organization and administration of the fiber optic facility and intrabuilding fiber equipment cables,
- b) a flexible platform for future fiber growth,
- c) and re-arrangeable connections between any two terminations or appearances.

Refer to Frame Forecast M&P for space planning information.

7.14 Where it is not practical to locate the office FDF in-line with the copper MDF, the FDF should be located directly across from the growth end of the MDF or directly above the MDF on an upper floor to simplify OSP fiber cable routing. Relative to other transport equipment, the FDF should be the closest equipment lineup to the building's 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.

7.15 Connection of new network technologies to customer-serving fiber optic OSP cables shall be accomplished via the office FDF rather than via equipment and apparatus installed in other office equipment frames and locations. The full cross-connect architecture will be used by the SBC 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.

#### D. Fiber Distributing Frames (FDF) Planning Considerations

7.16 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.*

7.17 Refer to the IDF, Transport, Tab3, Fiber Distributing Frames, dated 8/99 and the Frame Forecast Planning M&P for more details.

#### E. References

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

1. *Fiber Distributing Frames (FDF), Fiber Protection System (FPS) and Fiber Termination Equipment*, IDG, Transport, Tab 3, dated 8/99
2. *Digital Cross-Connect Frames (DSX-1 & DSX-3)*, IDG, Transport, Tab 13, dated 8/99
3. *Subscriber Main Distributing Frame (MDF)*, IDG, Switching, Tab 11, dated 8/99
4. *Optical Splitters, WDM*, IDG, Transport, Tab 9, dated 7/99

#### Future BSPs

BSP 201-222-900MP Distributing Frames in the SBC Local Exchange Carriers	projected 03/00
BSP 801-500-900MP DSX-1 Digital Cross-Connect Equipment and Frames	projected 01/00
BSP 801-500-901MP DSX-3 Digital Cross-Connect Equipment and Frames	projected 01/00
BSP 636-299-900MP FDF Fiber Distributing Frames and Miscellaneous Apparatus	projected 12/99

## 8. TRANSPORT EQUIPMENT AND AREAS

### A. General

8.01 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 4.33). 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.

8.02 Figure 8-1 illustrates the 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.

8.03 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 8.04). If in a Figure 4-3 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 4-3 scenarios is for a particular technology to span both sides of the main cross aisle.

8.04 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.

8.05 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.

8.06 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.

**B. Forecasting M&Ps (Transport / IOF, Data Engineering, LOOP Equipment)**

- 8.07 For transport equipment forecasting refer to *“Transport Engineering Space Reservation Process.”*
- 8.08 For Data Engineering forecasting refer to *“Data Engineering Space Reservation Process.”*
- 8.09 For Outside Plant Equipment forecasting refer to *“Documentation of Loop Requirements For Wire Center Space Planning.”*

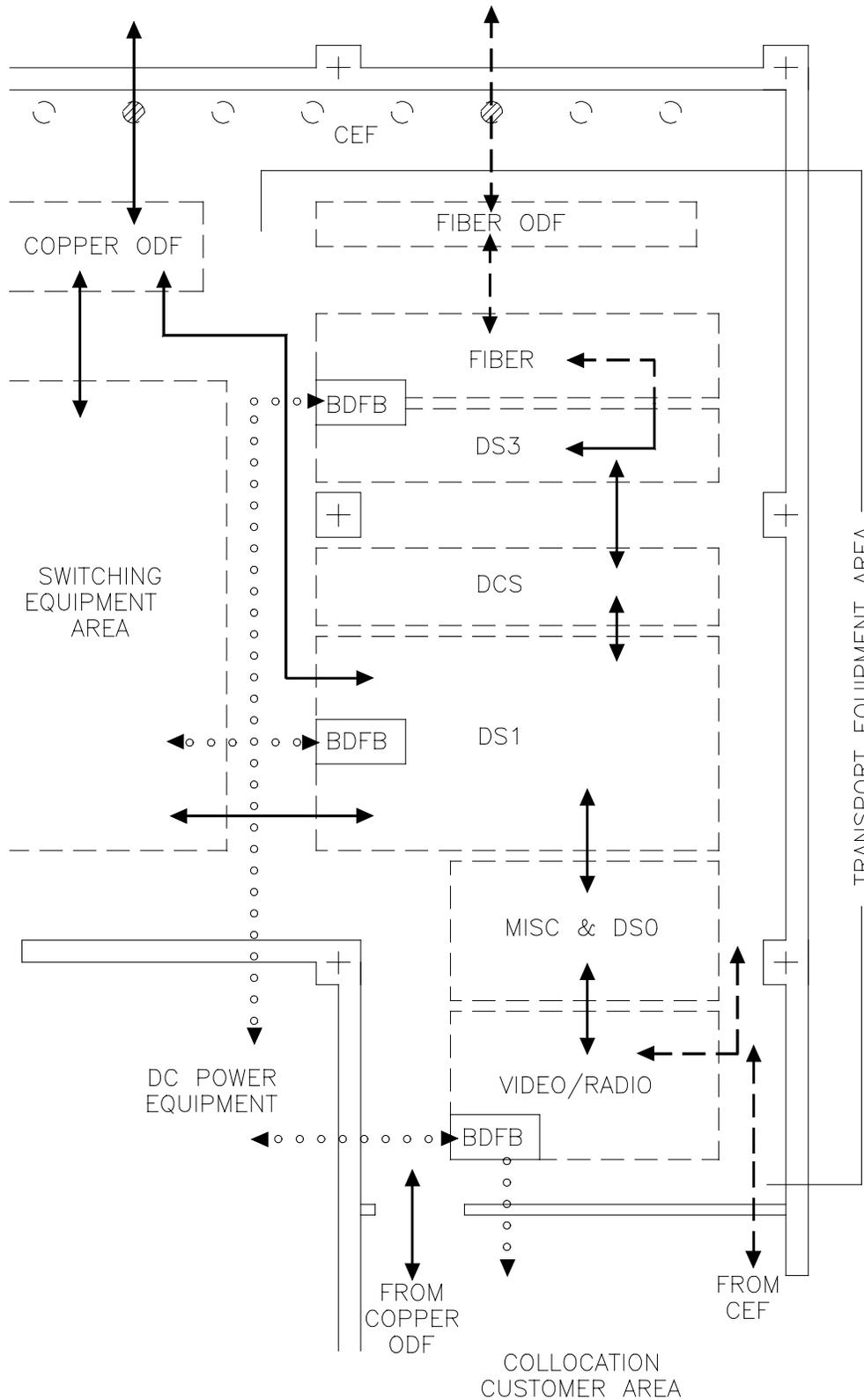


Figure 8-1 - Generic Relationship Of Network Technologies

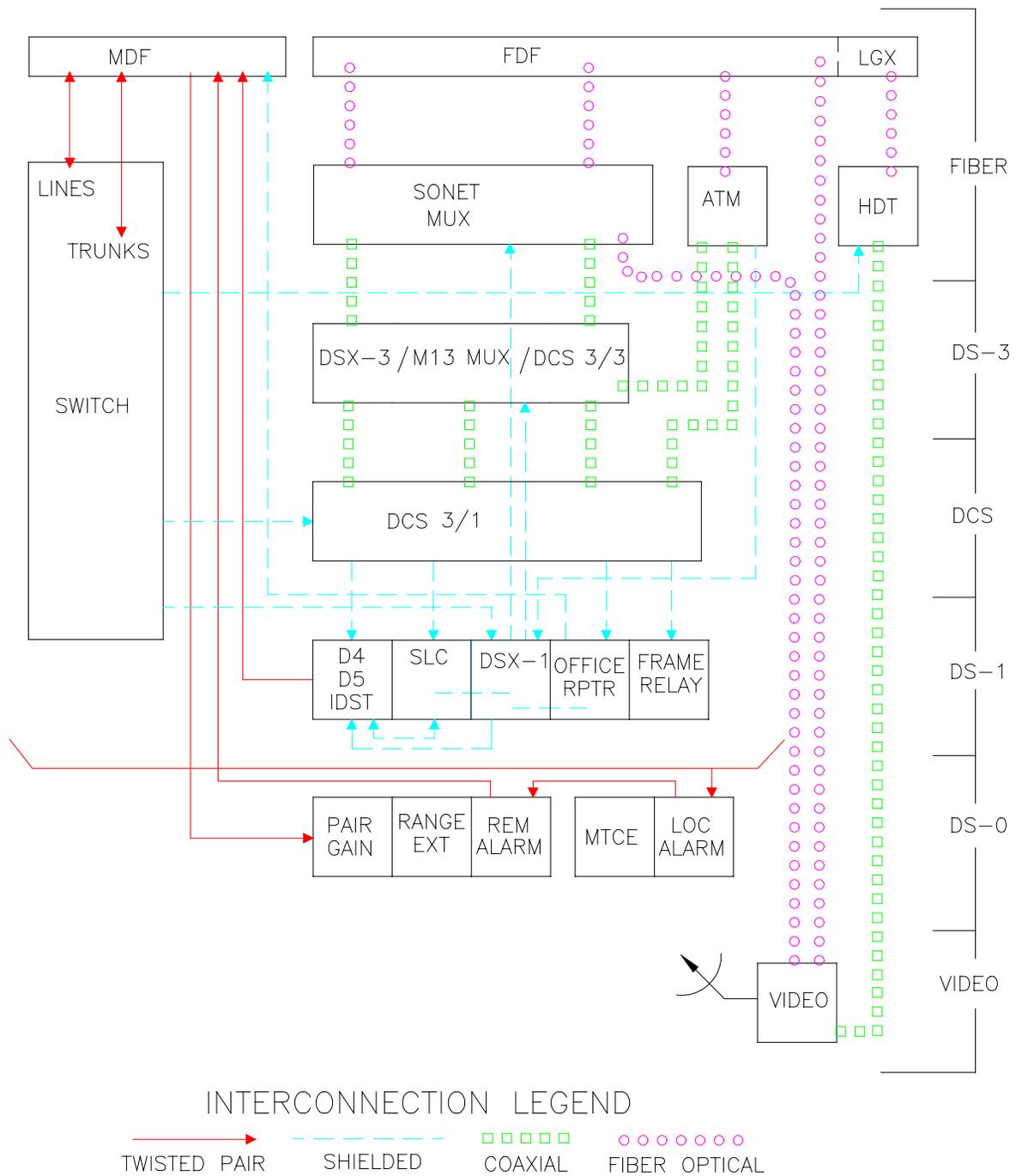


Figure 8-2 - Generic Functionality Of Transport Equipment Network Elements

## 9.0 EQUIPMENT AISLE SPACING

9.01 Refer to sections 4.12 to 4.16 for an initial discussion on equipment aisle spacing.

9.02 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).

9.03 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.

9.04 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.

9.05 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.

9.06 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.

9.07 Table 9-1 represents generic Aisle Spacing criteria.\*

<b>AISLE</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Standard</b>
Maintenance (Front)	2' – 6"	4' – 0"	3' – 6"
Wiring (Rear)	2' – 0"	3' – 0"	2' – 6"
End (from nearest object)	2' – 6"	-----	3' – 6"

\* Notes: Refer to Figures 9-1 to 9-6 for specific application.

9.08 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.

9.09 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.

9.10 Figure 9-5 provides a typical application of the aisle spacing guidelines provided in this part to the office layouts illustrated in Figures 4-1 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.

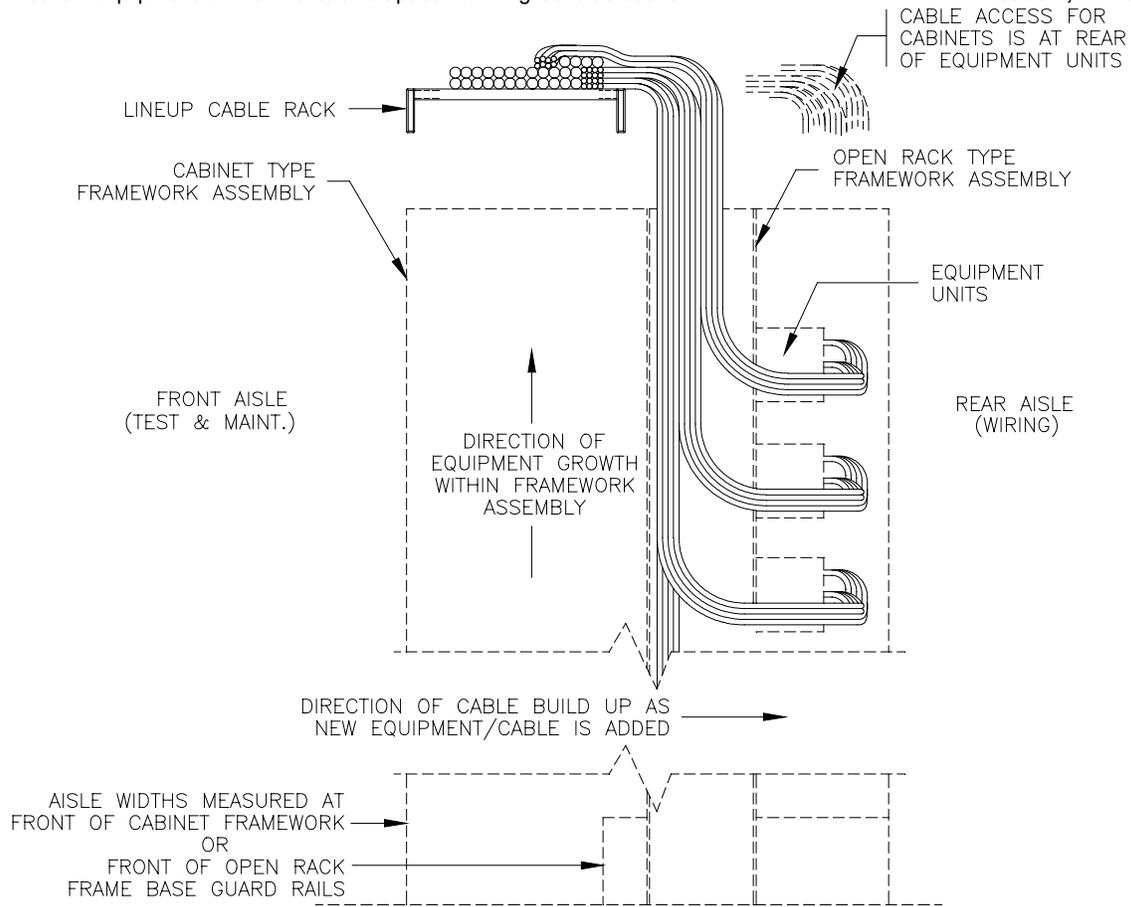
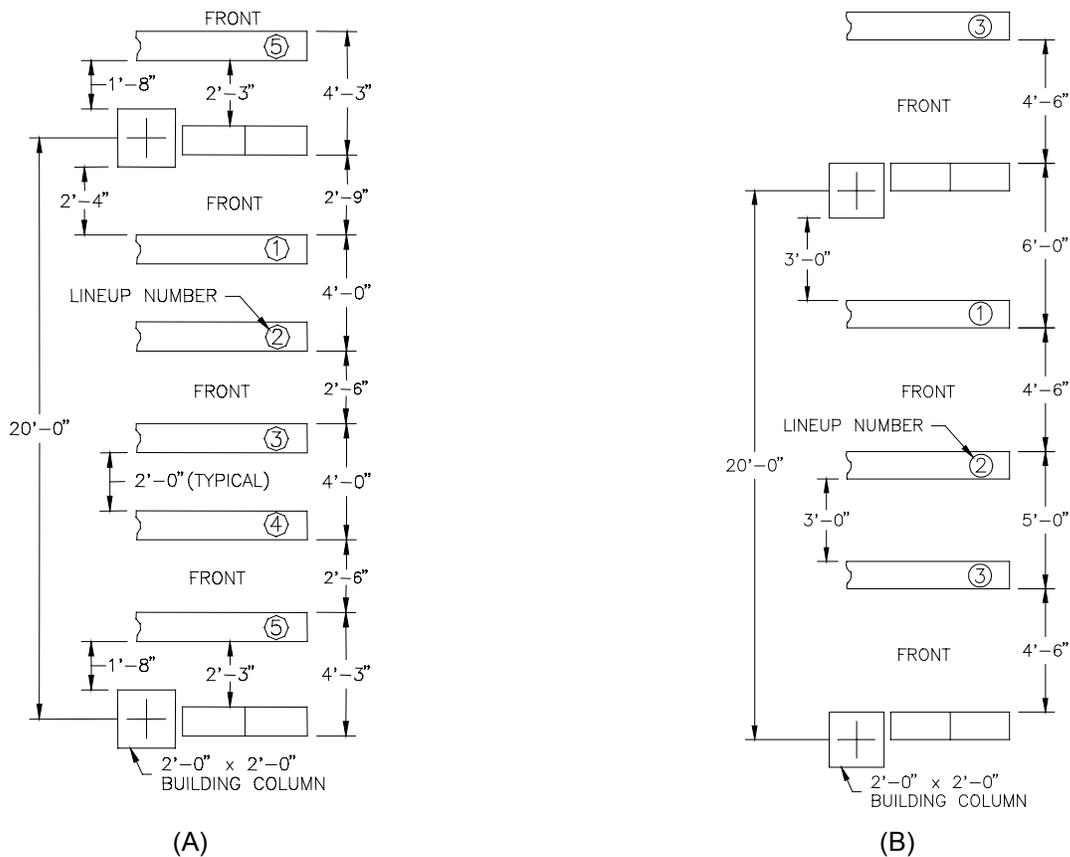
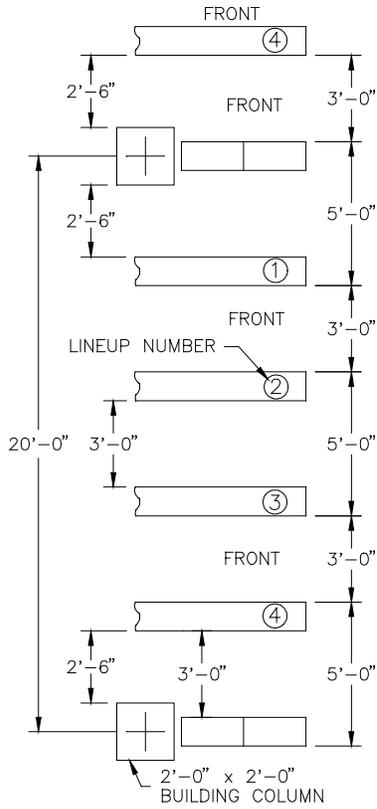


Figure 9-1 Generic Method Of Cabling Plan For Transport Equipment Frames And Cabinets

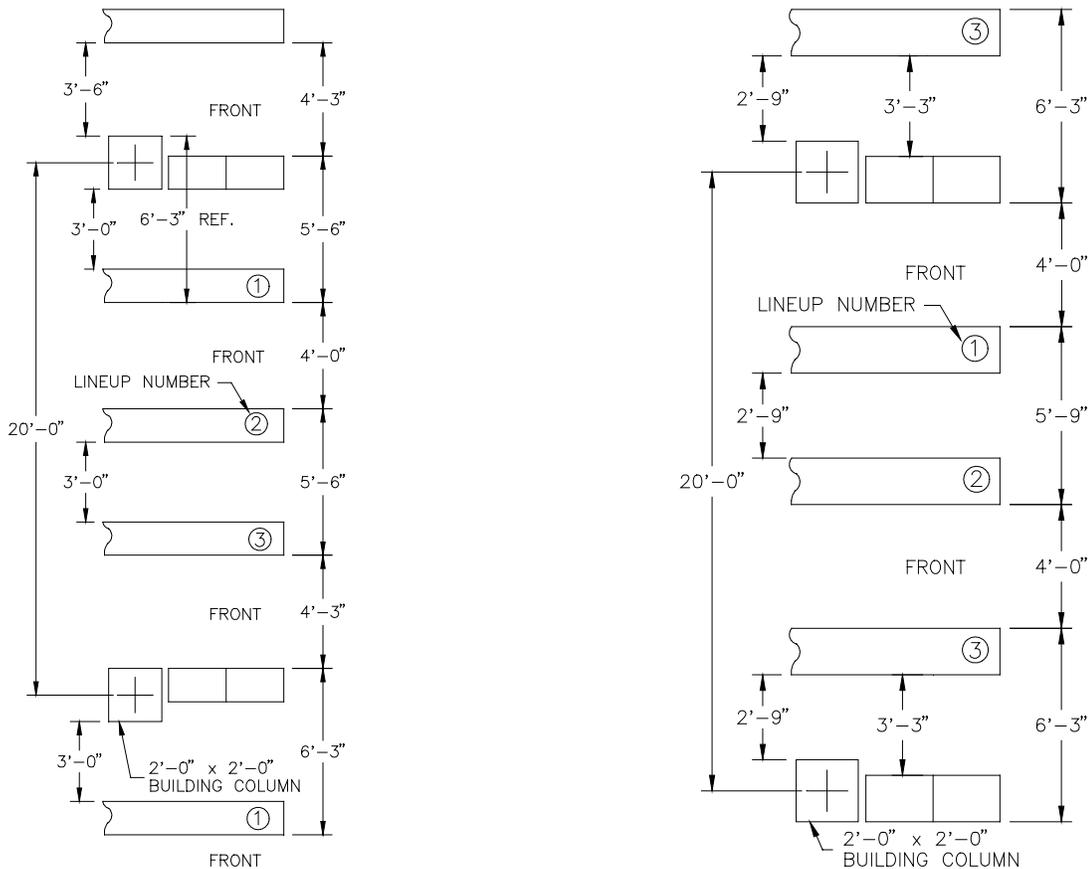




(C)

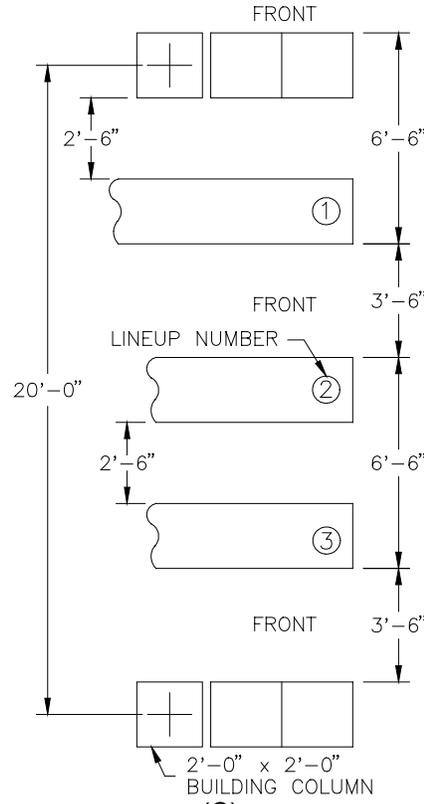
Lightly Cabled Equipment And Limited Floor Space Applications

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



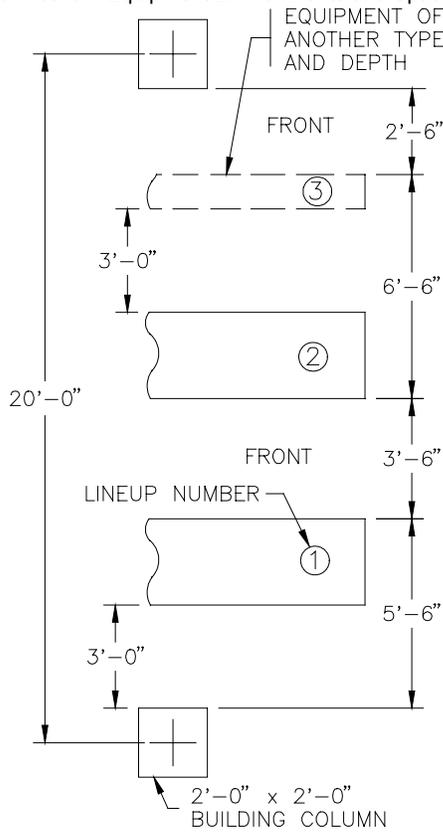
(A)  
1'-3" Deep Equipment Lineups

(B)  
1'-6" Deep Equipment Lineups

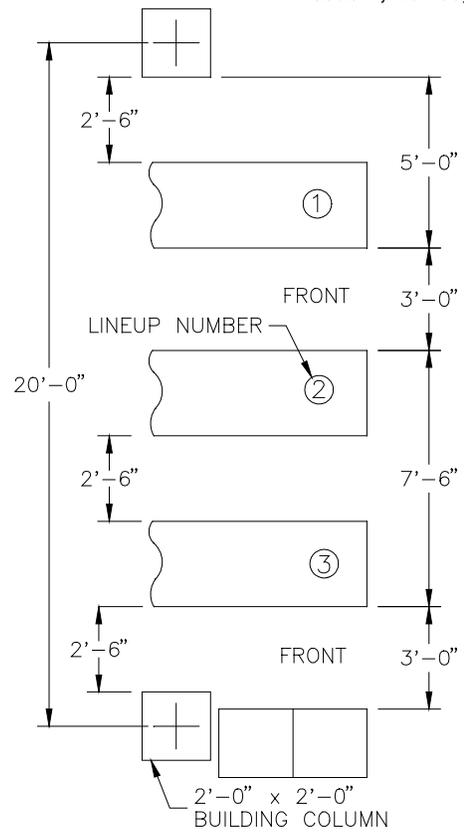


(C)  
2'-0" Deep Equipment Lineups

Figure 9-3 Typical Aisle Spaces For 1'-3", 1'-6" and 2'-0" Deep Equipment Lineups



(A)  
Preferred



(B)  
Limited Floor Space Applications

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

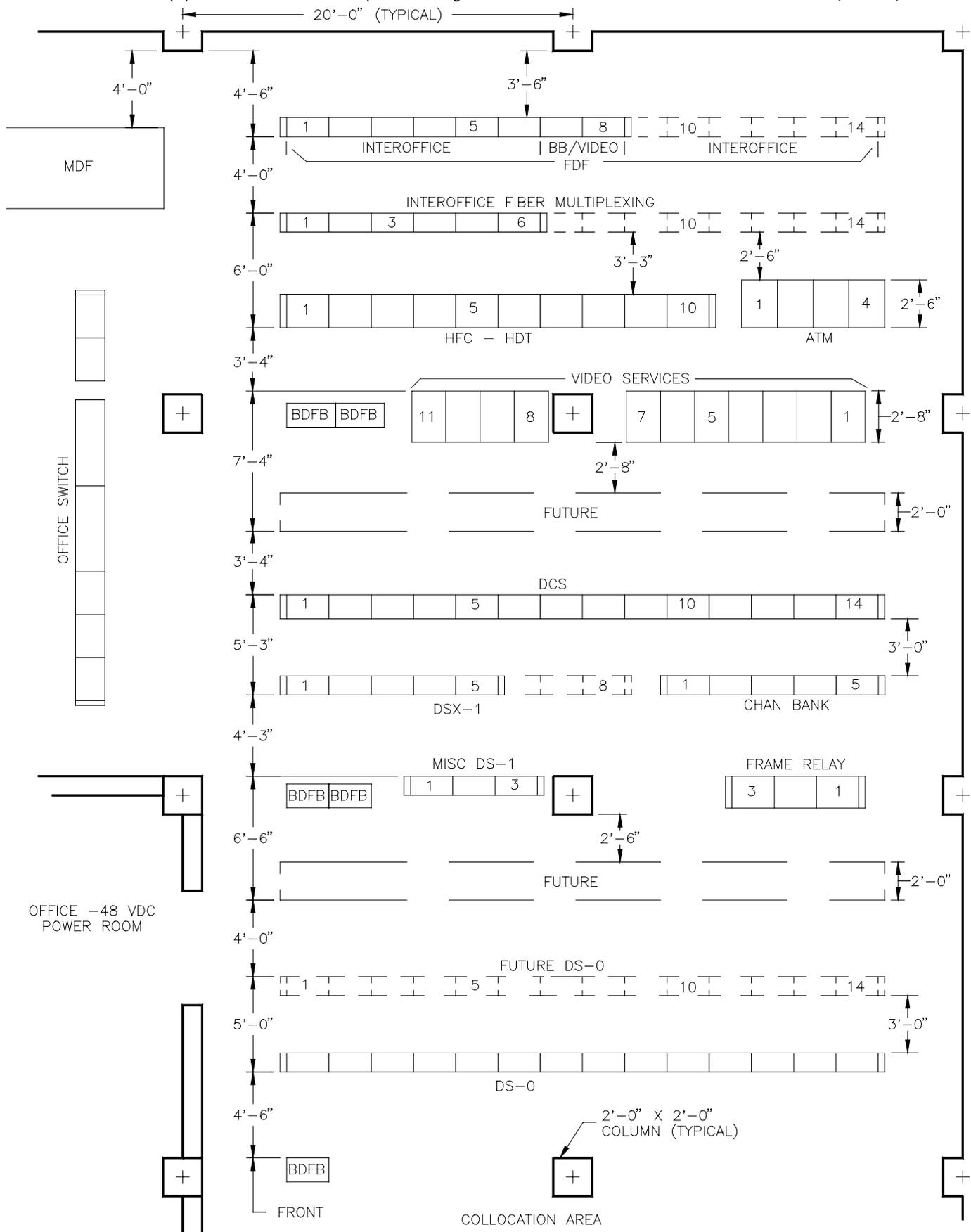


Figure 9-5 Typical Application Of Aisle Spacing Guidelines

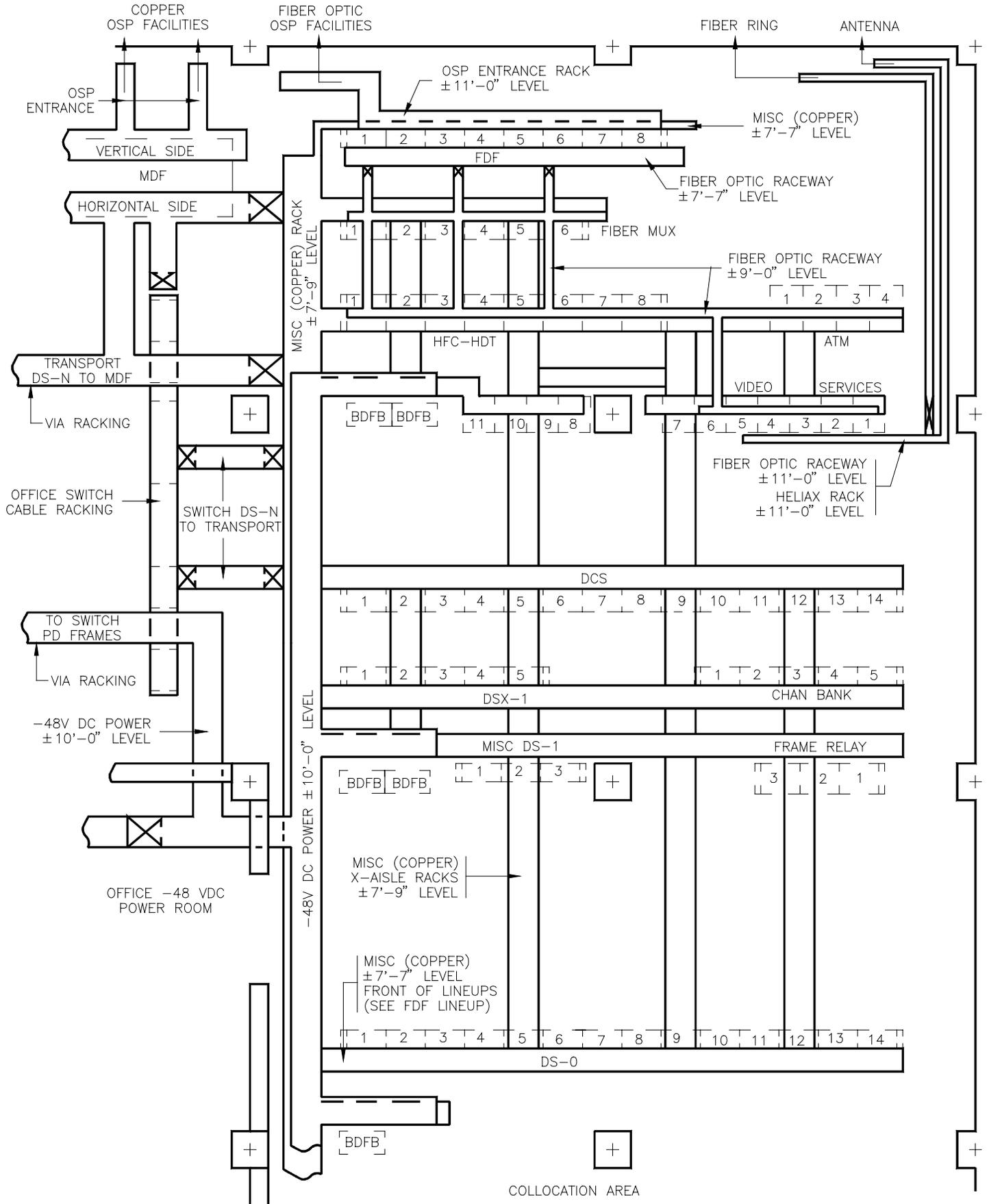


Figure 9-6 Typical Application Of Office Cable Racking To Figure 9-5 Floor Plan

## 10. SWITCHING EQUIPMENT AND AREAS

### A. General

10.01 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.

10.02 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).

### B. Forecasting M&P

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

## 11. COLLOCATION

### A. General

11.01 The SBC LECs will provide physical collocation in eligible structures (Wire Center, CEV, Huts) on a first come first served" basis. To apply for a dedicated space in a particular 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, SBC LEC will begin determining if space is available to fulfill the request. LECs must notify the CLECs within 10 days whether the request for space has been granted or denied due to the lack of space.

### B. Types of Available Physical Collocation Arrangements

11.02 PUC mandates that SBC LEC (ILEC) will make each of the following arrangements available to CLECs within it eligible structures so that collocators will have a variety of collocation options from which to choose:

- a) Caged Physical Collocation – This enclosure is an area designated by the ILEC Space Planners for the sole purpose of installing, maintaining, and operating the collocator-provided equipment. Collocators will be able to order space and a cage enclosure in amounts as small as that sufficient to house and maintain a single rack or bay of equipment
- b) Shared Caged Physical Collocation – A shared collocation cage is a caged collocation space shared by two or more collocators. The ILEC will make shared collocation cages available to all CLECs.
- c) Cageless Physical Collocation – Cageless location is any space in a wire center that is not reserved for ILEC use ILEC will not provide a collocator's personnel or agents with direct access to the ILEC main distributing frames, power plant or any other equipment.
- d) Physical Collocation in a CEV or Adjacent Structure –The collocator may construct a structure in a wire center premise, if there are sufficient room and local zoning ordinances permit to do so. ILEC reserves the right to assign the location of the designated space on the premise where the adjacent structure will be placed and must coordinate a mutually agreeable solution for provisioning power with the collocator.
- e) Other Physical Collocation Arrangements – ILEC will provide other arrangements that have been demonstrated to be technically feasible on other ILEC premises, unless a particular wire center cannot support that arrangement because of either technical reason or lack of space.

### C. Wire Center Survey For Collocation Space

11.03 Methods and Procedures for dedicating collocation equipment areas within network buildings are contained in the Wire Center Planning M&P, issue 6 dated September 20, 1999. Space is dedicated for CLECs utilizing equipment forecasting methodology described in the above M&P. Also refer to section 3.21 of this document.

### D. Space Reservation For Collocation

11.04 Dedicated space is reserved upon notification to the CLEC that space is available to process their application. For space reservation policy in your state please refer to Wire Center Planning M&P, issue 6 dated September 20, 1999. Also refer to section 3.22 of this document.

**E. Space Provisioning Matrix**

11.05 Upon office survey, if it is determined that space is available for CLEC, the space planner shall request that space be provisioned (floor, cable racks, lighting, ac outlet, dc power, grounding, card readers, air conditioning, floor marking, etc.), based upon the matrix provided in the Wire Center Planning M&P.

**F. Sub-Standard Space**

10.06 If the space is sub-standard (poses fire, earthquake, or network reliability risks; violates local building codes; or poses OSHA and other safety risks), it **shall not** be considered as "AVAILABLE SPACE AND ASSIGNABLE SPACE," until such space is brought to central office equipment standards. Neither CLEC nor any ILEC equipment shall be housed in the sub-standard space. It will be a business decision as when or if to upgrade the space for an equipment use. If the space is denied in that wire center due to sub-standard space, the collocators shall be informed of that situation.

## 12. EQUIPMENT REMOVAL

12.01 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. 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. 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.

12.02 For the purpose of the above reuse requirements, the word *apparatus* as used in 12.01 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 12.01(a) to (d).

12.03 Refer to BSP800-003-150MP *Central Office Cable and Wire Installation Requirements - Cable Racks and Raceways* and BSP 800-003-200MP *Central Office Cable Mining Requirements* for removal (Future) of cable associated with equipment taken out of service.

## 13.0 EQUIPMENT CONSOLIDATIONS

### A. Circuit Concentration

13.01 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:

- a) 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
- b) 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.
- c) Refer to BSP 201-222-900MP for specific details (Future). Recommendations in this new BSP shall prevail over all items mentioned in this section related to MDF or FDF.

### B. Equipment Concentration

13.02 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.

13.03 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.

13.04 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.

## 14. RAISED FLOORS ENVIRONMENTS

### A. General

14.01 Network equipment had been placed in raised floors environments that are different than conventional central office environments. Raised floors concept had been around for several years and assumed many names. One of them called "office of the future." Although raised floors concept may offer attributes over the present configuration of network equipment, some usual concerns for non-consideration of the environment are:

- Cable Management
- Equipment Securing
- Maintenance and growth concerns
- Wider aisle spacing (when space is a premium)
- Unfamiliar with the environment

The concepts can be effectively applied to small or medium size *new* wire centers, where total space consumption/usage can reasonably be predicted, and, all variables are known at the time of building design.

### B. NP&E Recommendations

14.02 It should be noted that raised floor is an approved architecture by the NP&E Leadership Team and Corporate Real Estate. Raised floors architecture must be considered as a first choice when alternatives are evaluated. The actual decision whether to deploy the raised floors architecture for a particular wire center is up to the local business unit. *When deployment of the raised floors environment is not possible for small or medium size new wire centers, the justification for non-compliance should be documented.*

## 15. TRANSITION PLANS

15.01 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. To accomplish this, a detailed understanding of how each facility is configured, and should be configured if appropriate, 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.

## 16. REFERENCES

### A. Methods and Procedures

	<u>M&amp;P</u>	<u>Author</u>	
1.	Wire Center Planning	Sha Hoda	626-308-8618
2.	Switching Equipment Forecasts	Mike Shelton	214-858-0867
3.	Transport Equipment Forecasts	David Sakamoto	925-823-5456
4.	Outside Plant Equipment Forecasts	Peter Mcneill	925-823-6703
5.	Data Engineering Equipment Forecasts	David Norris	925-901-6538
6.	Power Requirements/ Equipment Forecasts	Bob Burditt	214-858-1351
7.	Frame Planning/ Equipment Forecasts	Steve Weinert	214-858-1355
8.	Collocation Provisioning Guidelines	Steve Weinert	214-858-1355
9.	Collocation Space Requirements Forecasts	Nancy Clemons	713-567-8590

### B. BSP and TP

1.	TP76200	Network Equipment Power, Grounding, Environmental and Physical Design Requirements.
2.	TP 76300	Installation Requirements
3.	TP 76400	Detail Engineering Requirements
4.	BSP 800-000-102 MP	Central Office equipment Framework Design Requirements
5.	PBS-766-400 PT	Fire Safety Compartmentation
6.	PBS-762-025 PT	Seismic Design Guidelines For Building Mechanical And Electrical System
7.	PBS-765-208PT	Guidelines For Design & Selection of Heating, Ventilation and Air conditioning Equipment & Systems
8.	BR-781-810-880	Ventilation of Central Office Buildings
9.	GR-63-CORE	NEBS

### C. FOR OTHER RELEVANT BSPs & MPs

Please Visit **Common Systems Web Page** on <http://home.sbc.com/commonsystems/> Click TAB 6

## D. Definitions

1.06 The following terms are used in this section as indicated (not in alphabetical order):

- 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.”
- 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.
- 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.
- Requirements* - Practices that must be adhered to when managing network equipment environments. The words *shall* and *must* are used to convey requirements.
- 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.
- 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.
- 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.
- Space* - Room allocated for network functionality. Space may be equipment floor space, overhead space, cable installation/termination space, or people space.
- Allocation* - The assigning of space to wire center tenants in defined general terms.
- 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.
- 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.
- Collocation* - Collocation is a procedure for implementing the interconnection of CLEC networks with LEC networks. Generally, collocation takes place in the following ways: by placement of CLEC owned and maintained equipment in a CO, or by placement of CLEC-specified but LEC-owned and maintained equipment in a CO. The FCC and the PUC mandates the connectivity requirements for a CLEC. The space planning requirements for collocation is still evolving.
- Space Reservation* - Space reserved for ILEC, CLEC, Affiliate, etc.  
A space will be reserved for CLEC or Affiliates only after the application is received and money is deposited.

<i>Space Dedication</i>	A space will be dedicated (allocated) for CLEC and Affiliate based on forecasted information.
<i>Building Design Load -</i>	Heating and Cooling Loads for telephone Buildings, Floor Design Load, NEBS Standards, Earthquake Design Loads, Wind Design Loads, Local Vibratory Source Loads, etc.
<i>Equipment-Building Interface</i>	Cable Entrance Facility (CEF), CEF Conduit Entrance, Risers, and Holes Cable Openings, Floor and Ceiling Anchors, Equipment Support
<i>Building Elements -</i>	Structural Floors, Raised Floors, Column Designations, Column Spacing in Equipment Buildings, Ceiling Height for Equipment Buildings
<i>Floor Loading</i>	For new construction, 150 pounds per square foot, includes both live load and dead loads.
<i>Raised Floor</i>	Generally not required in a conventional wire center. However, "office of the future" utilizes raised floor concepts for new smaller buildings.
<i>Ceilings, Walls, Partitions</i>	Ceiling and partition material finishes should be of the type that does not dust or flake, and must be fire resistant.
<i>Electrical Protection -</i>	RFI Shielding, EMI, ESD, Grounding & Bonding
<i>NEBS -</i>	Network Equipment Building System – Generic Environmental Requirements for a CO Equipment, GR-63, Bellcore document. SBC has its own set of requirements contained in TP76200
<i>Environmental Control -</i>	Atmospheric Environment for Telecommunication Equipment Space - Equipment temperature and humidity control, CO Ventilation Requirements, Fire Alarm System, Noise Control
<i>Equipment Heat Release</i>	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. In general, heat release densities can be as high as 100 Watts per square foot of floor space.
<i>Operation at High Altitudes</i>	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.
<i>Room Lighting</i>	Should be designed to have illumination levels and direction depending upon the guidelines provided in the NEBS document.
<i>Acoustic Noise</i>	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.
<i>Airborne Contamination</i>	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.
<i>Vibration &amp; Shock</i>	Network equipment may be subjected to a low level vibration in service that is typically caused by nearby rotating equipment, outside

	<p>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</p>
<i>Seismic Requirements</i>	<p>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.</p>
<i>Air Filtration</i>	<p>All outside air must be filtered before introducing into the equipment area</p>
<i>Telephone and Building Power</i>	<p>DC Power Plants, Building Power, Standby Power, AC Power distribution</p>
<i>Fire Protection &amp; Detection</i>	<p>Smoke Detection Systems, Fire Extinguishers, Fire Alarm System</p>
<i>Alarm System</i>	<p>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.</p>
<i>IP -</i>	<p>Integrated Planning (Integrated = affects two or more disciplines (i.e. Switch, Loop, real Estate, Marketing, etc.). Formulation of detailed, implementable, 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.</p>
<i>IPPC -</i>	<p>Integrated Project Planning Committee</p>
<i>COE -</i>	<p>Central Office Equipment</p>
<i>Common System Space Planner -</i>	<p>The term Common System Space Planner should be used in reference to the function of <i>floor space planning</i> because it more accurately describe the current scope of the job function. The term "CSPEC" will no longer be used</p>
<i>Common Systems</i>	<p>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.</p>
<i>Obsolete Equipment -</i>	<p>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. Note: Equipment retired in place ( but may or may not be obsolete depending upon its future use)</p>
<i>Unused Equipment -</i>	<p>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</p>
<i>Technically Infeasible Space -</i>	<p>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.</p>
<i>Underutilized Equipment -</i>	<p>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).</p>

<i>Retired in Place -</i>	Equipment not being used at all is also referred to as <i>cut-dead</i> and Retired In Place (RIP) equipment
<i>Framework</i>	The structure composed of uprights, base assembly, and top member
<i>Frame</i>	The framework and the apparatus, equipment, and cable mount on it. (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
<i>Bay</i>	That portion of a frame between any two adjacent uprights of the frame framework
<i>Frame Dimension</i>	Height, Depth, Effective Frame Width. Also includes weight and circuit capacity.
<i>Effective Frame Width</i>	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
<i>Aisle Space</i>	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
<i>List 1, List 2 drain -</i>	See section 3.10 for definitions
<i>Cross-connect Systems -</i>	Cross-connect systems provide the flexibility required to evolve the network technologically and architecturally. Without cross-connects, network components are (by definition) hard wired. Evolution would then require wholesale disruption of service to existing customers as components are removed from service and replaced with newer equipment
<i>Physical connection -</i>	Cross-connect systems provide physical link between equipment and facilities
<i>Adjacent Structure -</i>	A collocator provided structure placed on the Utilities 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
<i>Facility -</i>	A general term for the communication transmission pathway and associated equipment, e.g., Office Repeater bay (ORB)
<i>DSX -</i>	A family of frames that provides for digital system facility/equipment cross-connections and access for test/maintenance
<i>Cross- Connections -</i>	Wired connection (pairs, triples, etc.) run between terminated apparatus on a DSX frame; commonly referred to as a “jumper”
<i>Tie Cable -</i>	A cable connected between DSX lineups or frameworks
<i>Equipment -</i>	Digital equipment terminated on a DSX. Examples are channel banks, multiplexers, and digital switch interfaces