RAISED FLOOR SYSTEMS

DESIGN CRITERIA

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1. GENERAL

1.01 This section describes and provides standards for raised floor systems. The standards apply to new raised floor installations, but may serve as a guide for updating existing raised floor areas.

1.02 This section is revised and reissued to exclude detailed information on MODUFLOR* which is included in Section 760-550-300, "Modular Cooling System." General information on raised floor systems, for all applications, is discussed in this section. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

*MODUFLOR is a patented Bell System design and is commercially available from outside suppliers.

1.03 Raised floors may be installed in either new or existing buildings. They may be installed on an entire building floor or a portion of a floor. If, in new construction, a depressed slab for raised floors can be economically designed and also allow for future growth, it should be considered as the need for ramps or steps can be eliminated.

1.04 Raised floors generally provide two main service functions. One is to provide concealed and easily accessible underfloor space for electrical cabling and liquid coolant piping. The other is to serve as an underfloor air plenum for a circulating air cooling system.

1.05 The higher initial cost of a raised floor system, as compared with conventional construction, must be carefully evaluated. Alternative solutions, such as undercarpet flat conductor power and communication wiring, power poles, or wall mounted raceways should be evaluated.

2. ELEMENTS OF A RAISED FLOOR SYSTEM

2.01 The primary elements of a raised floor system are removable floor panels, which provide free access to the underfloor space, and a structural system that supports the panels above the building floor.

FLOOR PANELS

2.02 Floor panel construction is normally one of three basic types:

(a) Wood core clad with sheet metal

(b) Die-cast aluminum

(c) Ribbed steel.

2.03 Finish surfaces of floor panels are normally covered with High-Pressure Laminate (HPL), Vinyl Asbestos Tile (VAT), or carpeting which serve as minimum-maintenance floor surfaces. The finish

covering is generally protected from upturning with panel edging trim.

2.04 Carpeting is ***not*** recommended for Central Office (CO) equipment areas, computer rooms, or administrative areas containing equipment that is electrically connected to the CO or computer equipment [such as the Maintenance Operations Center (MOC) area of No. 4 ESS office]. Carpeting may be used in administrative office areas or in computer terminal rooms where service characteristics of the carpeting will not have any detrimental effect on equipment operation.

2.05 The only types of carpeting that should be considered are those with low-static electricity properties and low-lint dispersion. Generally, carpet tiles should be used to permit easy access to the subfloor area. Factory installed carpeting on each floor panel permits easy access and eliminates need to remove numerous tiles to access a specific panel. Carpeting must also meet fire safety requirements as specified in Section 760-610-200, "Firesafety Considerations for Interior Finishes and Furnishing." The Bell System Carpet Guide describes various carpet types and outlines general carpet selection and maintenance considerations.

2.06 The standard commercial size of floor panels is 24 by 24 inches. Other sizes can be manufactured at an increased cost.

2.07 Where a raised floor system is used as an air plenum, the supply or return air is normally provided to or from the occupied areas by grilles or slots set into the panels.

SUPPORT SYSTEMS

2.08 Support systems are generally constructed of either aluminum or steel. There are three basic types. Each type utilizes panel support pedestals positioned at the panel corners. These pedestals are adjustable in height to permit leveling of the finished raised floor. Figure 1 shows each type.

(a) ***Freestanding pedestal:*** Panel corners rest directly on support pedestals. No stringers span between pedestals. This support system has strict height limitations due to minimal lateral stability. It offers nearly obstruction free subfloor access with the panels removed. This type of support system is generally not recommended due to:

- Reduced stability
- Tendency to disturb pedestal alignment.

(b) ***Drop-in grid:*** Stringers span between pedestals and are set into pedestal caps without being mechanically secured to the pedestals. This permits easy removal of stringers for increased access to the subfloor area. However, it also reduces the floors lateral stability.

(c) ***Rigid grid:*** Stringers span between pedestals and are mechanically secured to the support pedestals. This system offers maximum lateral stability and is required in seismic areas. See paragraph 3.02.

3. DESIGN REQUIREMENTS

3.01 Raised floor design loadings are generally specified for uniform and concentrated loadings. Typical uniform floor loadings for telephone buildings are listed in Section 760-200-020, "Design Loads for Telephone Buildings." Concentrated floor loadings should be verified at each location and should consider all transient floor loads.

3.02 In earthquake prone areas, raised floor systems must also be designed to resist overturning moments and shear loads from the equipment as well as the inertial loads induced by the floor response to earthquakes. Special consideration should be given to the stiffness of the raised floor. A rigid grid support system with panels nested between stringers and steel pedestals, which are mechanically anchored to the structural subfloor under equipment areas, is recommended in earthquake zones 3 and 4.

3.03 Additionally, in these zones, electronic data processing equipment should be secured directly to the building structure to prevent the equipment from undergoing excessive displacement or overturning. Drawings ED-97956, sheets 1, 2, and 3, and L-525235, sheets 1 and 2, outline one such bracing method utilizing a snubber rod anchorage (toggle bar) which attaches to the base of an equipment cabinet and then extends downward through an elongated hole in the raised floor panel to be anchored in the structural subfloor. Such equipment bracing may also be considered for critical equipment in regions of relatively low seismic threat.

3.04 Electrical grounding of the raised floor system must be provided. This is usually provided by connecting the raised floor support system to the

building ground. Grounding is discussed in Section 802-001-196, "Protective Grounding Systems—General Grounding Requirements for Data Processing Computer System Installations."

3.05 When the raised floor system serves as an air plenum, all wiring shall conform to the appropriate National Electric Code Article. In general, this requires electrical wiring in plenum floor areas to be enclosed in an approved metallic covering.

3.06 Raised floor support pedestals should generally be bonded directly to the unfinished subfloor for maximum stability. Existing subfloor finishes should be removed prior to the installation of the raised floor. If existing subfloor finishes are not removed, raised floor support pedestals should be mechanically fastened to the subfloor.

3.07 Where raised floors are to be installed on concrete surfaces, a sealer may be required to prevent dusting or to ensure proper bonding of the raised floor pedestals to the concrete floor.

3.08 When the subfloor area is subject to the hazard of water leakage, eg, when water or other liquid is piped in this area, the subfloor surface should be waterproofed to prevent leakage into lower building stories. Floor drains, drip pans, and a water detection alarm may also be considered. Cut outs in the structural subfloor (ie, cable holes) should be protected in the event of a water leak.

4. RAISED FLOORS IN TELEPHONE CENTRAL OFFICE EQUIPMENT AREAS

4.01 Central office transmission and switching equipment areas with a high heat dissipation density (greater then $20^{w}/ft^{2}$) should consider using a raised floor system as a cooling sytem air plenum.

4.02 Two cooling systems that require a raised floor are described in Section 760-230-101, "Equipment Room Air Distribution." One system uses the space beneath the raised floor as an air supply plenum. The other uses the underfloor space as an air return plenum in the Modular Cooling System (MCS). Using the underfloor space as an air return rather than an air supply plenum offers certain advantages:

(a) Permits better gravitational air circulation

(b) Provides a cleaner air supply

(c) Provides improved personnel comfort.

4.03 Floor panels and support work spacing must be coordinated with equipment layouts. The raised floor system should be designed to permit equipment lineup rearrangements without disturbing the raised floor support work.

4.04 Floor panels in the maintenance and wiring aisles should be completely removable.

4.05 Piping, cabling, and wiring in the underfloor space should be limited to service aisles. Such service aisles should be unobstructed by the underfloor support work.

4.06 When the underfloor space is used as an air plenum, locate air slots in floor panels close to the front of equipment frames to maximize the effectiveness of the cooling system.

4.07 At cable holes, a cable hole chase should be provided from the structural floor through the raised floor, permitting the passage of vertical cable runs while preserving the air plenum. Such a cable hole chase will also permit firestopping of the cable hole.

4.08 Raised floor systems were developed primarily for computer areas. The use of commercial raised floor systems for CO equipment areas has some drawbacks, which are primarily due to a lack of coordination between the design of commercial raised floor and the requirements for telephone equipment installation. They include:

(a) Difficulties in anchoring equipment frames to the floor

(b) Inadequate access to underfloor space because of access panels being trapped under equipment

(c) Inconsistent positioning of air passages relative to the equipment frames where underfloor space is used as an air plenum.

4.09 The MODUFLOR system was designed specifically for telephone equipment areas. It eliminates the above drawbacks. MODUFLOR is discussed in Section 760-550-300, "Modular Cooling System."

5. RAISED FLOORS FOR OPERATIONS SUPPORT SYSTEMS (OSS)

5.01 For additional information on raised floor systems in OSS areas, refer to Section 760-150-155, "Planning for Operations Support Systems."

6. RAISED FLOORS IN ELECTRONIC DATA PROCESSING (EDP) CENTERS

6.01 For additional information on raised floor systems in EDP centers, refer to Section 760-250-150, "Electronic Data Processing Centers Building Design Criteria."

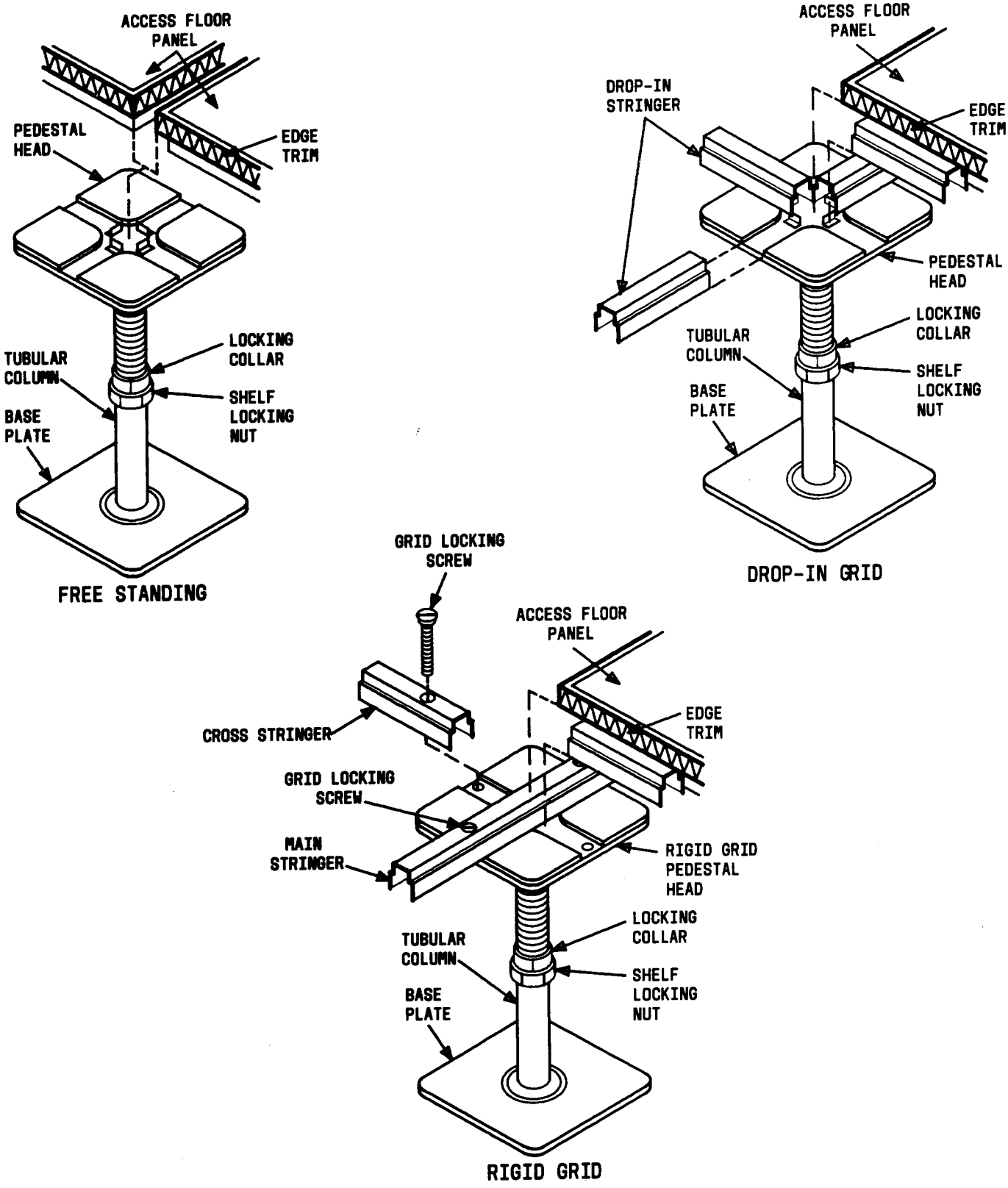

Fig. 1—Panel Support Systems