ATT-TP-76402

AT&T Raised Access Floor Engineering and Installation Requirements

This practice provides guidelines and requirements for engineering equipment framework on access floors.

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Business Unit: AT&T Services, Inc.

Points of Contact:

Author:

Edward Williamson (216.476.6321) ATTUID: ew7184
# Table of Contents

1. REASON FOR REISSUE ................................................................. 4
2. INTRODUCTION ................................................................. 5
3. GENERAL ................................................................. 6
   3.1 Description ................................................................. 6
4. PLANNING ................................................................. 6
   4.1 Floor Layout ................................................................. 6
   4.2 Room Ventilation and Power Equipment .............................................. 7
5. GENERAL ENGINEERING REQUIREMENTS ........................................... 8
   5.1 Local Code Requirements ................................................................. 8
   5.2 Room Preparation ................................................................. 8
6. FLOOR COMPONENTS ................................................................. 9
   6.1 Floor Panel ................................................................. 9
   6.2 Stringers ................................................................. 10
   6.3 Pedestals ................................................................. 10
   6.4 Floor Anchors ................................................................. 11
   6.5 Spares and Floor Accessories ................................................................. 11
7. ACCESS FLOOR INSTALLATION REQUIREMENTS ........................................... 11
   7.1 Personnel Floor ................................................................. 11
   7.2 Equipment Floor ................................................................. 12
8. GROUNDING REQUIREMENTS ................................................................. 14
   8.1 Grounding Floor System ................................................................. 14
9. SEISMIC ZONE REQUIREMENTS ................................................................. 15
   9.1 Access Floor Design ................................................................. 15
   9.2 Equipment Securing ................................................................. 16
10. SECURING EQUIPMENT FRAMEWORKS ON ACCESS FLOOR .................. 16
   10.1 Equipment on Personnel Floor ................................................................. 16
   10.2 Equipment on Equipment Floor ................................................................. 18
   10.3 Equipment on Legacy Telephony Equipment Floor .............................................. 19
11. OPENINGS IN PLENUM RAISED FLOORS ..................................................... 19
   11.1 Floor Seals & Sealing Grommets in Plenum Raised Floor Application 19
12. WORK ACTIVITIES ON COMPLETED FLOOR ..................................................... 20
12.1 Protection of Floor ........................................ 20
12.2 Maintenance Requirements ................................ 21

13. FIGURES and TABLES  ..................................... 22

Table A  Equipment Raised Access Floor Requirements .......... 22

Fig. 1  Planning Access Floor Layout ................................ 24
Fig. 2  Support of Components Off Floor ............................ 25
Fig. 3  Support of Components Off Floor ............................ 26
Fig. 4  Access Floor Components .................................... 27
Fig. 5  Square Tube Pedestal ........................................ 28
Fig. 6  Non-Captured Pedestal Head – Personnel Floor .......... 29
Fig. 7  Captured Pedestal Head – Equipment Floor .............. 30
Fig. 8  Anchor Pattern for 2 Anchor Applications ................ 31
Fig. 9  Access Floor Grounding Grid ................................ 32
Fig. 10 Ground Conductor Bonding Hardware ...................... 33
Fig. 11 Locating Grounding Conductor .............................. 34
Fig. 12 Grounding – Bonding to Pedestal ........................... 35
Fig. 13 Equipment Framework Secured to Personnel Floor ....... 36
Fig. 14 Floor Channel Anchoring Method ........................... 37
Fig. 15A Bridging Floor Obstructions ............................... 38
Fig. 15B Bridging Floor Obstructions ............................... 39
Fig. 16A Cross Aisle Bracing ....................................... 40
Fig. 16B Cross Aisle Bracing ....................................... 41
Fig. 17 Equipment Framework Secured to Equipment Access Floor ... 42
Fig. 18 Panel Underside Washer and Nut Assembly .............. 43
1. **REASON FOR REISSUE**

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2. INTRODUCTION

This practice defines and establishes requirements for installation of access floors in the AT&T facilities. An access floor is installed over a building floor to provide under floor space for room cooling air and/or space for routing building services. Equipment frameworks are installed on top of floor panels.

The following is a list of terms and their meanings as used in this document:

- **Building Floor**: The structural floor of the building usually of reinforced concrete slab tied back to building structural members such as columns, walls, beams.

- **Raised Access Floor**: An elevated floor system installed above the building floor providing an open space for building infrastructure.

- **Personnel Floor**: Non-captured head raised access floor system allowing the pedestal head to lift out of the structural tube.

- **Equipment Floor**: A raised access floor system with captured head pedestal design that ties the floor panels and pedestals together.

- **Dead Load**: The weight of permanent and fixed components of a structure. Term used in this document means the equipment frame attached directly to the raised floor system through-bolted to the floor panel resulting in a fixed weight.

- **Live Load**: The non-permanent and movable load on a structure. Term used in this document means any component or equipment framework on top of the raised floor system not directly secured to the floor panel and allowing framework weight to shift relative to the floor structure.

- **Equipment Framework**: Open or closed frames such as relay racks, cabinets or enclosures used for housing electronic shelves, usually designed for rack mounting of equipment to mounting rails or uprights by vertical stacking of shelves.
3. GENERAL

3.1 Description

3.1.1 Raised access floor system consists of 2’ by 2’ square steel floor panels, either hollow or filled, supported by an understructure of pedestals and stringers. The floor system is engineered and installed in modular sections using floor panels, pedestals and stringers. If the existing floor space was not originally designed for an elevated floor system, and there is an elevation difference between the raised access floor system and the existing building floor then transitional ramps and steps need to be installed as necessary.

3.1.2 The floor system shall be designed for local conditions including seismic and local code compliance and in consideration of the following Table A. The values listed within this document including Table A are the minimum design requirements for AT&T and shall be followed unless local codes require a more stringent or more robust floor design.

Notes:

a) The raised access floor system is secured by fasteners or welded. No gravity, friction or compression fittings shall be used.

b) All raised access floor grounding shall comply with ATT-TP-76403.

c) The successful bidder/manufacturer shall engage a professional engineer licensed within the jurisdiction of the project whom will sign and affix their professional seal on shop drawing submittals, certifying that their system meets and/or exceeds the seismic load requirements per applicable code in each jurisdiction.

4. PLANNING

4.1 Floor Layout

4.1.1 The layout of the floor system shall consider the location of the equipment lineups with focus on maximizing the number of lineups, avoiding building element obstructions, maintaining aisle clearances and providing proper airflow around equipment as shown in Fig. 1. The starting point of the first full floor panel in relation to a building reference will determine the floor pattern throughout the equipment space and should be examined thoroughly for the best space usage.

4.1.2 Coordination between Planners, Floor Installers and Equipment Engineers is required.

4.1.3 Floor layout shall include ramps or steps for transitioning from the building floor to the finished height of the raised access floor. Ramps shall be placed where equipment can be wheeled onto the floor from the nearest building entry or equipment staging area. Steps or another ramp are required for a minimum of two entrances into the area.

4.1.4 The areas immediately located in front of the raised floor ramps shall be clear of obstructions as dictated by the raised floor system design and local code requirements.

4.1.5 The top of the raised finished floor system shall be a minimum of 24” above the building floor.
4.1.6 The minimum floor to ceiling required clearance is determined by the overall equipment environmental design, e.g. access floor height, equipment frame height, cable management system (cable racking, fiber duct, etc.), building environmental design (air ducts, pipes, conduit, lighting, etc.) etc. - refer to ATT-TELCO-812-000-155 for more details.

4.1.7 Generally, AT&T office structures were constructed with floor load capabilities of 150 lbs/ft² for network equipment areas and 300 lbs/ft² for dc power equipment rooms that were defined prior to a building's initial construction. Refer to ATT-TELCO-812-000-155.

4.2. Room Ventilation and Power Equipment

4.2.1 The cooling system equipment shall be positioned to both effectively and efficiently distribute cooled air and exhausted air in support of equipment layout requirements. The final equipment floor plans and associated supporting cooling system(s) shall be developed by an integrated design team including input from Common System, COLD and CRE’s professional engineers. The design shall provide the best overall use of building resources including: floor space and building mechanical / cooling resources.

4.2.2 The room cooling equipment shall be supported by a steel stand independent of the access floor system. The steel stand must be capable of supporting the full weight of the cooling equipment with lateral stiffness equal or greater than the access floor system. The finished height of the stand shall match that of the raised access floor.

4.2.3 Pipes carrying fluids shall be routed away from locations where leaks can impact the operation of electronic equipment. Underfloor placement of pipes shall be limited to a few grouped runs in straight paths to avoid interfering with other under floor usage. Diagonal runs are not permitted. All pipes shall be supported off the building floor and secured at no more than 6’ spans as shown Fig. 2 and Fig. 3.

4.2.4 Hot and cold aisle configuration for equipment lineups is required for thermal management. The front aisle shall be designated as a cold aisle where cool conditioned air shall be introduced for equipment intakes. The rear aisle shall be the hot aisle where exhausted warm air from the equipment shall be discharged.

4.2.5 Equipment lineups shall be configured with front-face to front-face cabinets in cold aisles and rear-face to rear-face cabinets in hot aisle in paired alternating aisles.

4.2.6 Minimum aisle widths shall be 4’ for front cold aisle between opposing face of cabinets and minimum 3’ for rear hot aisles. At minimum, one full floor panel shall be available along any aisle length to allow access to underfloor area.

4.2.7 Power distribution and power storage equipment may be located on the floor system to power electronic equipment in the room. This power equipment may be large and heavy requiring an independent stand for support. The steel stand must be capable of supporting the full weight of the equipment with lateral stiffness equal or greater than the access floor system. The stand shall have provisions for access floor panels supported up to the stand edge. The finished height of the stand shall match that of the raised access floor.
4.2.8 Larger footprint power equipment shall be located against the room walls to provide the maximum open space for equipment lineups. Power storage equipment such as flooded cell batteries may require ventilation and spill control and shall be placed away from main equipment areas.

4.2.9 Smaller power distribution equipment such as fuse or breaker cabinets may be placed away from walls in equipment lineups as required. These cabinets may be supported by the access floor and secured in a similar manner as the frame equipment.

4.2.10 Conduit runs, power cables, wiring and outlet boxes shall be provided and routed to the immediate underfloor area where required in direct, straight and grouped runs to avoid interfering with other use of the floor space. Crossing paths of cable runs shall be avoided.

4.2.11 For cable running under a raised floor refer to ATT-TP-76400, Section 8.1.6 - Cable Under Raised Access Floor.

5. GENERAL ENGINEERING REQUIREMENTS

5.1 Local Code Requirements

5.1.1 Installation of access floors requires building permits and approvals by local authorities having jurisdiction. General contractors and/or consulting engineers retained for the project shall assure that the proper submittals have been filed and approvals have been received prior to construction.

5.1.2 The floor system shall be designed to meet or exceed local conditions including seismic and local code compliance.

5.1.3 All electrical work shall be designed and installed in strict conformance to National Electrical Code requirements.

5.1.4 Code compliant fire suppression systems shall be installed as required by local codes. See other company references on fire suppression policy.

5.1.5 The under floor space used as an air plenum shall require all cables and wiring to be rated per National Electric Code requirements.

5.1.6 Provide the necessary ramps, steps with associated railings per all ADA requirements.

5.2 Room Preparation

5.2.1 The building floor must be smooth, level and free of floor protrusions. Floor coverings, such as tiles, linoleum sheeting shall be removed completely when torn, broken or unfit for use. Caution must be taken when removing asbestos floor coverings and adhesives. Use AT&T EHS approved procedures for removal of all suspect materials.

5.2.2 Where abandoned anchors obstruct floor system pedestals or anchors, they shall be removed or leveled flush with floor surface. Anchor removal must be accomplished with
methods that will not harm concrete integrity; methods such as core drilling may be used. Direct extraction of anchors is permitted only if anchors are embedded less than 2" and are low strength anchors, i.e. lead alloy expansion, sleeve or wedge type anchors. Following anchor removal, holes shall be filled with epoxy mortar filler and finished flush to floor surface. For anchors 1/2" diameter or smaller the anchor may be ground flush and left in place if doing so does not interfere with new anchor installation.

5.2.3 Concrete floors with cracks greater than 1/32" wide shall be filled and leveled with an approved epoxy mortar or crack injection product, such as Hilti RM700EP, Epoxy Repair Mortar.

5.2.4 Concrete surface shall be sealed with urethane, epoxy or acrylic based product to protect against surface dusting, collection of dust on concrete, reduce moisture seepage and limit water penetration. Sealant may be sprayed or roller applied. Sealant shall be clear or light in color.

5.2.5 Identify and relocate electrical power outlets, telephone jacks, electrical switches, pipe valves, etc. to an area above the access floor system. Service devices are not to be hidden under the floor system.

5.2.6 Windows, doors or other openings shall be modified to accommodate the installation of the new floor height/system.

5.2.7 Prior to the floor system installation, all permanent partitioning walls shall be installed and fastened to building floor and ceiling. Partitioning walls shall not be installed on the elevated floor system nor secured to the floor system.

6. FLOOR COMPONENTS

6.1 Floor Panel

6.1.1 Access floor panels are the most visible component of the floor system. The floor panel surface is where equipment frameworks are placed. The floor panels are designed to be removable by lifting them upward and out of the stringer grid revealing the space under the floor.

6.1.2 Floor panels used in equipment space shall have anti-static properties in accordance with IEC 61000-4-2 and rated at minimum 1,250 pounds compression strength. The panels shall be 24" by 24", of steel construction, and covered with a white and gray swirl pattern plastic laminate – refer to Fig. 4.

6.1.3 Perforated airflow floor panels are provided in front (cold) aisles. The airflow panels shall have anti-static properties in accordance with IEC 61000-4-2 and rated at minimum 1,250 pounds compression strength. The panels shall be 24" by 24" and made of steel construction. If laminate covered it shall be the same plastic laminate used on the solid floor panels.

6.1.4 The floor panels shall have countersunk drilled holes at each corner for fastening the panel to the pedestal head with a threaded screw. The fastener head shall be below floor surface when tightened.
6.1.5 Laminate is specified to be NEMA LD3, high wear type of HW120 (minimum 0.120” thick) HPL (High Pressure Laminate).

6.2 Stringers

6.2.1 Stringers shall be rectangular shaped steel construction designed to be secured to each pedestal head with a 1/4” threaded screw. The screw head shall be recessed into the stringer. The stringers shall be provided in 4’ lengths for the majority of the floor area. Shorter stringer lengths are acceptable along the perimeter of the floor area, against building structural components and against equipment platform stands.

6.2.2 Stringers are used to interconnect pedestals in a 2’ by 2’ grid for greater stability and to provide support for floor panels.

6.2.3 The stringers are integral to the grounding of the floor system as they provide a metallic path from one pedestal to the next. The stringers shall always be secured to the pedestal heads.

6.2.4 Placement of stringers where front aisles of equipment lineups are 4’ or greater shall have a minimum of one full length removable stringer for unobstructed access to equipment.

6.3 Pedestals

6.3.1 Floor pedestals are the most critical component of the floor system. The design of the floor pedestals determine the overall performance of the floor and how the floor system can be utilized in equipment placement. Refer to Table A located within this document.

6.3.2 Square tubes spot welded to a stamped steel base shall not be used in any floor system intended for equipment frame installations. See Fig. 5 for example of square tube pedestal. The square tube pedestal is not designed for carrying equipment loads. Round tube pedestals of minimum 1” diameter welded to a steel base shall be used in equipment environments.

6.3.3 Pedestals used within personnel type floor systems, as defined in this document, do not have captured pedestal heads and have pedestal tubes of lighter gauge materials (refer to Fig. 6). The pedestal head inserts into the tube without a means to prevent the head from lifting out. A nut is provided in the threaded portion of the head for height adjustment only.

6.3.4 Equipment floor systems, as defined in this document, are floor systems with pedestals that have captured pedestal heads and larger diameter heavy walled steel or aluminum tube as shown in Fig. 7. The equipment pedestal head is prevented from upward lift by threaded connection or a locking pin. The head is adjustable for vertical height and a nut to lock the head to that height.

6.3.5 Floor pedestals are installed in a 2’ by 2’ grid pattern. The base shall be secured to the building floor with mechanical anchors. Adhesive bonding is not acceptable for equipment or personnel floor systems. It shall not be used because of the limited strength of adhesive and the reduction of performance with aging.
6.3.6 Floor height is determined by the length of the pedestal tubes. The overall floor height is measured from the surface of the building floor to the top surface of the access floor panel. The standard floor height will be a minimum of 24". Other floor heights may be found, however, the 24" provides best underfloor clearance for airflow and usable space for conduit, pipes and other services.

6.4 Floor Anchors

6.4.1 Floor anchors securing the pedestals to the building floor are an important component of the floor system as they determine the ability of the floor pedestals to tolerate lateral loads. In most situations the floor system loads will be primarily vertical loads from the weight of the equipment frames, foot traffic or rolling loads. Lateral loads on the floor may result from overturning forces of equipment frames, building wall pressure on the floor or ground motions.

6.4.2 Floor anchors shall be as Hilti Kwik Bolt TZ anchors or equivalent embedded into the concrete building floor.

6.5 Spares and Floor Accessories

6.5.1 Additional floor tiles with high pressure laminate of the same color and pattern of installed tiles shall be provided as spares. The quantity to be provided is a minimum of ten (10) per every 3000 ft$^2$.

6.5.2 Additional access floor pedestals and adjustment heads for aisle spaces shall also be provided. The quantity to be provided is four (4) for every 3000 ft$^2$.

6.5.3 Floor tile pullers shall be provided for every site. A minimum of two (2) suction cup pullers shall be provided for every 3000 ft$^2$. The floor tile pullers shall be housed in a wall-mounted holder near each main entrance or door to the room. Perforated tile pullers shall be provided at the same ratio as stated for blank tiles.

7. ACCESS FLOOR INSTALLATION REQUIREMENTS

7.1 Personnel Floor

7.1.1 Personnel floors shall not be used in support of equipment dead loading. Dead loads on the floor system is defined as any equipment frame directly secured to the floor system. Equipment frames placed on the access floor surface and attached to the building floor will be considered a live load. Live loads do not usually transfer enough lateral load to the access floor to affect the floor systems performance, but shall be considered in the system design.

7.1.2 Personnel floor pedestals are typically thin walled steel or aluminum tubing welded to a square base. Tubing shall be welded to the base with a full bead weld around the circumference of the tubing.

7.1.3 Pedestals are to be secured to the building floor using embedded concrete anchors (reference Table A) in accordance with manufactures guidelines. Two anchors per pedestal shall be installed at opposite diagonal corners. Any exposed thread anchor rod length shall not
protrude more than 3/8” above the nut. Any anchors with exposed threads exceeding 3/8” or anchors with sharp edges shall be covered with plastic caps.

7.1.4 Pedestal heads of personnel floors are typically drop-in design with a height adjustable nut at the base of the head. The threaded rod of the pedestal head shall have a minimum length of 4” inside the pedestal tube at final adjusted height.

7.1.5 Pedestal shall be installed vertically within 0.5 degrees. Shim base as necessary with minimum 1” wide and 1” long shim of high-compression material such as metals or high density composites. Shim stack should not exceed 0.5” height. Any greater height shimming shall be one piece or bonded together shims and located under anchor centerline.

7.1.6 Stringers shall be installed in 4’ lengths whenever possible and secured at every pedestal head with a fastener. Stringers shall be formed steel or aluminum and have electrical continuity to pedestal tubes. Placement of stringers where front aisles of equipment lineups are 4’ or greater shall have unobstructed full-length removable or swing aside stringers.

7.1.7 Floor panels shall nest into stringers and firmly fit between adjacent panels with minimum need to force panels flush with stringers. All panel joints must be flat and level between panels with no more than 1/32” height difference.

7.1.8 Floor panels designed to be corner locked shall be secured to pedestal heads with screw fastener and tightened so there can be no lift of panel. Screw fastener shall be installed with head below panel finished surface and in accordance with manufacture guidelines.

7.1.9 Cuts made to floor panels shall be done outside of the building or away from main equipment area. All dust and metal filings shall be removed from panel prior to installation. Panels with greater cut surfaces than the remaining panel surface shall require additional understructure support where there will be foot traffic or equipment load placed on the panel.

7.1.10 Under floor coolant pipes, condensate drain pipes, electrical wiring passing through floor space shall not be directly attached to pedestals. Services for the immediate floor panel above may have items such as junction boxes, power outlets, attached to the pedestal serving that floor panel.

7.1.11 All conduits, power cables, wiring and outlet boxes shall be supported off the building floor. If clamps are placed on pedestals, they shall be designed to avoid deforming the pedestal and shall not require drilling or modifying pedestal tube for their attachment.

7.1.12 The completed floor surface shall be level within 1/8” over 24’ and panel joints flat within 1/32”. The underfloor area shall be clean of all debris, dust or loose hardware. The laminate floor surface shall be free of all markings, scratches, scuffs, and cuts. Cut edges shall be trimmed with protective materials so sharp edges are not exposed.

7.2 Equipment Floor

7.2.1 Equipment floor designs are more suitable for carrying the dead load of equipment frames and can have equipment framework attached direct to floor panels. HVAC equipment,
larger AC power equipment and battery stands shall have their own pedestal stand independent of the access floor system. The weight of heavier HVAC and power equipment will not be supported by the access floor pedestals.

7.2.2 HVAC and power equipment stands shall be secured to the building floor with the same floor anchor type as used for floor pedestals to meet all seismic and local code requirements. Battery stands for UPS or backup power systems shall be anchored to the building floor in all areas. At minimum the anchors shall be Hilti Kwik Bolt TZ 3/8” diameter embedded to 2” depth. HVAC and Power Equipment manufacturers’ securing requirements shall be followed unless those requirements are less stringent than those stated within this document.

7.2.3 Pedestals of equipment floors shall have heavy walled pipe of larger diameter and heavier base design for stability. The pedestal tube will be welded to the base with a full bead weld around the tube.

7.2.4 Pedestals are to be secured to the building floor using embedded concrete anchors (reference Table A) in accordance with manufactures guidelines. Any exposed thread anchor rod length shall not protrude more than 3/8” above the nut. Any anchors with exposed threads exceeding 3/8” or anchors with sharp edges shall be covered with plastic caps.

Quantity of anchors for securing pedestals is shown in Fig. 8 and Table A:

- **Seismic Zones 0, 1, 2**: Two (2) anchors in diagonal pattern
- **Seismic Zones 3, 4**: Four (4) anchors

7.2.5 Pedestal heads of equipment floors are captured by the tube so they will not withdraw unless they are unthreaded from the pedestal. The pedestal head is provided for height adjustment by threading in or out of the tube and a nut locks the head in place. The threaded rod of the pedestal head at final height adjustment shall have a minimum of 4” remaining in the pedestal tube.

7.2.6 Pedestal shall be installed vertically within 0.5 degrees. Shim base as necessary with minimum 1” wide and 1” long shim of high-compression material such as metals or high density composites. Shim stack should not exceed 0.5” height. Any greater height shimming shall be one piece or bonded together shims and located under anchor centerline.

7.2.7 Stringers shall be installed in 4” lengths whenever possible and secured at every pedestal head with a fastener. Stringers shall be formed steel or aluminum and have electrical continuity to pedestal tubes. Placement of stringers where front aisles of equipment lineups are 4’ or greater shall have unobstructed full-length removable or swing aside stringers

7.2.8 Floor panels shall nest into stringers and firmly fit between adjacent panels with minimum need to force panels flush with stringers. All panel joints must be flat and level between panels with no more than 1/32” height difference.
7.2.9 Floor panels shall be corner locked to pedestal heads with screw fastener and tightened so there can be no lift of panel. Screw fastener shall be installed with head below panel finished surface and in accordance with manufacture guidelines.

   a) Legacy Equipment floor systems may have gravity fit floor panels “non-captive corners”. These floor systems shall use legacy clamping style securing for equipment frames in low seismic areas as described in Section 10.3 of this document. These floor systems when used in high seismic areas shall use equipment securing methods listed in Section 10.1 of this document.

7.2.10 Cuts made to floor panels shall be done outside of the building or away from main equipment areas. All dust and metal filings shall be removed from panel prior to installation. Panels with greater cut surfaces than the remaining panel surface shall require additional understructure support where there will be foot traffic or equipment load placed on the panel.

7.2.11 Under floor coolant pipes, condensate drain pipes, electrical wiring passing through floor space shall not be directly attached to pedestals. Services for the immediate floor panel above may have items such as junction boxes, power outlets, attached to the pedestal serving that floor panel.

7.2.12 All conduits, power cables, wiring and outlet boxes shall be supported off the building floor. If clamps are placed on pedestals, they shall be designed to avoid deforming the pedestal and shall not require drilling or modifying pedestal tube for their attachment.

7.2.13 The completed floor surface shall be level within 1/8” over 24’ and panel joints flat within 1/32”. The underfloor area shall be clean of all debris, dust or loose hardware. The laminate floor surface shall be free of all markings, scratches, scuffs, and cuts. Cut edges shall be trimmed with protective materials so sharp edges are not exposed.

7.2.14 Equipment floor pedestals may not fit around perimeter of the floor where the building wall may interfere with its placement. Lighter duty pedestals may be used at the perimeter or at the building columns where no equipment frames are placed directly above these pedestals.

8. GROUNDING REQUIREMENTS

8.1 Grounding Floor System

8.1.1 Grounding requirements for the floor system shall be in accordance to AT&T grounding guidelines. Those requirements may be found documented in other references as well as in the following paragraphs. As a minimum, the installer shall follow the grounding methods described.

8.1.2 All components of a raised floor system are considered part of the common bonding network. When required by equipment vendor specifications, insulation as described in ATT-TP-76416, Section 4.7.6, shall be installed between the surface of the raised floor panel and underside of equipment enclosures.

8.1.3 When equipment is installed in an isolated bonding network, equipment framework securing hardware that penetrates the raised floor panel shall be furnished with nylon bushings.
or other adequate insulating hardware so that there is no electrical continuity between securing hardware and equipment enclosure.

8.1.4 The preferred design for a raised floor support system uses metal stringers between adjacent pedestals. The raised floor support system shall be equipped with a ground system as detailed in the appropriate Grounding document for the site application. Reference documentation: ATT-TP-76416, Section 3.11 - applies to all new Network and Legacy SBC locations; ATT-TP-76416, Section 3.12 - applies to Legacy AT&T Network locations; ATT-TP-76403, Section 4.1 - applies to Internet Services and Data Center locations.

8.1.5 The preferred design for a raised floor system uses metal stringers between adjacent support pedestals. If metal stringers are not used, the following shall be installed in addition to the ground system described in Section 8.1.4 of this document:

   a) Intermediate bonds between the grid system main conductors and support pedestals at 4’ intervals

   b) A minimum #10 AWG branch conductors connected, at intervals not exceeding 4’, between parallel #4 AWG main conductors forming the sides of a 40’ grid square - the branch conductors shall be bonded to every other pedestal so that every floor panel is in contact with at least one bonded pedestal.

8.1.6 There are no restrictions on contact between the grid assembly and conduits, ducts, pipes and other conductive materials installed under the floor, or extended through the floor that are part of the common bonding network.

8.1.7 Bonding conductors shall not be run over building service components or floor system components as shown in Fig. 11. The conductors shall rest on building floor.

9. SEISMIC ZONE REQUIREMENTS

9.1 Access Floor Design

9.1.1 An access floor system design must meet or exceed all seismic and code requirements.

9.1.2 Floor systems shall be designed to handle an equipment dead load of up to 1,200 pounds per frame, and a 7’ frame height with the center of gravity at mid-height. Several frames of equipment at these weights will be configured in lineups across the floor system.

9.1.3 AT&T has two established telephony Seismic Risk scenarios across all serving areas. Low Seismic Risk locations are Zones 0, 1 and 2 (Seismic Design Criteria of A, B & C), and High Seismic Risk locations Zones 3 and 4 (Seismic Design Criteria of D & E). Raised floor systems shall be designed to meet Seismic Zone 2 (Seismic Design Criteria of C) criteria in seismic Zone 0-2 locations and Zone 4 (Seismic Design Criteria of E) criteria in Zone 3-4 locations using appropriate AT&T design requirements (reference Table A) and all applicable federal, state, county and local laws, ordinances, regulations and codes.
9.2  Equipment Securing

9.2.1  The proper method of securing equipment framework on access floors requires the framework to be secured from any overturning and horizontal walking across the floor.

9.2.2  The level of securing required will be dependent on risks of the particular site. The risks result from natural environmental conditions, building conditions, foot traffic through the area and amount of construction at the site. Unbalanced loads of the equipment framework pose the greatest overturning risks for equipment.

9.2.3  Equipment frames are required to be secured in some manner to the building floor in both low and high seismic risk locations.

9.2.4  When personnel floor systems are used, the equipment frames shall be secured to the building floor by threaded rods.

10.  SECURING EQUIPMENT FRAMEWORKS ON ACCESS FLOOR

10.1  Equipment on Personnel Floor

10.1.1  Equipment frameworks installed on personnel access floors with non-captured heads require equipment to be secured to the building floor. The equipment framework shall never be secured direct to the personnel access floor or by securing to a channel straddled under the floor stringers.

10.1.2  Equipment framework shall be side-junctioned to all adjacent equipment to avoid pounding and to maintain alignment of the frame lineup. A minimum of top and mid-height attachments shall be provided to the adjacent equipment. For equipment frames with deep sides such as cabinets, junctioning hardware is required at top corner points. Hardware shall be a minimum Grade 5 material with a minimum 1/2" diameter if through bolting. Junctioning details using flat plates between frames may require smaller hardware of greater quantity.

10.1.3  Where equipment frames are not side-junctioned, a minimum space of 5” shall be provided between frames. Framework placed near building walls, columns or other structural members shall have a 5” space from any building member.

10.1.4  The equipment frames shall be secured to floor anchors or a floor mounted channel by way of a threaded rod through a hole cut in the floor panel down to the building floor as shown on Fig. 13. Each frame shall be secured at each corner to the building floor. A single unspliced length of threaded rod shall be used for each anchor.

10.1.5  Holes in the floor panels shall avoid being located within 2” of the floor panel edges to avoid weakening the floor panel and interference from the stringers. Use alternate hole locations in the equipment frame or in the worst case, do not install anchors blocked by a panel or a stringer. Equipment frame with deleted anchor(s) must be junctioned to adjacent frame that is properly secured.
10.1.6 Framework shall be secured to embedded concrete anchors equal to Hilti HDI+ (drop-in) style of anchors of 1/2” diameter. The anchors shall be embedded to 2” depth. The anchor shall be set with a hammer set tool. All anchors shall be installed flush or below the concrete surface.

10.1.7 Threaded rod shall be inserted into floor anchor with at least 5 full turns (0.375”). An outer nut is not required at the anchor to secure the rod.

10.1.8 For long lineups of similar dimensioned equipment frames, an anchoring channel secured to the building floor may replace individual anchors. Two (2) channels installed under the floor system parallel to the lineup can serve as anchoring points as shown in Fig. 14. The U-shape channel shall be equal to Unistrut P-1000T. The channel shall be secured to the building floor with a U-Bracket and embedded anchors at approximately 36” centers. Anchors shall be equal to Hilti HDI+ 1/2” diameter.

10.1.9 Position 1/2” channel nuts in the U-shaped channel for equipment frame securing rod.

10.1.10 Elevated channels secured to building floor can provide anchor positions for equipment frames blocked by under floor components such as pipes, conduit or cables by bridging channel over components as shown in Fig. 15A & 15B. The length of the channel shall be secured to the building floor at a minimum of two (2) points.

10.1.11 Equipment frame shall be secured to the building floor with 1/2” diameter hardened threaded rods and nuts of a minimum Grade 5 standard. A large diameter heavy washer shall be placed between the securing hardware and the base of the equipment frame to prevent a pull through from the base hole. For equipment requiring electrical isolation, a dielectric shoulder washer shall be placed under the large diameter steel washer.

10.1.12 The anchor nut shall be tightened to approximately 10 ft. lbs. Do not over tighten, or the equipment frame and the floor panel could be deformed.

10.1.13 Equipment frames not secured to the building floor requires supplemental support overhead to prevent overturning risks as shown in Fig. 16A and 16B. The supplemental support is required in addition to bolting the base of the cabinets to the floor panel. Equipment frames fastened to a personnel floor system are not considered secured to the building floor.

10.1.14 Equipment frames shall never be braced to the ceiling, suspended overhead cable rack, or auxiliary framing.

10.1.15 Supplemental overhead support shall be with a rigid cross aisle member between every two (2) opposing lineups at 5’ to 6’ distances. For an odd number of lineups, the supplemental support may need to be extended over to a third lineup of equipment frames. The connector shall be equal to a U-Shape channel such as Unistrut P-3300. The cross aisle member shall fasten to the top of the cabinet at two (2) places with minimum 1/2” Grade 5 hardware. All frameworks in the lineup shall be side junctioned to form a rigid assembly.

10.1.16 Cable racks supported on top of cabinets per ATT-TP-76409 shall have U-Shape channels positioned perpendicularly under the cable rack. The cable rack supporting channel, if
extended across the aisle to the adjacent lineup can be used as supplemental support for cabinets in place of a separate run of channel.

10.2 Equipment on Equipment Floor

10.2.1 Equipment frameworks can be secured directly to the floor panel by through-bolts on equipment floor systems. Securing of equipment frameworks down to the building floor will not be necessary. It is imperative that the floor system is designed to accept the dead load weight of the equipment secured to the floor system.

10.2.2 The hardware required for securing equipment frameworks to the access floor panel shall be a 1/2" - 13 hex head Grade 5 cap screw, 2" x 2" x 1/4" square washer, 1/2" flat round washer (min. 1-1/4" O.D., 0.112" thick), 1/2" - 13 heavy hex nut as shown in Fig. 17. The cap screw length required is calculated from the height of the top surface of the cabinet base to the floor panel plus an additional 2" length to accommodate the thickness of the floor panel and washers. For example: if the distance of the cabinet base to floor panel is 3-1/4", the length of the cap screw will be 5-1/4" long (3-1/4" + 2" = 5-1/4").

10.2.3 The 2" x 2" square washer is necessary to straddle the inverted cones of the underside of the floor panel as shown in Fig. 18. Drilled holes not centered in a cone are acceptable and the square washer will end up not being flat on bottom of the panel.

10.2.4 Tighten through-bolt nut to 10-15 ft.lbs. Do not over-tighten or floor panel may be crushed by through-bolt. For equipment frame base not sitting directly on the floor panel surface over-tightening may also deform the equipment frame base. Stacking washers under the base to eliminate space between the base and floor surface would prevent base deformation.

10.2.5 When a drilled hole is required within 1-3/4" from edge of floor panels, the underside ridge may prevent washer from seating flat. Any holes positioned within 1/2" from edge of a floor panel may also be interfered by the floor stringer. Anchoring holes very close to panel edges may require an alternate hole location or in the worst case leaving those anchors out. Deletion of some anchors shall only be permitted where cabinets are junctioned to adjacent cabinets that are properly supported.

10.2.6 A hole in the floor panel for a through-bolt shall be 5/8” diameter. Through-bolt shall not come into contact with the floor panel.

10.2.7 Equipment frameworks requiring electrical isolation shall have a non-conductive shoulder washer placed under the head of the cap screw through-bolt. The isolation washer shall provide insulation between the cap screw and the equipment base. Isolation pad or shims under the cabinet shall be provided to insulate cabinet base from the floor panel.

10.2.8 Equipment framework shall be junctioned to all adjacent equipment to avoid pounding and to maintain alignment of the equipment lineup. A minimum of top and mid-height junction attachments shall be provided for two and four post type framework to the adjacent equipment. For equipment frames with deep sides such as cabinets, junctioning hardware required at the top corners of the front and back of the framework to the adjacent equipment.
10.2.9 Where equipment frames are not side-junctioned, a minimum space of 5” shall be provided between frames. Framework placed near building walls, columns or other structural members shall have a 5” space from any building member.

10.3 Equipment on Legacy Telephony Equipment Floor

10.3.1 Legacy Telephone Equipment Floors have captured head pedestals, secured stringers and non-secured floor panels. Equipment frameworks cannot be secured directly to the floor panel on legacy telephony equipment floor systems without secured floor panels. Securing of equipment frameworks will be dependent on the Seismic Zone for the area.

10.3.2 In low Seismic Zone areas fasten cabinets or bay frameworks to an access floor system with two (2) 1-5/8” x 1-5/8” u-channel sections under the stringers. The sections shall be placed perpendicular to the equipment aisle with the continuous slot down. “C” clips shall be used to cover the bottom slotted ends of the U-channel where the threaded rod goes through, to prevent it from spreading when compressed. Use hold down plates engineered for the frame, two (2) 1/2” threaded rods per U-channel equipped with a nut, washer, insulating bushing and hold down washer on the base of the frame (top of assembly). Use “C” clip, washer, lock washer and nut on the bottom of each threaded rod assembly (bottom of the U-channel). The U-channel shall not extend more than 4” past the edge of the stringers. End caps shall be used on the U-channel to prevent injury. Torque the nut to 30ft.lbs. Over tightening of the assembly will deform the floor panel and result in unevenness.

10.3.3 In high Seismic Zone areas fasten cabinets or bay frameworks to an access floor system following the procedures specified in Section 10.1 of this document.

11. OPENINGS IN RASIED FLOORS

11.1 Floor Seals, Sealing Grommets and Edging in Raised Floor Application

11.1.1 The purpose of floor seals, sealing grommets and edging is:

   a) To allow for cable pass-through of the raised floor tile while maintaining proper air pressure of the cooling system under the floor. Floor seals or sealing grommets shall be used to cover floor tile cutouts in plenum raised floor applications.

   b) Prevent dust and foreign material from passing through raise floor tile cutouts when exposed to personnel and aisle traffic. Floor seals or sealing grommets shall be used to cover floor tile cutouts in these raised floor applications.

   c) Protect cables passing through tile cutouts from being damage from tile panel sharp edges. Floor seals, sealing grommets or edging shall be used for this application.

   d) Heavy-duty plastic floor sealing grommets shall be used to cover floor tile cutouts located in high traffic areas.

11.1.2 Floor seals, sealing grommets or cable guard channel shall comply with Fire Resistance requirements as detailed in ATT-TP-76200, Section 10.3, and NFPA 75 Section 5-4.4.
11.1.3 Floor seals, sealing grommets or cable guard channel shall not protrude more than 1/8” above the raised floor surface and are to be installed as per manufacture guidelines.

11.1.4 Floor tiles with cement or wood cores should have their exposed cut edges sealed in order to prevent core material from being blown into the equipment room.

11.1.5 Areas with equipment removed from plenum raised floors shall have the tiles with cutouts replaced with uncut tiles to maintain the pressure and integrity of the cooling system. Tiles with only equipment mounting holes of 1” or less in diameter may be reused in their original location with the drilled holes capped, covered or sealed.

11.1.6 Attention must be given to penetration(s) in the air supply space below the raised access floor due to conduit, piping, cable, etc. These shall be sealed as well as the edge of the raised floor to the walls or columns to ensure minimal air leakage from the raised access floor plenum area.

12. WORK ACTIVITIES ON COMPLETED FLOOR

12.1 Protection of the Floor

12.1.1 Movement of heavy equipment on top of an access floor requires protection of the floor with a minimum of 1/2” thick plywood sheeting along the full length of the path. Rolling loads of wheeled dollies, hand trucks, carts, or high-lifts shall always have the wheels on top of the plywood sheets.

a) Airflow panels are more vulnerable to top load damage and require more precautions when moving equipment over them. Installation of these airflow panels should be delayed until completion of all movement of equipment into area.

12.1.2 For normal non-installation service movement of personnel carts, the floor will not require plywood sheet protection. However, any signs that floor panel surfaces may be deforming under the cart load requires discontinuing use of the cart until the floor has been protected with plywood.

12.1.3 Dragging, sliding or rocking of equipment, boxes, pallets or any other products across a floor surface without first protecting floor from scratches and catching of joints is prohibited. Hardboard sheets shall be placed over the floor where products will be moved.

12.1.4 Lifting of floor panels shall always be with suction cup pullers. No other tool or implement shall be used to lift floor panels.

12.1.5 Lifting of perforated air flow floor panels shall be with hook puller. No other tool or implement shall be used to lift floor panels.

12.1.6 It is highly recommended that floor panels be removed for under floor access in a pattern of every other panel to maintain alignment of the floor system. Mark one corner of a panel
matching it to the corner of the adjacent panel. This will assure proper alignment when returning the panels to their original position.

12.1.7 It is recommended that stringers are not removed when accessing under floor space. Removal of stringers will result in misalignment of floor system and difficulty in reinstalling floor components.

12.1.8 Floor panels shall never be dropped, stomped or otherwise forced back into place when reinstalling floor panels. Floor panels that do not go back into place easily may be because of misalignment of adjacent panels.

12.1.9 Corner locked floor panels shall be re-secured at all four (4) corners to the pedestal heads when reinstalling floor panels.

12.1.10 Cuts made to floor panels shall be completed with the floor panel removed and taken outside of the equipment area. The size of a cut shall never exceed 50 percent of the total panel surface. All cut edges shall be covered with cable guard channel or a floor grommet to eliminate sharp edges.

12.1.11 Floor tile cuts for equipment cabinets should be placed under the cabinet framework or other location where the floor tile cut will not create a hazard.

12.1.12 Floor tile cuts for two-post racks should be placed either: under the vertical cable management panels located between adjacent frames, or under the rack (at the opening between the bottom angles).

12.1.13 No equipment structure or hardware shall be placed or secured at the same location prior to the installation of a plenum raised floor opening and its associated hardware.

12.2 Maintenance Requirements

12.2.1 Following installation of an access floor there may be activities requiring floor panels to be removed for access to the under floor areas. After several cycles of removal and reinstallation of panels and stringers the floor panels may no longer be level, aligned or appear new. Adjustments and realignment of floor systems may be required by the original installation contractor.

12.2.2 Panels that have experienced severe abuses leaving chipped, broken or scuffed surfaces may require replacement. All exposed floor panels in this condition shall be replaced or repaired. Spare panels shall be provided at all sites for such purpose. All other panels shall be cleaned with a damp mop to remove stains following completion of equipment installation. All precautions must be taken to avoid water dripping below floor.
13. FIGURES and TABLES

**Table A**

<table>
<thead>
<tr>
<th></th>
<th>Low Seismic Risk</th>
<th>High Seismic Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake Zones</td>
<td>Zones 0, 1 &amp; 2 (A, B &amp; C)</td>
<td>Zones 3 &amp; 4 (E &amp; F)</td>
</tr>
<tr>
<td>Captured Head Pedestal</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Secured Support Rails</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Secured Floor Panels</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Secure equipment to top of</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>raised floor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Rack weight</td>
<td>1,200 lbs (note 1)</td>
<td>1,200 lbs (note 1)</td>
</tr>
<tr>
<td>Equipment rack center of</td>
<td>5’ above top of raised floor</td>
<td>5’ above top of raised floor</td>
</tr>
<tr>
<td>gravity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raised floor system to</td>
<td>1.0 g</td>
<td>1.6 g</td>
</tr>
<tr>
<td>accommodate ground acceleration value of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentrated Load</td>
<td>1,250 lbs</td>
<td>1,250 lbs</td>
</tr>
<tr>
<td>Ultimate Load</td>
<td>3 x concentrated load</td>
<td>3 x concentrated load</td>
</tr>
<tr>
<td>Rolling Load</td>
<td>1,000 lbs wheel 1</td>
<td>1,000 lbs wheel 1</td>
</tr>
<tr>
<td>Pedestal Axial load</td>
<td>5,000 lbs</td>
<td>5,000 lbs</td>
</tr>
<tr>
<td>Pedestal Overturning Moment</td>
<td>Minimum 1,000 inch lbs &amp;</td>
<td>Minimum 1,000 inch lbs &amp;</td>
</tr>
<tr>
<td></td>
<td>meet/exceed IBC requirements</td>
<td>meet/exceed IBC requirements</td>
</tr>
<tr>
<td>Floor Panel Impact Load</td>
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<td>200 lbs</td>
</tr>
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<td>Uniform Load</td>
<td>300 lbs.ft²</td>
<td>300 lbs.ft²</td>
</tr>
<tr>
<td>Perforated Panels</td>
<td>25% &amp; 56% free area (note 2)</td>
<td>25% &amp; 56% free area (note 2)</td>
</tr>
<tr>
<td>Panel Composition</td>
<td>Welded steel concrete filled</td>
<td>Welded steel concrete filled</td>
</tr>
<tr>
<td>Pedestal Base Connection to</td>
<td>(2) Hilti Kwik Bolt TZ Anchors 3/8” x 2” (meet/exceed UBC requirements)</td>
<td>(4) Hilti Kwik Bolt TZ Anchors 3/8” x 2” (meet/exceed UBC requirements)</td>
</tr>
<tr>
<td>Building Floor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warranty</td>
<td>One year material &amp; labor (Note 4)</td>
<td>One year material &amp; labor (Note 4)</td>
</tr>
</tbody>
</table>
Notes:
1. Equipment weights above designated raised floor limitations are to be installed via use of an equipment pedestal. Pedestal is to be of the appropriate structural strength to accommodate the equipment requirements.

2. Raise floor perforated panel airflow rating may vary depending on site specific equipment cooling requirements.

3. Approved current raised access floor system manufacturers are ASM and Tate.

4. The successful bidder-manufacturer should provide an "add" alternate price for a three year material and labor warranty.
FIGURE 1. Planning Access Floor Layout
FIGURE 3. Support of Components Off Floor
FIGURE 4. Access Floor Components
FIGURE 5. Square Tube Pedestal

The square tube pedestal shall not be used for equipment framework applications in any AT&T equipment building or AT&T controlled space.
FIGURE 6. Non-Captured Pedestal Head – Personnel Floors

Head free to lift out of tube
FIGURE 7. Captured Pedestal Head – Equipment Floors

Head threaded into tube preventing lift out
FIGURE 8. Anchor Pattern For 2 Anchor Applications (Low Seismic Risk Locations)
FIGURE 9. Access Floor Grounding Grid
FIGURE 10. Ground Conductor Bonding Hardware
ROUTE GROUNDING CONDUCTOR AT FLOOR LEVEL,
NOT SUSPENDED ABOVE CONDUITS
FIGURE 12. Grounding - Bond To Pedestal

Single hole lug crimped to stranded bare #6 AWG conductor.

½” long bolt, split washer, then flat washer

Then C-Tap other end to grid.
FIGURE 13. Equipment Framework Secured To Personnel Floor

1/2-13 HEAVY HEX NUT
1/2" HARDENED THREADED ROD
1/2" FLAT ROUND WASHER
1/2" NYLON SHOULDER WASHER (AS REQUIRED)

CONTINUATION RUN OF 1/2" THREADED ROD

EMBEDDED ANCHOR (HILTI HDI 1/2")

FRAME BASE
EQUIPMENT FRAMEWORK
FIGURE 14. Floor Channel Anchoring Method

- U-SHAPE CHANNEL UNISTRUT P-1000 OR EQUAL
- SECURE TO BUILDING FLOOR UNISTRUT P-1047
- EQUIPMENT FRAMEWORK
FIGURE 15A - Bridging Floor Obstructions

Note:
Number of Unistrut levels and their height off of finished concrete floor depends on requirements needed to bridge floor obstructions.

Other configurations are acceptable.
Contact Common Systems SME.

Side View

Top View

Equipment aisle direction

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Page 38 of 43
FIGURE 15B - Bridging Floor Obstructions

Side View

Note:
Number of Unistrut levels and their height off of finished concrete floor depends on requirements needed to bridge floor obstructions.

Other configurations are acceptable. Contact Common Systems SME.

Top View

Unistrut P1000 Channel (1-5/8" Height)
1/2" Threaded Rod
Unistrut P1000 Channel (1-5/8" Height)
Unistrut P2880-10 Plastic End Cap
Unistrut P1001 Channel (3-1/4" Height)
Unistrut P1737 Double Channel Fitting
Hilti 1/2 " Anchor
Cable Rack Obstruction
FIGURE 16A. Cross Aisle Bracing

- SECURED TO TOP OF CABINET - 2 PLACES
- STRUT CHANNEL MIN. 7/8" HEIGHT
- 5'-6' SPAN

CABINET

CROSS AISLE BRACE CHANNEL
Figure 16B. Cross Aisle Bracing

- Front Aisle
- Rear Aisle
- Supplemental Bracing between two aisles
- Odd lineups braced to nearest adjacent line up
FIGURE 17. Equipment Framework Secured To Equipment Access Floor

CAPSCREW LENGTH DETERMINED BY BASE HEIGHT (WHERE CAPSCREW TOUCHES BASE TO WHERE FRAME BASE TOUCHES FLOOR PANEL) PLUS ANOTHER 2 INCHES FOR FLOOR PANEL AND WASHER THICKNESSES. ALL HARDWARE TO BE MINIMUM GRADE 5.
FIGURE 18. Panel Underside Washer And Nut Assembly