
USACE / NAVFAC / AFCEA / NASA UFGS-09 69 00 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-10270 (July 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

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SECTION 09 69 00

ACCESS FLOORING 04/06

NOTE: This guide specification covers the requirements for access flooring.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

NOTE: Access flooring systems include floor panels, pedestals and items such as stringers, steps, ramps, closures and trim. Access flooring systems must be designed to accommodate static, rolling and impact loading.

The designer is responsible for identifying and defining requirements for the floors. Drawings will indicate location and limits of the flooring systems, finish floor elevation, stair and/or ramp information such as tread width and riser height for stairs and width slope and length of ramps, connection to ground, and any other information required to indicate the extent of work.

Seismic loadings must be considered in designing access flooring systems.

There are three types of flooring installations:

Type I Floors completely surrounded by building walls. These are the most resistant to seismic loadings.

Type II Floors with part of the edge exposed and not restrained by other structural elements. Type II floors are less resistive to seismic loadings along the axis of the unconstrained side. Seismic loadings can be resisted by securing the perimeter panels of all floors to the supporting structural framing and fitting the panels tightly together, or by cross bracing the structural frame to resist overturning.

Type III Floors are free standing without lateral contact with other structural elements. Type III floors are primarily strengthened with cross bracing to resist lateral loads.

Buildings not excluded by UFC 3-310-02A or TI 800-01 Design Criteria will be accessible in accordance with 36 CFR, Part 1191, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

On the drawings, show:

1. Extent and shape of access flooring area.
2. Height of access floor surface above structural floor.
3. Location and design of ramps, steps, and doors to access floor area; railing heights and design.
4. Location and sizes of registers, grilles, perforated panels, and cable openings through access floor panels.
5. Design and type of plenum fire extinguishing systems, if space under access floor is to be used as air plenum.
6. Layout of plenum dividers.
7. Pattern of access floor panels.
8. Location of building electrode.

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in

this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 134 (2001) Electrostatic Propensity of Carpets

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A208.1 (1999) Mat-Formed Wood Particle Board

ASTM INTERNATIONAL (ASTM)

ASTM A 780 (2001) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings

ASTM E 648 (2004) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

ASTM E 84 (2006a) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM F 1066 (2004) Vinyl Composition Floor Tile

CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)

CISCA Access Floors (2004) Test Procedures for Access Floors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2003) International Building Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (2000) High-Pressure Decorative Laminates

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 75 (2003) Protection of Information Technology Equipment

NFPA 99

(2005) Health Care Facilities

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA PS1

(1995) Construction and Industrial Plywood
(APA V995)

UNDERWRITERS LABORATORIES (UL)

UL 779

(1995; Rev thru Jan 1997) Electrically
Conductive Floorings

1.2 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings[; G][; G, [_____]]

Drawings showing details at floor perimeter, method of grounding, description of shop coating, installation height above structural floor, and other details as specified.

SD-03 Product Data

Access Flooring System

Manufacturer's descriptive data, catalog cuts, and installation instructions. The data shall include information about any design and production techniques, procedures and policies used to conserve energy, reduce material, improve waste management or incorporate green building/recycled products into the manufacturer of their components or products. Cleaning and maintenance instructions shall be included.

SD-04 Samples

Floor Panels Panel Support System

One sample of each panel type and suspension system proposed for use.

SD-05 Design Data

Seismic Calculations

Design calculations which demonstrate that the proposed floor system meets requirements for seismic loading. Certified copies of test reports may be submitted in lieu of calculations.

SD-06 Test Reports

Factory Tests Electrical Resistance Field Tests

Certified copies of test reports from an approved testing laboratory, attesting that the proposed floor system components meet the performance requirements specified.

SD-07 Certificates

Access Flooring System

Certificate of compliance attesting that the access floor system meets specification requirements.

1.3 SYSTEM DESCRIPTION

NOTE: Access flooring support systems are available as either a stringer or stringerless system. A stringer is a horizontal framing member that connects the pedestal head, supports the panel edges and adds lateral stability to the floor system.

Stringers should be used on all systems with a height that exceeds 300 mm (12 inches).

For Army facilities, specify the stringer system when the total area is over 371 square meters (4000 square feet) unless the system provides bolted connection between the panel and pedestal.

For Army facilities requiring stringer type systems, aluminum, holder formed steel, metal-clad cementitious fill, metal-clad wood core and concrete panels may be used.

For Air Force facilities, use stringer Type floor systems for data processing facilities.

For Air Force facilities requiring stringer type floor systems, aluminum, hollow formed steel and metal-clad wood core are permitted options.

Consideration should be given to loads which will be imposed during operation. Some equipment, such as high speed printers require large quantities of paper to be delivered by carts. When in motion, these heavy loads may exceed capacity of floor system. Check with user activity and floor system manufacturer when heavy rolling loads are expected.

Access flooring shall be installed at the location and elevation and in the arrangement shown on the drawings. The floor system shall be of the [stringer] [or] [stringerless] type, complete with all supplemental items, and shall be the standard product of a manufacturer specializing in the manufacture of access flooring systems. Provide for self-alignment of floor panels, adjustable pedestals and readily removable floor panels covered as specified. Lateral stability of floor system shall be independent of panels. Finished assembly shall be rigid and free of vibration, noises, and rocking panels. Provide bolted stringer system for equipotential plane grounding.

1.3.1 Allowable Tolerances

- a. Floor Panel Flatness: Plus or minus 0.5 mm 0.02 inches on diagonal on top of panel or underneath edge.
- b. Floor Panel Length: Plus or minus 0.4 mm 0.015 inch.
- c. Floor Panel Squareness: Plus or minus 0.5 mm 0.02 inch in panel length.
- d. Finish Floor: Level within plus or minus 1.6 mm in 2 meters 0.062 inch in 10 feet, and plus or minus 2.5 mm 0.10 inch for entire floor.

1.3.2 Floor Panels

NOTE: Insert heavier load as required by facility use conditions. The deflection and permanent

deformation limits are for panels 610 mm by 610 mm, (24 by 24 inches) and smaller.

Check manufacturer's literature for maximum loadings available. Generally, computer rooms are based on live load of 12 kPa (250 psf) and point load of 450 kg (1000 lbs). Coordinate design loads for access floor with design of structural slab.

For Navy projects design loads will be in accordance with the International Building Code and NAVFAC P-355.

Floor panel testing shall be conducted in accordance with **CISCA Access Floors**. When tested as specified, all deflection and deformation measurements shall be made at the point of load application on the top surface of the panel. Floor panels shall be capable of supporting the following loads:

- a. Concentrated load of [4450] [5563] [6675] [_____] N [1000] [1250] [1500] [_____] pounds on 645 square mm one square inch, at any point on panel, without deflecting more than 2 mm 0.08 inch, with a safety factor of 2 based on static design load, without permanent deformation in excess of 0.25 mm 0.01 inch in any of the specified tests.
- b. Uniform live load of [11.97] [14.36] [16.76] [_____] kPa/square meter [250] [300] [350] [_____] psf, without deflecting more than 1 mm 0.04 inch.
- c. A rolling load of [_____] kg pounds applied through hard rubber surfaced wheel 150 mm 6 inch diameter by 50 mm 1 1/2 inch wide for 10,000 cycles over the same path. Permanent set at conclusion of test shall not exceed 0.25 mm 0.010 inch.
- d. A rolling load of [2670] [4450] [_____] N [600] [1000] [_____] pounds applied through a 75 mm 3 inch diameter by 30 mm 1-13/16 inch wide caster for 10 cycles over the same path, without deflecting more than 1 mm 0.04 inch and without permanent deformation in excess of 0.5 mm 0.02 inch. In accordance with **CISCA Access Floors**, the permanent deformation limit under rolling load shall be satisfied in all of the specified tests. In the specified tests, the permanent deformation shall be measured after 10 passes with Wheel 1 and after 10,000 passes with Wheel 2.
- e. An impact load of [_____] kg on 645 square mm pounds on one square inch from a height of 300 mm 12 inches with permanent set not to exceed 1.5 mm 0.060 inch.

1.3.3 Stringers

Stringers shall be capable of supporting a [1110 N 250 pound] [90 kg 200 pounds] concentrated load at midspan without permanent deformation in excess of 0.25 mm 0.010 inch.

1.3.4 Pedestals

NOTE: Pedestals consist of a base plate, post and

an adjustable head, and are available in heights from 150 mm (6 inches) to 2400 mm (96 inches). Pedestals 24 inches high or higher will be securely anchored to the structural floor in addition to being held in place by adhesive.

Pedestals are normally held in place with an adhesive and must be in full contact with the subfloor surface. Pedestal 600 mm (24 inches) high or higher will be securely anchored to the structural floor in addition to the adhesive.

For Air Force projects, the minimum pedestal height is 300 mm (12 inches).

Pedestals shall be capable of supporting a 22.24 kN 5000 pound axial load without permanent deformation.

1.3.5 Pedestal Adhesive

Adhesive shall be capable of securing a pedestal in place with sufficient bonding strength to resist an overturning force of 113 Nm 1000 inch pounds.

1.3.6 Bond Strength of Factory Installed Covering

Bond strength of floor covering shall be sufficient to permit handling of the panels by use of the panel lifting device, and to withstand moving caster loads up to 4.45 kN 1000 pounds, without separation of the covering from the panel.

1.3.7 Seismic Calculations

1.3.7.1 Navy Requirements

NOTE: For Navy projects, provide lateral bracing calculations on all installations. Level 1 Contracting Officer's approval was granted for calculations by a registered professional engineer. Occupancy importance factor (I) and seismic zone factor (z) should be deleted in accordance with NAVFAC P-355.

The Contractor shall submit seismic calculations for lateral bracing, sealed by a Professional Engineer. Show that access flooring system complies with seismic requirements of ICC IBC for Occupancy Importance Factor (I) of [1.5] [1.25] [1.0], Seismic Zone Coefficient (Z) of [0.075] [0.15] [0.20] [0.30] [0.40] and Horizontal Force Factor (Cp) of 0.75.

1.3.7.2 Army Requirements

NOTE: Provide seismic requirements, if a Government designer (Corps office or A/E) is the Engineer of Record, and show on the drawings. Delete the bracketed phrase if seismic details are not provided. Section 13 48 00 SEISMIC PROTECTION FOR

MISCELLANEOUS EQUIPMENT, properly edited, must be included in the contract documents.

The Contractor shall submit calculations for special bracing to resist the effects of seismic or other forces in accordance with Section 13 48 00 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT [as shown on the approved detail drawings].

1.3.8 Leakage

NOTE: Requirements for air leakage will be deleted when the space under the finished floor will not be used as an air plenum. Concrete floors to be used as air plenums shall be painted in accordance with Section 09 90 00 PAINTS AND COATINGS.

When the space below the finished floor is to be an air plenum, air leakage through the joints between panels and around the perimeter of the floor system shall not exceed 0.15 L/s of air per linear meter 0.1 cubic foot of air per minute per linear foot of joint subjected to 2.5 mm 0.1 inch, water gauge, positive pressure in the plenum.

1.3.9 Grounding

NOTE: Access flooring system must be grounded for safety hazard and static control. The three most common static control requirements are:

1. Computer rooms, electronic offices, data centers and control rooms. The access floor system should provide resistance from floor wearing surface to building grounding electrode within range of 0.5 to 20,000 megohms.

2. Clean rooms, laboratories, and other environments which are more sensitive to static discharge. The access floor system should provide resistance within range of 0.2 to 2.0 megohms.

3. Hospitals and other facilities described by NFPA 99 and referenced to UL 779. The access floor system should provide resistance within range of 0.025 to 1.0 megohms.

These limits may be changed if other values are required by the Using Agency. The grounded floor system should be designed to provide positive contact between all metal components. Grounding details must be shown on the project drawings; the option of using manufacturer's alternate methods of grounding may be included in the project specification.

The access flooring system shall be grounded for safety hazard and static

suppression. Provide positive contact between components for safe, continuous electrical grounding of entire floor system. Total system resistance from wearing surface of floor to building grounding electrode shall be within range of [0.5 to 20,000 megohms] [0.2 to 2.0 megohms] [0.025 to 1.0 megohms].

1.3.9.1 Metal Grilles

Exposed metal is not allowed at wearing surface of access floor system, except at metal grilles and registers. When grilles and metal registers are provided, insulate as required to provide same grounding resistivity as wearing surface.

1.3.9.2 Joint Resistance

NOTE: Coordinate with electrical drawings and specifications to assure that connection to building grounding electrode is shown. Do not use sound deadening materials which prevent grounding of system. Select total system resistant to comply with user requirements.

Electrical joint resistance between individual stringer and pedestal junctions shall be less than 0.1 milliohms. Electrical resistance between stringers and floor panels as mounted in normal use shall be less than 3 ohms.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials to site in undamaged condition, in original containers or packages, complete with accessories and instructions. Label packages with manufacturer's name and brand designations. Where materials are covered by referenced specification, containers or packages shall also bear specification number, type, and class as applicable.

1.4.2 Storage

Materials shall be stored in original protective packaging in a safe, dry, and clean location. Panels shall be stored at temperatures between 4 and 32 degrees C 40 and 90 degrees F, and between 20 and 70 percent humidity. Replace defective or damaged materials.

1.4.3 Handling

Materials shall be handled and protected in a manner to prevent damage during the entire construction period.

1.5 EXTRA MATERIALS

NOTE: To assure matching floor panel which may become damaged and require replacement, supply of extra stock is recommended. Set amount based on conditions of specific project. Do not specify extra stock unless user activity concurs;

warehousing may not be available.

a. ARMY: Spare floor panels, spare complete pedestal assemblies, and spare stringers shall be furnished at the rate of one space for each 100 or fraction thereof required.

b. NAVY: Provide [four] [_____] floor panels complete with specified floor covering for future use.

c. AIR FORCE: Provide four spare panels with pedestals and stringers for each 100 square meters 1,000 square feet of access flooring and total of 3 linear meters 10 linear feet of cut-out trim. Store extra stock in same manner and location as project materials.

1.6 DETAIL DRAWINGS

The Contractor shall take measurements from finished areas at site and shall submit detail drawings indicating:

- a. Location of panels
- b. Layout of supports, panels, and cutout locations
- c. Stair, handrail, and ramp framing
- d. Sizes and details of components
- e. Lateral bracing
- f. Typical cutout details
- g. Gasketing, return air grilles, supply air registers, and perforated panels. Include air transfer capacity of grilles, registers and panels
- h. Floor finishes
- i. Location of connection to building grounding electrode

PART 2 PRODUCTS

NOTE: The designer should consider incorporating, when possible, any design provisions which encourage use of innovative construction materials or techniques which are environmentally sensitive, take advantage of recycled materials, and conserve our natural resources.

2.1 FLOOR PANELS

2.1.1 Panel Construction

NOTE: There are five basic floor panel types: aluminum, hollow formed steel, metal-clad cementitious fill, metal-clad wood core, and

concrete. Nonferrous materials should be used in areas where there is potential for damage by rust oxides or paint flakes. In accordance with CISCA Test Method, hollow panels should have a safety factor of 2 and filled panels a safety factor of 3 in terms of ultimate load.

The standard panel size of 600 by 600 mm for metric projects and 24 by 24 inches for imperial unit projects will normally be used. Check with user activity and verify product availability before specifying nonstandard panels of 450, 750 and 900 mm (18, 30, and 36 inches) where required to match existing floor systems or to satisfy special requirements.

Use 150 mm (6 inches) as minimum practical height for access floor installation and 300 mm (12 inches) minimum when there is a plenum. Include the five panel types as options except that wood core panels should not be specified for Air Force projects, SPAWARS projects, or other projects where data processing involves highly strategic data having direct bearing on National Defense effort. Check with user activity before specifying wood core panels.

Base access floor system on a 600 by 600 mm 24 by 24 inch square module providing minimum of [150] [300] [] mm [6] [12] [] inch clearance between structural floor and top of finished floor. Fabricate so accurate job cutting and fitting may be done using standard sizes for perimeters and around columns. Do not expose metal on finished top surface of panels. Provide cutouts and cutout closures to accommodate utility systems and equipment intercabling. Reinforce cutouts to meet design load requirements. Provide extra support pedestals at each corner of cutout for cutout panels that do not meet specified design load requirements. Use panels of uniform dimensions within specified tolerances. Panels shall be permanently marked to indicate load rating and model number.

2.1.1.1 Aluminum

NOTE: Die-cast aluminum panels are lightweight, have very little variation in dimension from panel to panel, and are acceptable in environments where nonferrous materials are required (e.g., Magnetic Resonance Imagery rooms), but they tend to be more expensive than other types of panels.

Die-cast aluminum panels are normally used as a stringerless system. Stringers, when required, are fastened to the top of the pedestal shaft.

Aluminum panels shall be of die-cast or extruded construction.

2.1.1.2 Hollow Formed Steel

NOTE: Die-formed hollow steel panels perform best under static loads and should not be used under dynamic (rolling) loads. These panels are more economical than other types of panels and can be provided by most flooring system manufacturers.

Steel panels shall be of die-formed construction, consisting of a flat steel top sheet welded to one or more formed steel stiffener sheets. Panels shall be chemically cleaned, bonderized, and painted with the manufacturer's standard finish.

2.1.1.3 Metal-Clad Cementitious Fill (Composite Panels)

NOTE: Cementitious core filled panels are enclosed in steel sheeting and are designed to provide improved resistance to rolling and impact loads. Specific strength and load requirements should be specified wherever it is a critical concern. These panels are quiet due to their mass, but usually cost slightly more than the standard formed steel panels.

There is some concern that the fill material may deteriorate when subjected to repeated loading cycles, and the cut edges could introduce dust into the underfloor space. Where the underfloor space will be a plenum, or where dust-sensitive computer equipment is to be installed, verify that the composite panel is acceptable to the Using Agency.

Current Air Force criteria does not permit the composite panel.

Composite panels shall be of die-formed steel construction totally enclosing the panel, including the top surface. The void spaces between the top sheet and the formed steel bottom sheet shall be completely filled with an incombustible cementitious or concrete material. Seal cut edges in accordance with manufacturer's recommendations. Gravity held panels with bolted stringer understructure: Fasten end of each stringer and mid-point of each 1212 mm 4 foot stringer positively to pedestal heads, using manufacturer's standard screws. Provide screws that are removable from top.

2.1.1.4 Metal-Clad Wood Core

NOTE: Wood core panels consist of a core of particleboard with an overlapping skin of galvanized steel. The wood core is a good sound deadener and insulator and increases resistance to rolling loads. Wood core panels are the most economical to procure.

Although the core material is combustible, the composite panel with bonded steel for face sheets when tested in accordance with the NFPA 225,

revealed the composite panel to be noncombustible with a flame spread index of 0, a smoke developed index of 10, and to have a Class A fire rating.

Wood core panels can be easily cut and trimmed; however, doing so causes loss of fire retardancy and UL rating. The edges of wood core panels must be protected from moisture in order to prevent warping.

Wood core panels shall have cores of wood particleboard conforming to ANSI A208.1, Grade 1-M-3, or of plywood conforming to APA PS1, EXT-DFPA-C-C. The core shall be not less than 25 mm 1 inch thick, and shall be faced on both sides with structurally bonded zinc-coated steel sheets not lighter than 0.70 mm 24 gauge. All edges and corners shall be sealed with zinc-coated steel or extruded aluminum. The completed panels shall have a flame spread rating of 25 or less when tested in accordance with ASTM E 84. Provide zinc-coated steel, extruded aluminum, fire resistant vinyl, or other fire resistant edging to protect shop and field edge cuts and cutouts through the face of panels in a manner to meet specified flame spread requirements.

2.1.1.5 Concrete

NOTE: Lightweight concrete panels are either solid or metal clad. They perform well under dynamic loadings with little deformation and their weight is approximately 195 kg/m² (40 psf). They are primarily used in office flooring and are similar in cost to cementitious fill panels.

Concrete panels shall be of lightweight structural concrete with either structural reinforcing or a die-formed, electro-galvanized steel bottom pan. All concrete surfaces including those resulting from field cuts shall be sealed with the manufacturer's standard sealer before covering the surfaces with other materials.

2.1.2 Floor Covering

Floor panels shall be surfaced with materials firmly bonded in place with waterproof adhesive. The electrical resistance shall remain stable over the life expectancy of the floor covering. Any antistatic agent used in the manufacturing process shall be an integral part of the material, and shall not be surface applied. Bolt heads or similar attachments shall not rise above the traffic surface.

2.1.2.1 High Pressure Laminate

NOTE: High pressure laminate is the standard surfacing material and is preferred where cost is not an overriding factor.

Grade HW-120, approximately 3 mm (1/8 inch) thick, is recommended on metal floor panels to reduce the possibility of cracking due to impact. On wood core, filled steel and concrete panels, Grade HW-62,

1.5 mm (1/16 inch) thick is sufficient due to absorptive quality of panel material. This option is recommended when there is frequent movement of equipment.

High pressure laminate surfacing shall conform to NEMA LD 3, Grade [HW 62] [120]. Total system electrical resistivity from the wearing surface of the floor to the ground connection shall be between 150,000 ohms and 20,000,000,000 ohms.

2.1.2.2 Conductive Surfacing

NOTE: Conductive floor surfacing material is used where minimal electrical resistance is desired, mainly in clean rooms, hospital operating rooms, etc. The surface does not perform well under the application of heavy concentrated loads.

When conductive floor surfacing is specified, require submittal of maintenance instructions as per paragraph OPERATION AND MAINTENANCE MANUALS to identify special cleaning and maintenance requirements to maintain "conductive" properties of the panel finishes.

Conductive surfacing shall conform to NEMA LD 3, Grade HW 62. The total system electrical resistivity from the wearing surface of the floor to the ground connection shall be between 25,000 ohms and 1,000,000 ohms.

2.1.2.3 Conductive High Pressure Laminate

NOTE: Conductive high pressure laminate floor surfaces combine the electrical resistivity qualities of the conductive surfacing with the wear characteristics of high pressure laminate.

Conductive high pressure laminate floor surfacing shall conform to ASTM F 1066, Type III, Vinyl Tile and UL 779. The total system electrical resistivity from the wearing surface of the floor to the ground connection shall be between 25,000 ohms and 1,000,000 ohms.

2.1.2.4 Vinyl Composition Tile

NOTE: Vinyl composition tile is the lowest cost surfacing tile, however the availability of tile meeting the electrical resistance requirements is limited. Wax build-up on vinyl tile is a prime cause of static problems.

Normally either Composition 1 or 2 will be specified; however Composition 1 should be specified when the Using Agency desires an asbestos-free material. ASTM F 1066, Type II - Rubber or Type III

- Vinyl tile may be specified when requested; however the electrical resistance characteristics should be verified before use. At installations where operating personnel will be required to wear conductive footwear to prevent static electricity buildup, conductive vinyl tile flooring may be necessary to satisfy the conductivity requirements.

Vinyl composition tile surfacing shall be 3 mm 1/8 inch thick conforming to ASTM F 1066, Type IV, Composition [1] [1 or 2]. Tiles may be approximately 300 mm 12 inches square or may be the full size of the panel.

2.1.2.5 Carpet

NOTE: Carpet should be specified only when requested by the Using Agency. Carpet may be bonded to the panels, or may be installed as loose-laid carpet squares. Where loose-laid carpet squares are used, delete the test for floor covering bond strength specified in paragraph BOND STRENGTH OF FLOOR COVERING. Carpet squares may be placed with carpet joints in alignment with panel joints, or may be placed with carpet joints at the panel midpoint. Color and pattern of carpet will be in accordance with current Air Force or Army carpet policy.

Carpet surfacing shall be [factory] [field] installed using one full carpet square per panel. Carpet shall be nylon filament, loop pile, minimum 0.8 kg/square m 24 ounce per square yard, minimum density 4000, and without cushion. Carpet shall conform to ASTM E 648 with a minimum average critical radiant flux of 0.25 watts per square centimeter. Static control shall be less than 2.0 kV at 20 percent relative humidity at 21 degrees C 70 degrees F, when tested in accordance with AATCC 134. Provide vinyl edge trim to prevent unravelling.

2.1.3 Edge Strip

Panels shall be edged with extruded vinyl edge strips secured in place with mechanical interlock or adhesive bond, or shall be of a replaceable type. Top of strip shall be approximately 3 mm 1/8 inch wide, and shall be flush with the floor surfacing. Metal edge strips exposed at finish floor surface will be rejected.

2.1.4 Accessories

NOTE: Perforated panels are preferred for use in areas with hard surfaces such as high pressure laminates, and grilles or registers are preferred in areas with carpet

Registers, grilles, perforated panels, and plenum dividers shall be provided where indicated, and shall be the manufacturer's standard type. Registers, grilles, and perforated panels shall be designed to support the same static loads as floor panels without structural failure, and shall be

capable of delivering the air volumes indicated. Registers and perforated panels shall be 25 percent open area and shall be equipped with adjustable dampers.

2.1.5 Resilient Base

Base shall be [rubber] [or] [vinyl] [straight style (installed with carpet)] [coved style (installed with resilient flooring)]. Base shall be [100] [150] mm [4] [6] inches high and a minimum 3 mm 1/8 inch thick. [Performed outside] [Job Formed] corners shall be furnished.

2.1.6 Lifting Device

Each individual room shall be provided with one floor panel lifting device standard with the floor manufacturer. A minimum of two devices shall be furnished. [For AIR FORCE projects provide a total of two suction-type floor panel lifting devices for each floor area.]

2.2 PANEL SUPPORT SYSTEM

Design support system to allow for 360 degree clearance in laying out cable and cutouts for service to machines and so that panel and stringer together take up maximum of 50 mm 2 inches.

2.2.1 Pedestals

Pedestals shall be of steel or aluminum or a combination thereof. Ferrous materials shall have a factory-applied corrosion-resistant finish. Pedestal base plates shall provide a minimum of 10,300 square mm 16 square inches of bearing surface and shall be a minimum of 3 mm 1/8 inch thick. Pedestal shafts shall be threaded to permit height adjustment within a range of approximately 50 mm 2 inches, to permit overall floor adjustment within plus or minus 2.5 mm 0.10 inch of the required elevation, and to permit leveling of the finished floor surface within 1.56 mm 0.062 inch in 3000 mm 10 feet in all directions. Locking devices shall be provided to positively lock the final pedestal vertical adjustments in place. Pedestal caps shall interlock with [panels] [stringers] to preclude tilting or rocking of the panels.

2.2.2 Stringers

NOTE: Specify bolted stringer and bolted panel systems. Specify bolted stringer type system and plastic laminate finish for computer room access flooring in Air Force and Naval Warfare Systems Command (SPAWARS) facilities, except where die-cast interlocking panel to pedestal aluminum system is designated.

Consideration must be given to equipment planned for installation including type and amount of grounding required. If such equipment has extendable drawers or chassis which require equipment to be firmly anchored to prevent overturning, a rigid grid stringer system of suitable strength and rigidity may be used as anchoring point in lieu of fabricating special subfloor foundations for such equipment, which would restrict 360 degree freedom.

The specification may require modification to provide sufficiently rigid grid system to accommodate this condition.

Delete this paragraph if a stringerless system is used.

Stringers shall be of rolled steel or extruded aluminum, and shall interlock with the pedestal heads to prevent lateral movement. Provide stringers that can be added or removed after floor is in place.

2.3 FASCIA

Aluminum or steel fascia plates shall be provided at open ends of floor, at sides of ramps and steps, and elsewhere as required to enclose the free area under the raised floor. Steel plates shall have a factory applied baked enamel finish. Finish on aluminum plates shall be as standard with the floor system manufacturer. Fascia plates shall be reinforced on the back, and shall be supported using the manufacturer's standard lateral bracing at maximum 1200 mm 4 feet on center. Trim, angles, and fasteners shall be provided as required.

2.4 STEPS AND RAMPS

Steps and ramps shall be securely fastened to the access flooring system and to the structural floor. Construction shall include standard floor system components and custom components as required, and shall include all supports, fasteners, and trim necessary for a finished installation. Step nosings, threshold strips, and floor bevel strips shall be cast or extruded aluminum with nonslip traffic surfaces.

2.4.1 Steps

Height of risers shall not exceed 180 mm 7 inches. Steps shall be designed to support a uniform load of 7.18 kPa 150 psf. Treads shall be surfaced with the manufacturer's standard nonslip floor finish.

2.4.2 Ramps

Slope of ramps shall not exceed 25 mm 1 inch rise to 300 mm 12 inches of run. Ramps shall be designed to support the same loads as specified for floor panels. Ramps shall be surfaced with the manufacturer's standard nonslip floor finish.

2.5 RAILINGS

NOTE: Where open sides of floors are 1200 mm (4 feet) or more above adjacent ground or floor level, "standard railing" shall be installed in accordance with CFR 1910.23(e). Run post through raised floor and bolt to concrete floor for stability.

Railings shall be the double rail and post type, fabricated of at least 25 mm 1 inch round or square seamless aluminum tubing with a satin natural anodized finish. At steps and ramps, the top rail shall be approximately 900 mm 36 inches high and parallel to the incline. The top rail shall be

1050 mm 42 inches high at open ends of the floor. Guardrails shall have intermediate rails or an ornamental pattern such that a sphere 100 mm 4 inches in diameter cannot pass through. Space posts maximum of [1200] [1500] [1800] mm [4] [5] [6] feet oc. Provide railings complete with anchorages, floor plates, and end caps. [Electronically connect hand rails to raised floor system to prevent static build-up.]

2.6 FACTORY TESTS

Access flooring shall be factory tested by an independent laboratory at the same position and maximum design elevation and in the same arrangement as shown on the drawings for installation so as to duplicate service conditions as much as possible.

2.6.1 Load Tests

Floor panel, stringer, and pedestal testing shall be conducted in accordance with CISCA Access Floors.

2.6.2 Bond Strength of Covering

The test panel shall be supported on pedestals and stringers as specified for the installed floor. The supports shall be braced as necessary to prevent sideways movement during the test. A test load of 4.45 kN 1000 pounds shall be imposed on the test assembly through a hard plastic caster 75 mm 3 inches in diameter and 25 mm 1 inchwide. The caster shall be rolled completely across the center of the panel. The panel shall withstand 20 passes of the caster with no delamination or separation of the covering.

2.7 COLOR

NOTE: Editing of color reference sentence(s) shall be coordinated with the Government. Generally the 09915 COLOR SCHEDULE or drawing is used when the project is designed by an Architect or Interior designer. Color shall be selected from manufacturers standard colors or identified as a manufacturers color in this specification only when the project is very simple and has minimal finishes.

When the Government directs that color be located in the drawings a note shall be added that states:
"Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers. The word "color" as used herein includes surface color and pattern."

Prior to specifying a custom color finish, research to determine if additional cost and lead time is feasible. Note there is often a minimum order requirement; this requirement will also affect future orders.

When a manufacturer's name, stock number, pattern,

and color is used, be certain that the product conforms to this specification, as edited.

Color shall be [in accordance with Section 09 06 90 COLOR SCHEDULE.] [as indicated on the drawings.] [selected from manufacturers standard colors.] [[_____.] Color listed is not intended to limit the selection of equal colors from other manufacturers.]

PART 3 EXECUTION

3.1 INSTALLATION

The floor system shall be installed in accordance with the manufacturer's instructions and with the approved detail drawings. Open ends of the floor, where the floor system does not abut wall or other construction, shall have positive anchorage and rigid support. Areas to receive access flooring shall be maintained between [16] [4] and 32 degrees C [60] [40] and 90 degrees F, and between 20 and 70 percent humidity for 24 hours prior to and during installation.

3.1.1 Preparation for Installation

NOTE: Sections 03300A CAST-IN-PLACE STRUCTURAL CONCRETE and 03300N CAST-IN-PLACE CONCRETE should require that concrete floors used as air plenum surfaces beneath raised floors be sealed with approved liquid sealer compound. Sealer should be compatible with pedestal adhesive, if pedestals are anchored with adhesive. If a non-compatible sealer is applied before pedestals are anchored, specify removal of sealer at pedestal locations before adhesive is applied. If an existing subfloor has been painted or otherwise sealed with non-compatible sealer or paint, specify removal of coating before applying adhesive.

The area in which the floor system is to be installed shall be cleared of all debris. Structural floor surfaces shall be thoroughly cleaned and all dust shall be removed. Floor coatings required for dust or vapor control shall be installed prior to installation of pedestals only if the pedestal adhesive will not damage the coating. If the coating and adhesive are not compatible, the coating shall be applied after the pedestals have been installed and the adhesive has cured.

3.1.2 Pedestals

NOTE: Seismic calculations must be made by the designer to determine if adhesives or anchors are to be used; pedestal adhesives must be capable of securing pedestals in place with sufficient bonding strength to resist an overturning force of 113 N-m (1000 inch-pounds). If the calculations indicate the overturning force is greater than 113 N-m (1000 inch-pounds) steel expansion anchors will be used.

Pedestals shall be accurately spaced, and shall be set plumb and in true alignment. Base plates shall be in full and firm contact with the structural floor, [and shall be secured to the structural floor with adhesive.] [and shall be secured to the structural floor with steel expansion anchors.]

3.1.3 Stringers

Stringers shall be interlocked with the pedestal caps to preclude lateral movement, and shall be spaced uniformly in parallel lines at the indicated elevation.

3.1.4 Auxiliary Framing

Auxiliary framing or pedestals shall be provided around columns and other permanent construction, at sides of ramps, at open ends of the floor, and beneath panels that are substantially cut to accommodate utility systems. Special framing for additional lateral support shall be as shown on the approved detail drawings. Provide additional pedestals and stringers designed to specific heights and lengths to meet structural irregularities and design loads. Connect auxiliary framing to main framing.

3.1.5 Panels

The panels shall be interlocked with supports in a manner that will preclude lateral movement. Perimeter panels, cutout panels, and panels adjoining columns, stairs, and ramps must be fastened to the supporting components to form a rigid boundary for the interior panels. Floors shall be level within the specified tolerances. Cut edges of steel and wood-core panels shall be painted as recommended by the panel manufacturer. Cut edges of composite panels shall be coated with a silicone rubber sealant or with an adhesive recommended by the panel manufacturer. Extruded vinyl edging shall be secured in place at all cut edges of all panel cut-outs to prevent abrasion of cables. Where the space below the floor is a plenum, cutouts for conduit and similar penetrations shall be closed using self-extinguishing sponge rubber.

3.1.6 Resilient Base

Base shall be provided at vertical wall intersections. Cracks and voids in walls and other vertical surfaces to receive base shall be filled with an approved filler. The base shall be applied after the floor system has been completely installed. Base shall be applied with adhesive in accordance with the manufacturer's recommendations.

3.1.7 Fascia Plates

Exposed floor ends and exposed openings of ramps and stairs shall be covered with aluminum or steel closures.

3.1.8 Repair of Zinc Coating

Zinc coating that has been damaged, and cut edges of zinc-coated components and accessories, shall be repaired by the application of a galvanizing repair paint conforming to [ASTM A 780](#). Areas to be repaired shall be thoroughly cleaned prior to application of the paint.

3.2 FIELD TESTS

3.2.1 Acceptance Tests

Conduct acceptance tests after installation of floor system. Make at least one test for each [40] [100] [_____] square meters [400] [1000] [_____] square feet of floor area. Conduct tests in presence of Contracting Officer and representatives of manufacturer and installer.

3.2.2 Electrical Resistance

Testing of electrical resistance in the completed installation shall be conducted in the presence of the Contracting Officer. Testing shall be in accordance with NFPA 99 modified by placing one electrode on the center of the panel surface and connecting the other electrode to the metal flooring support. Measurements shall be made at five or more locations. Each measurement shall be the average of five readings of 15 seconds duration at each location. During the tests, relative humidity shall be 45 to 55 percent and temperature shall be 21 to 24 degrees C 69 to 75 degrees F. The panels used in the testing will be selected at random and will include two panels most distant from the ground connection. Electrical resistance shall be measured with instruments that are accurate within 2 percent and that have been calibrated within 60 days prior to the performance of the resistance tests. The metal-to-metal resistance from panel to supporting pedestal shall not exceed 10 ohms. The resistance between the wearing surface of the floor covering and the ground connection, as measured on the completed installation, shall be in accordance with paragraph FLOOR COVERING.

3.3 CLEANING AND PROTECTION

3.3.1 Cleaning

The space below the completed floor shall be free of all debris. Before any traffic or other work on the completed raised floor is started, the completed floor shall be cleaned in accordance with the floor covering manufacturer's instructions. [Do not permit seepage of cleaner between individual panels.]

3.3.2 Protection

Traffic areas of raised floor systems shall be protected with a covering of building paper, fiberboard, or other suitable material to prevent damage to the surface. Cutouts shall be covered with material of sufficient strength to support the loads to be encountered. Plywood or similar material shall be placed on the floor to serve as runways for installation of heavy equipment not in excess of design load capacity. Protection shall be maintained until the raised floor system is accepted.

3.4 FIRE SAFETY

An automatic detection system shall be installed below the raised floor meeting the requirements of NFPA 75 paragraph 5-2.1 and shall sound an audible and visual alarm. Air space below the raised floor shall be subdivided into areas not exceeding 929 squared meters 10,000 square feet by tight, noncombustible bulkheads. All penetrations for piping and cables shall be sealed to maintain bulkhead properties.

3.5 SEISMIC SPECIAL INSPECTION AND TESTING

NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by paragraph 3.2 of FEMA 302, NEHRP RECOMMENDED PROVISIONS FOR SEISMIC REGULATIONS FOR NEW BUILDINGS AND OTHER STRUCTURES.

This paragraph will be applicable to both new buildings designed according to UFC 3-310-03A SEISMIC DESIGN FOR BUILDINGS, and to existing building seismic rehabilitation designs done according to UFC 3-301-05A SEISMIC EVALUATION AND REHABILITATION FOR BUILDINGS.

The designer must indicate on the drawings all locations and all features for which special inspection and testing is required in accordance with Chapter 3 of FEMA 302. This includes indicating the locations of all structural components and connections requiring inspection.

Add any additional requirements as necessary.

Special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01 45 35 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

3.6 OPERATION AND MAINTENANCE MANUALS

Provide maintenance instructions for proper care of the floor panel surface. When conductive flooring is specified, require submittal of maintenance instructions to identify special cleaning and maintenance requirements to maintain "conductivity" properties of the panel finish.

-- End of Section --