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USACE / NAVFAC / AFCEC / NASA	**UFGS-12 59 00 (August 2017)** **Change 1 - 08/18**
Preparing Activity: USACE	**Superseding** **UFGS-12 59 00(February 2009)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2021

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DIVISION 12 - FURNISHINGS

SECTION 12 59 00

SYSTEMS FURNITURE

08/17, CHG 1: 08/18

-- End of Section Table of Contents --

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SECTION 12 59 00

SYSTEMS FURNITURE
08/17, CHG 1: 08/18

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NOTE: This guide specification covers the requirements for systems furniture which include panels, workstations and components.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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PART 1 GENERAL

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NOTE: Various provisions of this guide specification may be irrelevant to or in conflict with the requirements of any given project. This specification should be carefully edited to fit the needs of each specific application. Portions must be deleted, if not applicable, and additional material inserted where necessary to adequately delineate requirements. Brackets and blanks identify provisions which involve alternates; the editor must select and/or insert the appropriate requirements.

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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 Reference Identifier (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.

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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 FOREST FOUNDATION (AFF)

ATFS STANDARDS	(2015) American Tree Farm System Standards of Sustainability 2015-2020

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - SI	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building

	Materials
ASTM E290	(2014) Bend Testing of Material for Ductility

BIFMA INTERNATIONAL (BIFMA)

ANSI/BIFMA M7.1	(2011; R 2016) Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating
ANSI/BIFMA X5.5	(2014) American National Standards For Office Furnishings -Desk Products
ANSI/BIFMA X5.6	(2016) American National Standards For Office Furnishings -Panel Systems

CSA GROUP (CSA)

CSA Z809-08	(R2013) Sustainable Forest Management

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA WD 1	(1999; R 2020) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2016) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 101	(2021) Life Safety Code
NFPA 265	(2019) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013	(2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019	(2015) Standards, Rules for Label Use, Procedures and Guidance

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.2	(2009; Errata 2010; Add 2 2014; Add 1 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-569	(2015d) Commercial Building Standard for Telecommunications Pathways and Spaces

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 1286	(2008; Reprint Apr 2021) UL Standard for Safety Office Furnishings
UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G[, [_____]]

SD-03 Product Data

Warranty; G[, [_____]]

Workstations

Power and Communications

Communications

Recycled Content for system furniture components; S

Energy Star Label for Task Lighting; S

SD-04 Samples

Workstations; G[, [_____]]

Mock-up; G[, [_____]]

Samples

SD-06 Test Reports

Selected Components; G[, [_____]]

Panel Acoustics; G[, [_____]]

Fire Safety; G[, [_____]]

Electrical System; G[, [_____]]

SD-07 Certificates

Workstations

[Certified Sustainably Harvested door panels; S

] SD-10 Operation and Maintenance Data

Assembly Manuals; G[, [_____]]

Maintenance Manuals; G[, [_____]]

Cleaning; G[, [_____]]

Electrical System; G[, [_____]]

Maintenance Agreements

Installation; G

1.3 CERTIFICATIONS

[1.3.1 Certified Sustainably Harvested Wood

Provide wood door panels certified as sustainably harvested by FSC STD 01 001[, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013]. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Provide current product certification documentation from certification body. Submit copies of invoices bearing certification numbers.

]1.3.2 Indoor Air QualityCertifications

1.3.2.1 Office Furniture Systems and Seating

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold, ANSI/BIFMA M7.1 Certification or provide certification by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 QUALITY ASSURANCE

1.4.1 General Safety

Provide workstation products free of rough or sharp edges. [Provide panel supported components with a positive, integral locking device which secures components without the use of additional screws or clamps to prevent the components from being accidentally pulled or knocked off the

panels.] [Provide desk-based workstation components with an option for a positive, integral locking device that secures components to the base units.]

1.4.2 Fire Safety

Components must meet requirements for flame spread and smoke development as specified by NFPA 101 except as follows. Conduct testing in accordance with either ASTM E84 or UL 723 on the entire assembled panel of the worst case (most combustible) combination of fabric and interior construction. In addition, fabric must meet the requirements of NFPA 265. Do not exceed [[25 for Class A] [75 for Class B] [200 for Class C]] for panel flame spread and 450 for Class A, B and C panel smoke development .

1.4.3 Electrical System

Task lights are required to be UL listed and installation of task lighting must meet the requirements of NFPA 70. The electrical system must meet the requirements of UL 1286. Submit three sets of electrical system manuals describing the functions, configuration, and maintenance of the electrical system (power [, communications] [, data]). This material may be included in the Assembly or Maintenance manuals at the Contractor's option.

1.4.4 Detail Drawings

Submit detail drawings showing communications, electronic data processing (EDP) and local area network (LAN); locations may be provided as a separate submittal from remaining workstation drawings. Provide drawing requirements, which are the furniture manufacturer's responsibility, as a single submittal. Provide electronic drawings to the user for future re-configuration in the software package requested by the user. Include in the electronic drawings all modifications made during installation. As a minimum, submit the following:

a. Overall reference drawings: Drawings showing workstation locations and overall plan view within each floor in a scale of [1:400 (1/16 inch = 1 foot) 1/16 inch = 1 foot] [1:200 (1/8 inch = 1 foot) 1/8 inch = 1 foot]. Layouts must reflect field verified conditions and clearly illustrate the overall space planning concept and intent.

b. Installation drawings: Drawings showing workstations, panels, components, and plan view within each floor. Identify workstations by workstation type; submit drawings showing the proposed workstation installation at a scale of 1:100 (1/4 inch = 1 foot) 1/4 inch = 1 foot, unless otherwise specified. Installation drawings must reflect field verified conditions.

c. Workstation elevations: Dimensioned workstation elevations showing each type of workstation with panel frame configurations and all components identified with manufacturer's catalog numbers. Draw elevations at 1:50 (1/2 inch = 1 foot) 1/2 inch = 1 foot scale.

d. Panel drawings: Panel drawings showing locations and critical dimensions from finished face of walls, columns, panels, including clearances and aisle widths. Key assemblies to a legend which includes width, height, configuration and composition of frame covers finishes and fabrics (if different selections exist within a project), power or nonpower, connectors and wall mount hardware. Coordinate

panel placement with location of electrical, voice/date LAN,[SIPRNet,][NIPERNet,] mechanical and fire protection fixtures. Drawings must reflect field verified conditions.

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NOTE: NOTE TO INTERIOR DESIGNER for "e. Electrical Drawings": Coordinate with electrical engineer the furniture wiring configuration, receptacle quantities, and receptacle locations for compliance with ASHRAE 90.1 automatic receptacle control requirements.

NOTE TO ELECTRICAL ENGINEER for "e. Electrical Drawings": Provide a separate set of electrical drawings for furniture coordination identifying switched/unswitched supply circuits, furniture wiring configuration(s), switched/unswitched furniture line voltage conductors, switched/unswitched receptacles (or specifically which furniture line voltage spade to which each receptacle is connected), and receptacle locations. Recommend naming drawing series "EF" for "Electrical Power - Furnishings". Coordinate furniture wiring configurations, receptacle quantities, and receptacle locations with the interior designer and this specification. Consult UFC 3-520-01 for systems furniture power guidance. Where shared neutrals are used, provide oversized neutrals to match the harness configuration and balance loads between circuits and phases. A single circuit must not serve more than four (4) cubicles under any circumstances.

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e. Electrical drawings: Drawings showing power provisions including type and location of feeder components (service entry poles, base or ceiling feeds), activated power receptacles and other electrical components. Wiring configuration (circuiting, switching, internal and external connections) identified and a legend provided as applicable. Identify which receptacles in typical furniture configurations will be connected to controlled building power circuits as applicable to meet [ASHRAE 90.1 - IP][ASHRAE 90.1 - SI] requirements. Coordinate with electrical drawings.

f. Wire management capacity drawings.

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NOTE: NOTE TO INTERIOR DESIGNER for "g/h/i/j. Communications Drawings": Coordinate with communications designer the quantity, types, locations, and minimum separations of communications outlets.

NOTE TO COMMUNICATIONS DESIGNER for "g/h/i/j. Communications Drawings": Provide a separate set of communications drawings for furniture coordination identifying quantity, types, locations, and minimum separations of communications outlets. Recommend naming drawing series "TF" for "Telecommunications -

Furnishings". Consult UFC 3-580-01 for furniture communications guidance.

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g. Communication drawings showing telephone provisions: Drawings indicating the type and location of feeder components and communications jacks with wiring configuration identified where applicable.

h. Communication drawings showing electronic data processing provisions: Drawings indicating the type and location of feeder components, communications jacks, or accessories with wiring configuration identified where applicable.

i. Communication drawings showing local area network provisions: Drawings indicating the type and location of feeder components and data jacks with extra ports for future expansion with wiring configuration identified where applicable.

j. Communications drawings indicating the TIA-568-C.2 pin/pair assignment that will be used for communications outlet as coordinated with the COR.

k. Reflected ceiling plan for projects specified with power poles.

l. Drawings indicating cabling is protected at all transition points, and that metallic separation is provided between telecommunication and power wiring in the utility columns and systems furniture track in accordance with TIA-569 and NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

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NOTE: Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders. Absorbent systems furniture includes, among others, fabric-covered components.

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Deliver components to the jobsite in the manufacturer's original packaging with the brand, item identification, and project reference clearly marked. Remove furniture from packaging and store in an unoccupied, dry location that is ventilated. Storage shall be free from dirt and dust, water, and other contaminants, and in a manner that permits easy access for inspection and handling.

1.6 WARRANTY

Warrant the systems furniture for a minimum period of [12 years][lifetime] with the following exceptions: fabrics and other covering materials, and paper handling products for 3 years, LED drivers/power supplies for 5 years, and electromagnetic ballasts for [2][3] years. Warranties must be

signed by the authorized representative of the manufacturer. Present warranties, accompanied by document authenticating the signer as an authorized representative of the guarantor, to the Contracting Officer upon the completion of the project. Guarantee that the workstation products and installation are free from any defects in material and workmanship from the date of delivery. Submit two copies of the warranty.

1.7 MAINTENANCE AGREEMENTS

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NOTE: Maintenance agreements are standard practice in the building industry. Under a green lease, when the customer no longer requires the use of the particular product or requires an updated model, the manufacturer is obligated to reclaim it and refurbish it or disassemble it for recycling as appropriate. Coordinate with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

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Collect information from the manufacturer about [maintenance agreement] [green lease] [take back program] options, and submit to Contracting Officer. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse and avoid landfilling and burning reclaimed materials. When such a service is not available through a manufacturer, local recyclers should be sought after to reclaim the materials.

PART 2 PRODUCTS

2.1 MATERIALS

****

NOTE: Use materials with recycled content where appropriate for use. Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying product recycled content requirements. A resource that can be used to identify products with recycled content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

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Provide System Furniture Components with a minimum of 55 percent recycled content. Provide data identifying percentage of recycled content for system furniture components.

Provide certification of indoor air quality for Office Furniture Systems and Seating.

****

NOTE: Adjustments to workstations and workstation componentry such as height adjustable work surfaces

and storage design must be made when ADA-ABA conformance within the workstation is required. Consider the use of existing reconditioned systems furniture when appropriate. The aesthetics and function of all componetry within this specification must be compatible.

****

2.2 SYSTEM DESCRIPTION

2.2.1 Workstations

This specification establishes the minimum requirements for the acquisition and installation of a complete and usable system of workstations composed of panels, freestanding work surfaces or base units, supporting components, electrical hardware, communications, special electrical features, and accessories. Provide workstation requirements and configurations in accordance with the furniture layout and typical workstation types shown in drawings and specified herein. Provide components and hardware from a single manufacturer that are standard products as shown in the most recent published price lists or amendments. Proposed product must be part of the manufacturer's current line with no intent to discontinue within two years. Submit complete listing of part/model numbers for all components to be provided, including names and codes of components referenced on updated drawings. Provide electrical components from a single manufacturer to the extent practicable (different types of components may be of different manufacturers, but all units of a given component must be from a single source). Conformance with NFPA 70, UL 1286, NFPA 101, and 36 CFR 1191 is required. Coordinate the work of this section with that to be performed under other sections. This specification may include items which are not manufactured by the furniture manufacturer; provide any such items under this section. Submit two complete sets of certificates attesting that the proposed workstation meets specified requirements. Date the certificate after the award of the contract, include the name of the project, and list specific requirements being certified.

2.2.2 Samples

Submit samples as required to obtain final approval. The Government reserves the right to reject any finish samples that do not satisfy the technical or color requirements. Work can not proceed without sample approval in writing from the Contracting Officer. Submit four sets of the finish samples listed below:

a. Panel, tackboard and overhead door fabric. Minimum 150 by 150 mm 6 by 6 inches with label designating the manufacturer, pattern, color, fiber content, fabric width, fabric weight, fire rating, and use (panel and/or tackboard).

b. Workstation component finishes. Minimum 60 by 75 mm 2-1/2 by 3 inches with label designating the manufacturer, material composition, thickness, color, and finish.

c. Personal Task lights (Not overhead task lights).

d. Panel glazing. Glazing samples with label designating the material and safety ratings.

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NOTE: Limit mock-up requirement to sizeable projects involving at least 10 workstations or as required for individual projects.

****

2.2.3 Mock-up

Submit a Mock-up of an actual workstation reflecting approved finishes and fabrics. Locate the mock-up installation at [the local dealership][approved off-site location][_____]. Do not order product for the project until the mock-up has been approved. Submit manufacturer's product and construction specifications which provide technical data for furniture system and components specified, including task lighting and illumination performance information. Include adequate information in the literature to verify that the proposed product meets the specification. Review of the mock-up may result in adjustments to the product, layout and finishes. The approved mock-up can be used in installation.

2.2.4 Alternate Design

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NOTE: Minor differences exist among different manufacturer's product. This paragraph pertaining to an "alternate design" was written to not exclude a manufacturer when an equally acceptable solution is proposed.

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Manufacturers who are unable to provide workstations that conform exactly to the furniture layouts and typical workstation types shown in the contract drawings, may submit alternate designs for consideration by the Contracting Officer. Alternate designs must meet or exceed the following criteria. Alternate designs that are submitted but do not meet these criteria will be rejected. In the alternate design provide workstations and components of the same basic size and configuration shown, with only the sizes of the individual components within the workstation changed to meet the standard product of the manufacturer or site conditions.

2.2.4.1 Component Requirements

Provide the types of components or elements as shown on the drawings and as specified in PART 2 PRODUCTS of this specification. Do not reduce the storage capacity, number of workstations accommodated, width of aisles, or workstation configuration.

2.2.4.2 Wiring Configuration

Alternate configurations shall support the circuiting and connection capabilities identified under the provisions pertaining to power distribution of paragraph POWER AND COMMUNICATIONS. Generally any alternate will be acceptable which involves only a variation in size or quantity that exceeds the specified configuration.

2.2.5 Performance Requirements

Panels, frames and frame covers, connection system, work surfaces, pedestals, shelf units, overhead door cabinets, lateral files, locks, accessories, and miscellaneous hardware must meet testing as specified.

ISO 9001 certified manufacturers may perform in-house testing. Manufacturers not ISO 9001 qualified will be required to produce testing by an independent testing laboratory. Component specific requirements are listed in appropriate paragraphs.

2.2.5.1 Selected Components

Workstation conformance to ANSI/BIFMA X5.5 and ANSI/BIFMA X5.6 is required with the following exceptions: Panels, or panel supported components conformance to ANSI/BIFMA X5.6 is required. Representative items will be selected for testing based on worst case situations (i.e., the deepest and widest work surface or shelf). Perform the keyboard drawer or shelf test applying a 19 kg 50 lb load to the center of the keyboard shelf for a period of 5 minutes. Any loosening of attachments or damage to the operation of the drawer or shelf will be cause for rejection.

2.2.5.2 Panel Acoustics

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NOTE: Consider using non-acoustical panels when storage units cover more than half of the panel surface as the acoustical advantage is lost and the non-acoustical unit is less expensive.

Acoustical performance ratings should be based upon the workstation design. While NRC and STC ratings contribute to overall acoustical performance, the acoustical role of panels is relatively minimal in the overall environment when compared to sound absorptive properties of other finish surfaces. Most major manufacturers do not comply with the higher 0.80 NRC and 24 STC without providing their more costly high performance panels. The designer must determine if the additional acoustical performance is worth the added cost to the Government.

Delete paragraph if acoustical panels are not required.

****

Provide acoustical panels with a minimum noise reduction coefficient (NRC) of [0.65] [0.80] [_____] when tested in accordance with ASTM C423 and a minimum sound transfer coefficient (STC) of [14] [20] [24] [26] [_____] when tested in accordance with ASTM E290. Conduct the test on the entire assembled panel, full face area (the complete core, adhesive, decorative fabric, frame and joining components).

2.2.5.3 Panel Glazing

****

NOTE: Curved glazed panels should not be specified since most products utilize an acrylic glazing. Acrylic glazing is not acceptable since it does not meet flame spread and smoke development requirements.

****

Tempered glass must conform to ANSI Z97.1 and ASTM C1048, Kind FT, Condition A, Type I, [Class 1 Transparent] [Class 3 - Light reducing,

tinted or translucent].

2.2.6 Pattern and Color

****

NOTE: Include a reference in Section 09 06 00 SCHEDULES FOR FINISHES or drawings for all items requiring a finish color. This includes, but is not limited to, the following items: Work Surfaces, Storage Units, Tackboards, Erasable Marker Boards, Signage, Slat Tile, Panels, Panel Frames, Screens, Connectors, Trim and Accessories. Specify finish of both sides of panels.

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Provide pattern and color of finishes and fabrics for panel systems, components, and trim [in accordance with Section 09 06 00 SCHEDULES FOR FINISHES] [as shown on the drawings] [_____].

2.3 SYSTEMS FURNITURE

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NOTE: A term sometimes used for the main run of panels distributing the power and data throughout the system is spine wall. For the purpose of this specification, panel systems comprehensively include un-powered, powered, and spine wall panels.

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2.3.1 Panel System Components

Supply aaccessories and appurtenances for a completely finished panel assembly with the system. Provide a system capable of structurally supporting cantilevered work surfaces, shelves, files, overhead cabinets, and other components in the configurations shown on the drawings plus more than one fully loaded component per panel per side. Provide panels that are[tackable][or][capable of accommodating fabric covered tackboards,] [acoustical,] [stackable with a system capable of lowering or raising the overall panel assembly height at horizontal connections by removing or adding panel-frames on-site without disturbing adjacent panel components,] [segmented as designated on the drawings]. [Segments will be field removable from both sides of the panel]. [Provide capability for worksurfaces to attach to the panels in 25 - 50mm 1 - 2 inch increments.] [Provide a spine wall system where electrical and data management will be easily accessible by removable wall covers that can be removed while workstation components are still attached. [Cables must be laid in the system, not threaded through the frame.]] Provide a panel system that is available in a variety of nominal widths and heights as designated on the drawings. Measure heights from the finished floor to the top of the panel. Supply powered and nonpowered panels that are compatible in height. Coordinate panel heights with the HVAC and electrical designs. [Minimum panel thickness is 76 mm 3 inches thick.] [System to have 100 percent off-modular capability with no defacement of any element caused by components when used in an off-modular application. Unique panel frames must not be required for off modular connections.] Submit three sets of Assembly Manuals describing assembly and reconfiguration procedures.

****

NOTE: Specify a finish and fabric for applicable items. Include fabric content, for example: 50 percent Nylon, 50 percent Wool. The designer must verify that fabric content, pattern, and color specified are not proprietary and that several manufacturers can provide a similar product.

Filler trim incurs added cost.

****

2.3.2 Panel Finishes

Provide panels in the following options: [safety glazed,] [open frame,] [tackable fabric,] [acoustical fabric,] [wood veneer,] [marker surface,] [paint,] [slat tile,] [perforated metal,] [_____]. [Frame covers may have different options on either side of the frame.] Exposed panel trim to have a [factory baked enamel or epoxy powder] [wood] finish. [Filler trim will either match the panel trim or be fabric covered to match the panel fabric.] [Do not provide filler trim.] Provide each fabric-faced panel with a seamless width of fabric stretched over the entire face of the panel. The fabric color throughout the installation must be consistent. Curved panels may use adhesives on curved sections. Attach the fabric securely and continuously along the entire perimeter of the panel and allow for easy removal and replacement in the field (with the exception of curved panels). Fabric must be factory installed with [ ] panel fabric content.2.3.3 Raceways

Provide raceways and covers as an integral part of the panel whether powered or nonpowered. Magnet held base covers will not be accepted.

2.3.4 Leveling Glides

Provide precise alignment of adjacent panels and include leveling glides to compensate for uneven floors. Provide quantity and location of leveling glides as recommended by the manufacturer. A minimum 19 mm 3/4 inch adjustment range is required.

2.3.5 Connection System

****

NOTE: Delete "...connection of 2 panels for setting the panels at any angle" if not required. This connection limits sources.

****

Provide connectors which accommodate a variety of configurations as indicated on the drawings to include: a straight line connection of 2 panels (180 degrees), corner connection of 2 panels (90 degrees), T connection of 3 panels (90 degrees), cross connection of 4 panels (all 90 degrees),[angle connection of 2 panels (120 degrees),][and a connection of 2 panels for setting the panels at any angle]. Provide tight connections with continuous visual and acoustical seals. Plastic, painted metal, fabric or wood finish connections are required to match system. Provide connector system that allows removal of a single panel within a typical workstation configuration, without requiring disassembly of the workstation or removal of adjacent panels. Provide for connection of similar or dissimilar heights to include trim pieces to finish the exposed edge. Right angle (90 degree) connections between panels must not interfere with the capability to hang work surfaces and other components on any adjacent panel. Provide, as required, the continuation of

electrical and communications wiring within workstations and from workstation to workstation. Filler posts must be level with the top rail.

2.3.6 Wall Mounted Panels

Use wall-mount components when it is necessary to attach panels or vertical panel-frame assemblies to the building walls. Provide structural support for wall panels as required. Panels and other systems furniture components are not be wall mounted unless they are included in the original design.

2.3.7 Glazed Panel Inserts

Provide safety glass glazed panel inserts in accordance with ANSI Z97.1 and ASTM C1048. Acrylic glazing will not be accepted.

2.3.8 Door Panels

Provide door panels with a rigid metal frame with rails, a threshold, and a [wood] [laminate] [safety glazed] [_____] clad door adaptable to either hand swing. Allow for a 810 mm minimum 32 inch clear opening. Include connectors, hinges, and [brushed chrome] [epoxy powder] [baked enamel] finished ADA compliant door knob or handle.

2.3.9 Sliding Doors

Attach sliding or rolling doors to the panel as shown on the drawings. Provide doors that the direction in which the door slides can be changed in the field. Supply [translucent][_____] door in same width or wider than the opening to be covered. Provide door pulls for each side of door. Door frame to match the panel frame color.

2.4 DESK-BASED SYSTEM

Supply accessories and appurtenances for a completely finished desk-based assembly within the system. Provide a desk-based system that is free-standing, independent of panel system support and capable of structurally supporting work surfaces, shelves, and other components in the configurations shown on the drawings. Provide a variety of nominal widths and depths as indicated on drawings.

2.5 WORK SURFACES

2.5.1 Construction

Construct work surfaces to prevent warpage. [Fully support work surfaces from the panels or support jointly by the panels and supplemental legs, pedestals, or furniture end panels. Use supplemental end supports only under work surfaces when the work station configuration does not permit full support by the panels. Use metal support brackets to support work surfaces from the panels, provide metal-to-metal fitting to the vertical uprights of the panels, vertically adjustable, to lock the work surfaces in place without panel modifications.] [Support work surfaces with legs, pedestals, or furniture end panels.] Abutting work surfaces must line up closely and be at equal heights when used in side-by-side configurations in order to provide a continuous and level work surface. Provide pre-drilled holes to accommodate storage components, pedestals and additional supports in work surfaces, or drill holes at the job site to accommodate these items. Provide work surfaces in sizes and

configurations shown on the drawings. Provide work surfaces in nominal depths of [510 mm 20 inches,][and][610 mm 24 inches,][and][760 mm 30 inches,] plus or minus 50 mm 2 inches, nominal lengths from 610 to 1830 mm 24 to 72 inches, and a nominal thickness from 25 to 45 mm 1 to 1-3/4 inches. [Provide height adjustable work surfaces from 630 to 1040 mm 25 to 52 inches above the finished floor with a [crank-based][mechanical][electrical] control.] Provide [corner,] [peninsula,] [and][counter/transaction] work surfaces as shown on the drawings and include hardware necessary to provide firm and rigid support.[Work surfaces must have 100 percent off-modular capability with no defacement of any element caused by components when used in an off-modular application.][Provide mobile half round table to include casters of which a minimum 2 must be locking[, and table must lock to the adjacent worksurface].]

2.5.2 Finishes

Provide work surfaces with a finished top surface of [high pressure plastic laminate], [veneer] and a smoothly finished underside. The work surface must not be damaged by ordinary household solvents, acids, alcohols, or salt solutions. Provide metal support brackets that match the color and finish of trim. Provide [PVC] [ABS] [laminate] [solid wood] [wood veneer] [synthetic wood] edges

2.6 PEDESTALS

Provide drawer configurations and pedestal height as shown on the drawings. Provide the deepest possible pedestal for each work surface size specified. [Free standing mobile pedestals to include[an attached upholstered seat cushion,][a handle for moving,][and] casters. Mobile pedestals must be load bearing and equipped with counterbalance as standard. Provide appropriate height of mobile pedestal so it can be stored under a standard height worksurface.]

2.6.1 Construction

Provide pedestals and drawers of steel construction[with the exception of drawer fronts]. Securely attach drawer faces to the drawer front.

2.6.2 Finishes

Provide a factory baked enamel finish or powder coated for steel surfaces. Provide [steel][plastic laminate][molded plastic][veneer] drawer fronts.

2.6.3 Drawer Requirements

Pedestals must be field interchangeable from left to right, and right to left, and must retain the pedestal locking system capability. Design pedestals to protect wires from being damaged by drawer operation. Provide pedestals that are [work surface hung,][support work surfaces,][free standing][mobile]. Drawers must stay securely closed when in the closed position and provide each drawer with a safety catch to prevent accidental removal when fully open. File drawers to be provided with full extension ball bearing drawer slides or rack and pinion suspension. File drawers to be provided with hanging folder frames or rails and capable of hanging side-to-side or front-to-back. [Provide dividers with vertical files.]
[Provide box drawers with pencil trays.] [Provide center pencil drawer

and mount under the work surface.]

2.7 STORAGE

Provide storage units in the sizes and configurations shown on the drawings. [Provide task lights under overhead cabinets][and][shelf units]. Depth to accommodate [a standard three ring binder][_____][Panel attached storage is required to have 100 percent off-modular compatibility with no defacement of any element caused by components when used in an off-modular application.]

2.7.1 Shelf Unit Construction

Provide metal construction shelf pan with formed edges. Provide shelf supporting end panels of metal, high density particle board, molded phenolic resin, or molded melamine. Provide relocatable shelf dividers with shelf units.

2.7.2 Overhead Cabinet Construction

Provide metal construction overhead cabinets. Provide doors with a suspension system. [Provide overhead cabinet door that retracts over the top of the cabinet[and is curved].][Provide overhead cabinet door that retracts into the cabinet.] [Provide upmounted overheads.] [Provide sliding doors on overheads.] [Overhead cabinet must be ADA accessible.]

2.7.3 Lateral File[, Vertical File][and Book Case] Construction

Provide units and file fronts, top and end panels of steel construction. File drawers to be provided with full extension ball bearing drawer slides or rack and pinion suspension. File drawers to be provided with hanging folder frames or rails and capable of hanging side-to-side or front-to-back. [Provide dividers with vertical files.]

2.7.4 Personal Storage Tower Construction

Provide personal storage tower and components of steel construction. Height of the unit to be [the same height as the surrounding panels][_____]. The personal storage tower will include one full height wardrobe unit with coat rod, two file drawers, bookcase with two adjustable shelves, [_____] and hinged lockable doors.

2.7.5 Finish

Provide a factory baked enamel or epoxy powder coat finish for shelves, dividers and top dust cover. Provide either a factory baked enamel, epoxy powder coat or laminate finish for shelf supporting end panels. Shelf bottom is required to match end panel color. Provide metal doors with an exterior finish of factory baked enamel and an interior finish of factory baked enamel or epoxy powder coat. Provide a factory baked enamel finish or epoxy powder coat on metal drawers. [Provide a wood veneer surface on [overhead cabinets] [pedestals] [book cases] [towers],[and] [lateral files].]

2.8 ACCESSORIES

2.8.1 Coat Hook

Provide one mounted coat hook per workstation.

2.8.2 Keyboard Tray

Provide work surfaces that are capable of accepting an articulating keyboard in locations as shown on the drawings. The keyboard tray must be capable of fully recessing under the work surface and extending to give the user full access to the keyboard. Provide height adjustability, 180-degree swing side travel rotation and negative tilting capability. Include a wrist support and a mouse pad at the same level as the keyboard tray to accommodate either right or left-handed users.

2.8.3 Tackboards

Fabric must be factory installed. Provide [ ] fabric content of tackboards. Location and size [as shown on the drawings][_____].

2.8.4 Erasable Marker Boards

Provide marker boards with a white writing surface that can be easily written on and erased and unaffected by common marker board cleaning/conditioning agents. Include a storage tray and minimum two markers with the markerboard. Size and location [as shown on the drawings][_____].

2.8.5 Paper Management Unit

Provide paper management units as indicated [on the drawings] [_____]. Construct these units of coated steel or injection molded plastic to accommodate either legal or letter size lengths.

2.8.6 Wall Mounted Components

Provide wall tracks when components are shown attached directly to wall surfaces. Provide tracks of heavy duty extruded metal with finish and color matching the the panel trim. Provide vertically aligned tracks slotted on 25 mm 1 inch centers in heights required that match slot spacing for components.

2.8.7 CPU Holder

Provide a mounting to support the computer hard drive. Desk top and floor locations are not acceptable.

2.8.8 Signage

Provide [panel mounted][_____] signage composed, at a minimum, of aluminum frame, back panel, clear plastic cover, and hanging device. Provide signage approximately[76 by 203 mm 3 by 8 inches][_____] and capable of receiving a replaceable [standard white][_____] paper insert. Match [_____]text type.[Include name of occupant on signage for each workstation with names provided by customer prior to installation [_____].][Provide software for creating text in PC computers for owner production of replacement paper inserts after project completion.]

2.8.9 Slat Tile

Provide slat tile with channels to accommodate attachments such as monitor arm, task light and organizer accessories. Provide maximum slat tile height of [_____] and a length [as shown on the drawings][_____]. Slat

tile must be integral to the panel and not attached to the surface of the panel. [Provide slat tile that is able to support the weight of two monitor arms and two flat panels simultaneously.]

2.8.10 Monitor Arm

Provide monitor arm that allows 360 degree monitor rotation for portrait and landscape viewing, and 60 degree range of lateral and vertical monitor tilt for additional viewing adjustability. Provide monitor arm that supports monitors weighing[3 to 8 kg 7 to 19 lbs][_____]. [Provide [dual monitor arm for 2 screens] [ ].] Mount monitor arm on [slat walls][work surface].

2.9 MISCELLANEOUS HARDWARE

Provide brackets, supports, hangers, clips, panel supported legs, connectors, adjustable feet, cover plates, stabilizers, and other miscellaneous hardware that contribute to a complete and operable furniture system.

2.10 LOCKS AND KEYING

****

NOTE: The quantity of different key operations required is dependent on the size of the project. The number specified should not exceed the total quantity of workstations. The maximum quantity utilized should not exceed 150.

****

Provide [overhead cabinets,][vertical files,][personal storage towers,] pedestals and lateral files with keyed locks, unless otherwise noted. Provide field changeable lock cylinders with a minimum of [100] [_____] different key options. Key each workstation individually, and key locks alike within a workstation. Provide lockable drawers within a pedestal either by a central lock that controls all pedestals under one work surface or an individual keyed lock in each pedestal. Key alike central file and storage units which are grouped together but are not a part of a workstation unless otherwise specified. Provide two keys for each lock or two keys per workstation when keyed alike, and provide three master keys per area as indicated. Number keys and lock cylinders for ease of replacement. Clearly label locks with a key number, except for those manufacturers who have removable format locks. [Provide door panels withkeyed [door knob][_____] set.]

2.11 POWER AND COMMUNICATIONS

****

NOTE: It is recommended that the type of cabling assembly (wiring, harnesses, or buses) be left as a Contractor selection unless it is necessary to restrict for compatibility with existing equipment.

Furniture designer shall coordinate with the building power designer to select a systems furniture power distribution wiring system which aligns with the circuit quantities provided to the furniture and satisfies the ASHRAE 90.1 Automatic Receptacle Control requirements. The quantity of receptacles required to be integral for each

furniture type should be determined to allow for consistent automatic control of supply circuits for typical furniture of a given type. See additional designer notes within Paragraph 1.3.4 "Detail Drawings" of this specification.

****

Provide both powered and nonpowered panels with base raceways capable of distributing power circuits, [communication cables] [and] [data lines]. Provide nonpowered bases that are capable of easy field conversion to powered base without requiring the panel to be dismantled or removed from the workstation. [Provide panels able to support lay-in cabling and having a large capacity for power and data. Provide ample space for storing excess wires and fiber optic cables in the interior of the spine wall frame. Provide easy access to power and data systems in the spine wall without having to move return panels or components. Provide the ability for the spine wall system to supply power to a wall-attached panel system and/or an adjacent desk system. A termination center or utility closet may be utilized in the wall or at the end of a panel run.] Provide copper [cable assemblies,] [wiring harnesses][or][electrified bus] for the system and meet the requirements of UL 1286 and NFPA 70, Article 605. Provide conductors with 20 amp [90] [75] degree C, #12 AWG wires (unless indicated otherwise) or the equivalent in the bus configuration. A single circuit must not serve more than four (4) cubicles or workstations under any circumstances. The label or listing of Underwriter's Laboratories, Inc. will be accepted as evidence that the material or equipment conforms to the applicable standards of that agency. In lieu of this label or listing, submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures of UL and that the materials and equipment comply with contract requirements. Electrical work not addressed in this section must conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.1 Panel Raceways

****

Coordinate raceway locations with workstation components such as overhead storage units.

****

Provide panels that have hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Place raceways in locations such as the base, beltline, and below and above the beltline. The raceway must not extend past either [panel face] [frame cover] by more than 13 mm 1/2 inch. Provide metal or plastic covers which attach securely to the raceway as required and match the finish and color of the panel trim. Provide a minimum of 2 knockouts (doors) per side for power receptacles and communications jacks as indicated in raceways [in full size over 610 mm 24 inches powered panels] [on panel frames]. Provide other raceways that are flush with [panel face][frame covers].

2.11.2 Power Distribution

****

NOTE: The 8-wire system is currently the most common system utilized for applications serving mixed loads including electronic data processing

equipment. This is available in several configurations from which to choose. Since EDP equipment generates high levels of harmonics (* see footnote below), a full size neutral should be provided for each EDP circuit. Alternately, it is recommended that the phase conductor not be loaded to more than 12A or that an oversized neutral be specified. To minimize interference from electronic noise to sensitive data processing components, the EDP equipment should be placed on the dedicated circuits.

In the absence of other criteria, use of an isolated ground conductor is not recommended for the EDP circuits (See IEEE Std. 1100). If the amount of EDP load is extensive and the conventional load is minimal, a modified 8-wire system should be provided.

Non-linear loads such as computers, copiers, laser printers, electronic lighting ballasts, and uninterruptible power supplies cause harmonic distortion on power distribution systems. The majority of workstation loads are non-linear, harmonic producing loads. Designers must ensure that the building power distribution equipment can support these non-linear loads. IEEE 519 and 1100 provide details concerning the causes, effects, and means of compensation for non-linear, harmonic producing loads on power systems. Harmonic compensation may include, but is not limited to: specifying harmonic-mitigating transformers, derating transformers, oversizing neutrals to 200 percent of the ampacity of the phase conductors or phase bus, using phase conductors and terminals with higher ampacities and/or higher temperature ratings, supplying non-linear loads from dedicated isolation transformers, and installing shunt filters. See UGGS-16415A for further guidance. Refer to UFC 3-501-01 for discussion on non-linear loads.

Surge suppression and power conditioning receptacle modules are available. However power conditioning for specific loads (particularly portable equipment) is normally a User responsibility and is not provided as part of the construction contract. The Air Force has identified specific responsibilities of the user and suppliers of end-use equipment. (See Air Force ETL 89-6 for specific criteria or verify specific requirements for electrical support.)

****

Provide power distribution as indicated on the drawings. Provide an internal [power][and][communications] raceway and the capability of disconnecting and connecting external circuits to the electrified raceway in the panel. Capacity for at least [six][twelve][twenty] 4-pair category 6 cables is required for the communications receiving raceway. Power and communications wiring may share a common wireway if a metal divider is included to ensure electrical isolation. Provide doors or access openings

for entry of communications cable. Provide the electrified power raceway for the [10-wire][8-wire][6-wire][or][5-wire] configuration indicated.[Unless otherwise indicated, allocate conductors of the 8-wire system as follows: the three-phase system will have one equipment ground, one isolated ground, [one neutral] [one oversized (133 percent minimum) neutral], and two each dedicated phase.][Unless otherwise indicated, allocate conductors of the 8-wire system as follows (4-2-2 shared neutrals, 2+2): the three-phase system will have one equipment ground, one isolated ground, two oversized (133 percent minimum) neutral, and four phase conductors; each neutral will be used by two phase conductors, no neutral conductor will be connected to multiple phase conductors of the same phase, and no ground conductor will be on the same circuit as two phase conductors from the same phase; circuits sharing a given neutral conductor will share the same ground conductor.][Unless otherwise indicated, allocate conductors of the 8-wire system as follows (4-2-2 shared neutral plus dedicated circuit, 3+1): the three-phase system will have one equipment ground, one isolated ground, two oversized (133 percent minimum) neutral, and four phase conductors; one neutral will be dedicated to a single phase conductor, one neutral will be shared by three phase conductors, and no neutral conductor will be connected to multiple phase conductors of the same phase; the isolated ground conductor will use by the circuit with the dedicated neutral conductor and the equipment ground conductor will use by the circuit with the shared neutral conductor.]
[Unless otherwise indicated, allocate conductors of the 8-wire system as follows (3-3-2 independent neutrals, 2+1): the three-phase system will have one equipment ground, one isolated ground, three neutral, and three phase conductors; one neutral will be dedicated to each phase conductor; the isolated ground conductor will use by one circuit and the equipment ground conductor will use by the other two circuits.]
[Unless otherwise indicated, allocate conductors of the 10-wire system as follows (6-2-2 shared neutrals, 3+3): the three-phase system will have one equipment ground, one isolated ground, two oversized (133 percent minimum) neutral, and six phase conductors; each neutral will be shared by three phase conductors and no neutral conductor will be connected to multiple phase conductors of the same phase; circuits sharing a given neutral conductor will share the same ground conductor.]
[Unless otherwise indicated, allocate conductors of the 10-wire system as follows (4-4-2 independent neutrals, 3+1): the three-phase system will have one equipment ground, one isolated ground, four neutral, and four phase conductors; one neutral will be dedicated to each phase conductor; the equipment ground conductor will be shared by three circuits, the isolated ground will be dedicated to the other circuit, and no ground conductor will be on the same circuit as two phase conductors from the same phase.]
[Unless otherwise indicated, allocate conductors of the 10-wire system as follows (4-4-2 independent neutrals, 2+2): the three-phase system will have one equipment ground, one isolated ground, four neutral, and four phase conductors; one neutral will be dedicated to each phase conductor; one ground conductor will be shared by two circuits, the other ground will be shared by the other two circuits, and no ground conductor will be on the same circuit as two phase conductors from the same phase.]

2.11.2.1 Receptacles

****

NOTE: 15 AMP receptacles are the current industry standard. If 20 amp receptacles are required, the channel depth for the receptacle may have to be increased. Coordinate with the panel wall thickness.

****

Provide power receptacles in the powered panels. Place devices at the locations indicated on the plans connected to the designated circuits. [Electrical power receptacles and communications jacks should have the ability to be hung at [200 mm 8 inch] [multiple] [_____] vertical increments throughout the frame via power harnesses.] Unless otherwise indicated, receptacles must be [15 amp (NEMA 5-15R)] [20 amp (NEMA 5-20R)] commercial grade conforming to NEMA WD 1 and NEMA WD 6. Provide 10 percent spare devices of each type shown on these plans if receptacles are not interchangeable or will not permit field adjustment of phase and circuit selection. [All][General use] receptacles are required to be of the duplex configuration; unless otherwise indicated, special use receptacles are required to be of the simplex configuration with the blade/pin arrangement identified on the plans. Coordinate the color of receptacle bodies with the color of the panel trim. Isolated ground receptacles must [be orange] [or] [have distinct markings][be of a different color than other receptacles]. Furniture receptacles whose building power supply circuit is controlled by an energy management system, timer, or some other automatic means or are provided with local automatic control, will be identified using the standard symbol shown in NFPA 70 Figure 406.3(E); each outlet on a multi-outlet receptacle shall be identified individually. Provide field applied identification that is permanent; stick-on or non-setting adhesives are not acceptable. Provide [5][_____] percent spare devices for each configuration and type of receptacle. Provide a minimum of [5][_____] receptacle removal tools for systems that require special tools for proper receptacle removal.

2.11.2.2 Power Cabling Variations

The paragraph Power Distribution has identified specific cabling configurations. Since universal conventions have not been established, variant configurations available from various manufacturers will be considered. Alternates shall allow the same circuiting, device connections, neutral and ground separation, and upstream feeder connections as shown on the plans. See paragraph ALTERNATE DESIGN. An example of an acceptable variation includes the use of a manufacturer's configuration which allocates individual conductors differently, but which has the same quantity of conductors and allows devices to be physically connected in the field as shown on the plans. It is not necessary that the manufacturer's labeling codes or terminology match the designations used on project plans or in the specifications; however, neutrals and grounds shall have insulation color coded per standard practice or be provided with tags, colored tape, colored ribbons or similar identification. (The reference to "dedicated" conductors in this specification pertains to circuit connections upstream and load connections downstream of panels; it is not necessary that manufacturer's designations correspond.)

2.11.3 Electrical Connections

****

NOTE: The direct wired configurations should be suitable for most applications. All wiring should be contained within raceways or wireways. The exposed cord/plug arrangement should not be used, unless specifically requested by the user. If used, ensure that the design conforms to the limitations of Article 605-8 of NFPA 70.

Code-enforcing personnel in some areas require separate hard wired junction box interfaces from building services to furniture system installations. If the facility will be under their jurisdiction, the design must conform and the junction box configuration must be provided in lieu of the direct wired. If the facility will not be under local jurisdiction, the direct wired configuration could be provided per User request; however, it is preferred that the Government design be consistent with local practice. If top entry service poles are used for power interfacing, the junction box configuration is preferred for all locations.

****

2.11.3.1 Internal Connections

****

NOTE: Some local codes require hardwired connections with the panels. If local codes are to be followed, this item will need to be verified.

****

Utilize [straight or flexible plug/receptacle connector assemblies] [hardwired connections] for internal panel-to-panel power connections and provide the powered configurations shown on the drawings.

2.11.3.2 Connections to Building Services

Supply external [power][and][communications] services to the panels via [direct-wired [top][base] entry modules.][hard wired [top][base] entry junction box assemblies.][Extend wiring from building services to the entry modules or panel bases in metal conduit or tubing or in flexible liquidtight conduit 1830 mm 6 foot maximum.][Extend wiring from building services to junction box assemblies in metal conduit or tubing. Provide wiring from junction boxes that is flexible liquid-tight conduit 1830 mm 6 foot maximum or in metal conduit or tubing.] Do not use cord and plug assemblies for any portion of external links.[Provide base feed modules that plug into the end or either side of the raceway at receptacle doors.][Top entry [modules][junction box assemblies] are required to extend the [power][and][communications] wiring into service entry poles attached to the electrified panels.] External wiring must conform to Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.4 Wire Management

Provide wire management capability at all workstations and accommodate all cable types specified, including the applicable manufacturer required bending radius at corners. Design raceways and interfaces to the raceways to accommodate the bend radius as shown in TIA-569 for Category [6][6A][7][_____][and][fiber optic cables] communication wiring [whichever is greater]. Copper and fiber cabling shall meet the requirements of Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM. The capability may be accomplished by cable access cutouts (1 minimum per work surface), covered wire management troughs in vertical end panels, horizontal wiring troughs, internal midpanel (beltline) raceways,

or rear gaps (between the back edge of the work surface and the facing support panel). Provide grommet kits or another suitable finish arrangement for all cable cutouts. Provide accessories for an externally mounted vertical and horizontal wire management and concealment system [as indicated on the contract drawings] [as recommended by the manufacturer]. Supply horizontal wire managers for mounting under all work surfaces. Attach the wire managers either to the underside of the work surface or to the vertical panel without damaging the face. Exposed or loose wiring will not be acceptable. Wire managers must be prefinished and secure, conceal, and accommodate outlet cords as well as electrical and communications wiring. Wire channels are required to match color of panel trim, attach by means of clip-on attachment, and conceal wires routed vertically. Separate power wiring from communication wiring by use of separate raceways or by placement of channels in joint use troughs or wireways.

2.11.5 Circuit Layout

Provide the circuit layout for workstations on the drawings. Connect devices to the designated circuits in the neutral, ground, and automatic control configurations indicated. Connections must be made to the building electrical distribution system as shown on the contract drawings and in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.6 Service Entry Poles

****
NOTE: Coordinate requirements with paragraph Power Distribution. Power and communications separation is required if the power is not in any metallic conduit when run in the pole or channel.
****

Provide service poles, as indicated on the contract drawings, and capable of minimally accommodating the [8-wire][10-wire][_____] power configuration and the equivalent of [six][twelve][twenty] 4-pair category 6 cables.[Poles musthave metal barriers or channels to separate power and communications wiring.] Pole dimensions can be equal to maximum panel thickness. Designated poles are required to have the capability of being opened along the vertical access to permit the lay-in of wiring. Provide each pole with a wiring interface, an end cap and a ceiling trim plate which extends a minimum of 40 mm 1-1/2 inches from all sides of the pole. Include a junction box either as part of the pole assembly or in a field installed configuration with poles for power service. Service poles must be securely attached to the panels and installed plumb. Provide wiring and interface components as required to connect the building power supply to power poles.

2.11.7 Task Lighting

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NOTE: Coordinate with electrical engineer to comply with LED and task lighting guidance in UFC 3-530-01 Interior and Exterior Lighting Systems and Controls. The decision to use linear fluorescent or LED task lighting shall be based on a life-cycle cost analysis.
****

Provide task lights with [linear fluorescent lamp][light emitting diode (LED) technology] to include a built-in reflector and shielding device that prevents direct glare into an occupant's eyes when they are in a typical working position. [Provide adjustable arm task lights with adjustable, fully articulated and balanced head and arms, minimum 254 mm 10 inch adjustable arm range, linear, circular, or compact fluorescent lamp technology, cord set for plug in, built in reflector, that is [panel mounted][desk mounted][freestanding][_____].] Provide task light size and placement on the contract drawings. It is required that lights be a standard component of the manufacturer's workstation products, and the ends of the task light length can not extend beyond the edges of the overhead cabinet. Enclose task light power cords within vertical wire cover or clips. Luminaires shall be UL approved for use in the configurations indicated on the drawings.Provide task lighting that is Energy Star labeled. Provide data identifying Energy Star label for task lighting.

2.11.7.1 Luminaire Configuration

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NOTE: The lamp and ballast/driver types should be indicated on the drawings. Ballast and driver technical requirements are covered in Section 26 51 00 INTERIOR LIGHTING. When used, the electrical design must consider the harmonics and electromagnetic energy generated by these ballasts/drivers. Specific areas which shall not have electronic ballasts/drivers are medical electronic equipment areas and areas equipped with infrared remote control or security devices. It is important to inform Users of the benefits and risks of electronic ballasts/drivers and to involve them in the decision regarding their use.

****

Provide luminaires and lamps as specified in Section 26 51 00 INTERIOR LIGHTING and modified herein. For undershelf or undercabinet lighting, provide luminaires that are [linear fluorescent lamp][light emitting diode (LED)] type and have prismatic lenses, baffles, or other shielding device configured to minimize glare by shielding the lamp from view of the seated user.[For adjustable arm task lights, provide luminaires that are linear, circular, or compact fluorescent lamp or LED type and have prismatic lenses, baffles, or other shielding device configured to minimize glare by shielfing the lamp from view of the seated user.] For fluorescent-type luminaires, provide built-in reflectors. Provide task lights for each workstation with a minimum of [[810][650] lx][[75][60] footcandles] of light (horizontally measured) without veiling reflections, on the work surface directly below and a maximum of [500mm][20 inches] from the luminaire. Easily removable diffusers, grilles, or other coverings are required to allow for cleaning and relamping.[Use F32T8 lamps in [1220 mm][4 foot] units for fluorescent-type task lighting.][For LED-type task lighting, power consumption shall not exceed 8 watts per foot.] Correlated Color Temperature (CCT) of task lighting shall match the CCT of the ambient room lighting. Provide an easily accessible on-off switch and one ballast or driver per luminaire. A variable intensity control is acceptable if the low setting is equivalent to "off" with zero energy consumption. Multiple level switching is also acceptable.[For fluorescent type technology, do not use ganged luminaires or shared ballasts.][For LED type technology, ganged luminaires or shared drivers

are permitted for up to 4 continuous feet in length. A single driver designed for use with an individual LED housing of greater than 4 feet in length is allowed.]

2.11.7.2 Wiring

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NOTE: If the facility will be under the jurisdiction of a city code, verify requirements. Some locations require hard wired connections.
****

Provide each luminaire with a 1830 mm 6 foot minimum, factory installed, heavy duty electrical cordset with a grounded plug for luminaries that are mounted on the same wall as the receptacle. Provide luminaires mounted on non-powered wall with a 2743 mm 9 foot minimum, factory installed heavy duty electrical cordset with a grounded plug. Direct or hard wire connections are not acceptable. Unless otherwise indicated, conceal cord. Built-in cord concealment is required within panels or utilize field installed, manufacturer approved accessories. Cords may be extended through dedicated channels located at any point within panels or may be placed in vertical slots or in the space between panels if held in place by retainers and concealed by a cover plate. Vertical wire managers are required to be prefinished and cut to size and shall extend from the task light level down to the top of the work surface below the task light. Attach each manager to a panel vertical edge or connector strip without damage to the surfaces.

2.11.7.3 Control Device

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NOTE: Coordinate with the appropriate version of ASHRAE 90.1 to comply with the requirements for task lighting control. For ASHRAE 90.1-2007, the requirements are found in Paragraph 9.4.1.4.d. For ASHRAE 90.1-2010, the requirements are found in Paragraph 9.4.1.6.d. For ASHRAE 90.1-2013, the requirements are found in Paragraph 9.4.1.3(c). Coordinate with the electrical engineer.
****

[Provide task lighting with an automatic shutoff control device integral to the luminaires.][Provide occupancy sensors with "manual ON", "automatic OFF" controls for luminaire control.][For furniture with automatically-controlled building supply power circuits, task lighting shall be connected to an automatically-controlled circuit.][Provide task lighting with a manual ON/OFF switch.]

2.11.8 Communications

Communications wiring will be extended to, and installed in, the electrified panels as shown on the plans. Install communications jacks at designated locations.[Provide a communication consolidation point at the end of the cubicle. The consolidation point will consist of a [24][48] port patch panel that is rated for Category [6][6A][7]. The panel that covers the consolidation panel is required to be lockable with all locks keyed alike. These locks must not be keyed the same as any other item associated with the workstations.] Communications work may be performed in conjunction with the installation of workstations or may be separately

executed at the Contractor's option; however, equipment, materials, and installation must conform to the requirements of [Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM] [Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM][_____], and properly coordinate all interfaces.

2.11.9 Special Systems

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NOTE: Include this paragraph only in projects where requirements for shielded facilities (TEMPEST, Red/Black, EMP, etc.) and secure wiring have been called out in project criteria. Specific requirements for cable arrangement, separation of Red/Black lines, etc., need to be verified for each project. Provide metal raceway, channels, etc. throughout. Separation distances required for exposed cable or wiring in nonmetallic raceways are much greater than for wiring installed in totally enclosed metal raceway. Site specific details and/or notes should be prepared for each project.

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Provide management for secure and nonsecure power, computer and telecommunications cabling through designated raceway systems. Separate secure distribution from nonsecure distribution [in accordance with details shown on the plans][by running secure lines along top located raceway and nonsecure along the bottom of the workstation panel].

PART 3 EXECUTION

3.1 INSTALLATION

Install the workstations using certified installers in accordance with manufacturer's recommended installation instructions. A licensed electrician is required to hardwire the workstations. Install workstation components level, plumb, square, and with proper alignment with adjoining furniture. Securely interconnect and attach components to the building where required. Provide three sets of special tools and equipment necessary for the relocation of panels and other components. Verify that equipment is properly installed, connected, and adjusted.

3.2 CLEANING

Provide cleanup as specified in Section 01 78 00 CLOSEOUT SUBMITTALS. Upon completion of installation, clean and polish all products and leave the area in a clean and neat condition. Any defects in material and installation are required to be repaired, and damaged products that cannot be satisfactorily repaired are required to be replaced. Submit three sets of Maintenance Manuals describing proper cleaning and minor repair procedures.

-- End of Section --