# DIVISION 12

# FURNISHINGS

# SECTION 12210
# WINDOW BLINDS

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This Section includes horizontal louver blinds.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Finish Carpentry" for wood blocking and grounds for mounting horizontal louver blinds.
2. Division 8 Sections for window walls with horizontal louver blinds mounted on window frames.
3. Division 8 Sections for windows with horizontal louver blinds mounted on window frames.
4. Division 9 Section for roller shades as an alternative to window blinds.

### 1.02 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of horizontal louver blind specified. Include printed data on physical characteristics.

C. Shop drawings showing location and extent of blinds. Show installation details at and relationship to adjoining work. Include elevations indicating blind units. Indicate location of blind controls.

D. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare samples from the same material to be used for the Work.

1. Louver and Valance: Manufacturer's standard-size unit, not less than 300 mm long.

E. Schedule of horizontal louver blinds using same room designations indicated on Drawings.

F. Maintenance data for horizontal louver blinds to include in the operation and maintenance manual specified in Division 1. Include the following:

1. Methods for maintaining horizontal louver blinds and finishes.
2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

### 1.03 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide horizontal louver blinds identical to those tested for the following fire-test-response characteristics as determined by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Test Method: NFPA 701.
2. Rating: Pass.

B. Single-Source Responsibility: Obtain each type of horizontal louver blind from one source and by a single manufacturer.

C. Mockups: Prior to installing horizontal louver blinds, construct mockups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
   1. Locate mockups on-site in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's acceptance of mockups before start of final unit of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. When directed, demolish and remove mockups from Project site.
      b. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.04 PROJECT CONDITIONS

A. Field Measurements: Check actual horizontal louver blind dimensions by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Enclosure and Environmental Limitations: Do not install horizontal louver blinds until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

## 2.00 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Horizontal Louver Blinds:
      a. Hunter Douglas, Inc.
      b. Levolor Corp.
      c. Vimco, Inc.

B. Products: Subject to compliance with requirements, provide one of the products specified in each Product Data sheet at the end of this Section.

2.02 HORIZONTAL LOUVER BLINDS

A. Louvers: Manufacturer's standard as follows:
   1. Aluminum.
   2. Nominal Louver Width: 25 mm (miniblinds).
   3. Distance between rungs: 19.6mm

4. Slat thickness (after painting): .22mm

B. Tilt Operation: Manual with wand.
1. Length of Tilt Control: half length of blind.
2. Position of Tilt Control: Left side, unless field conditions limits access to control.
3. Tilt: Limited.
a. Angle: 60 degrees from horizontal.

C. Cord-Lock Operation: Top-locking cord lock; locks pull cord to stop blind in either fully opened or fully closed position only and is equipped with a ring pull not more than 250 mm long.
1. Position of Cord Lock: Right side, unless field conditions limits access to control.

D. Cord Equalizers: Self-aligning to maintain horizontal louver blind position.

E. Valance: Match color of louvers.

F. Mounting: ON WINDOW SYSTEMS SUPPORT OR IN BLIND POCKET. REFER TO ARCHITECTURAL DRAWINGS

G. Colors and Patterns: Where manufacturer's standard products are indicated, provide horizontal louvers complying with the following requirements:
1. White or Gray wth matte finish, Architect's selections from manufacturer's range of colors and patterns for horizontal louver blinds of type indicated.

2.03 FABRICATION

A. Product Standard and Description: Comply with AWCMA Document 1029 for each horizontal louver blind unit consisting of louvers, rails, cord locks, tilting mechanisms, tapes, and installation hardware.

B. Lifting and Tilting Mechanisms: Noncorrosive, self-lubricating materials.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 23 deg C:
1. Blind Units Installed Between (Inside) Jambs: Width equal to 6 mm per side or 12 mm total, plus or minus 3 mm, less than jamb to jamb dimension of opening in which each blind is installed. Length equal to 6 mm, plus or minus 3 mm, less than head to sill dimension of opening in which each blind is installed.

D. Installation Fasteners: Not less than 2 fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; support blind units under conditions of normal use.

E. Hold-Down Brackets: NON PLASTIC FROM Manufacturer's standard, as indicated.

## 3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of horizontal louver blinds. Do not proceed with installation until unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

A. Install blinds level, plumb, and located so exterior louver edges in any position are not closer than 25 mm to interior face of glass lites.

1. Flush Mounted: Install blinds with louver edges flush with finish face of wall OR MULLION.

## 3.03 ADJUSTING

A. Adjust components and accessories for proper operation.

B. Provide Owner with maintenance and cleaning instructions.

## 3.04 CLEANING

A. Clean blind surfaces, according to manufacturer's instructions, after installation.

B. Remove surplus materials, packaging, rubbish, and debris resulting from installation. Leave installation areas neat, clean, and ready for use.

## 3.05 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensure that horizontal louver blinds are without damage or deterioration at the time of Substantial Completion.

## HORIZONTAL LOUVER BLIND SCHEDULE

A. General: Provide horizontal louver blinds to comply with requirements in this Section and with the following schedule of blinds:

WT-1 Horizontal Louver Blind Designation:

a. Color: White or Gray with matte finish . Architect to select from manufactures standard colors.

b. Blind Location: On the interior of all exposed exterior glazing, excluding public areas on the ground floor and second floor. The first and second floor Lobby areas, Corridor spaces do not receive any window treatment.

c. Location of Tilt Control: Left side, unless otherwise indicated.

d. Location of Cord Lock: Right side, unless otherwise indicated

e. Mounting: Ceiling and ceiling pocket. As indicated refer to Architectural drawings.

*END OF SECTION 11210*

# SECTION 12352
# METAL LABORATORY CASEWORK

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. THIS SECTION INCLUDES

1. Steel casework.
2. Table frames.
3. Work surfaces.
4. Sinks and outlets.
5. Service fittings.
6. Accessory equipment.

B. RELATED SECTIONS

1. Division 16 "Interior Distribution System", for electrical receptacles, switches, boxes and raceways.
2. Section 09651 Resilient Tile Flooring and 09652 Resilient Sheet Flooring, for resilient bases at casework.
3. Section 12353 Adaptable Laboratory Casework System.
4. Section 15451 COMMERCIAL PLUMBING FIXTURES, for sink traps and final piping connections to sinks, liquid faucets and eyewash.

### 1.02. UNDIVIDED RESPONSIBILITY

Unless specified otherwise for individual products, casework, worktops and accessories shall be manufactured or furnished by a single laboratory casework manufacturer. Laboratory fume hoods must be fully integrated with casework as shown on drawings and should be furnished by the same laboratory casework company.

### 1.03 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

Furnish liquid faucets and gas outlets to plumbing subcontractor for installation.

### 1.04 QUALITY ASSURANCE

A. REFERENCES AND STANDARDS

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

| | |
|---|---|
| ANSI Z535.1 | (2006) Standard for Safety Color Code |
| ANSI Z97.1 | (2004) Safety Glazing Materials Used in Buildings |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A 240/A 240M | (2007e1) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and |

| | |
|---|---|
| | Strip for Pressure Vessels and for General Applications |
| ASTM C 1036 | (2006) Standard Specification for Flat Glass |
| ASTM C 1048 | (2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 30 | Latest version, Flammable and Combustible Liquids Code |

SCIENTIFIC EQUIPMENT AND FURNITURE ASSOCIATION (SEFA)

| | |
|---|---|
| SEFA 8 | Latest version, Laboratory Furniture, Casework, Shelving and Tables, Recommended Practices |

## 1.05 DESIGN AND PERFORMANCE CRITERIA

A. Flush Overlay Construction

Surfaces of doors and drawers and shall overlay the cabinet ends top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall be concealed behind drawer and door fronts

B. Face Frames

Front width of end panels 3/4 inch. Front height of top and bottom members 1 inch.

C. Self-Supporting Units

Completely welded shell assembly without applied panels at ends, backs or bottoms. Cases shall be interchangeable or as a single, stand-alone unit.

D. Interior of Case Units

Easily cleanable, flush interior. Base cabinets with double swinging doors shall provide full access to complete interior without center vertical post.

E. Drawers

Modular sizes for interchange to meet varying storage needs. Design to be easily removable without use of special tools.

F. Case Openings

Rabbet shape joints all four sides of case opening for hinged doors and two sides for sliding doors.

G. Framed Glazed Doors

Identical in construction, hardware and installation to solid panel doors. Design frame glazed doors to be removable for glass replacement.

H. Access

Provide removable backs as specified under Part 2 where access is required to utility chases.

I. Structural Performance

Casework components shall support the following minimum loads without damage or impediment to operation:

1. Base Unit Load Capacity: 744 kg per meter (500 lbs. per lineal foot).
2. Suspended Units: 446 kg per meter (300 lbs. per lineal foot).
3. Cabinet Drawers: 223 kg per meter (150 lbs. per lineal foot).
4. Utility tables (4 legged): 446 kg per meter (300 lbs. per lineal foot).
5. Hanging wall cases: 446 kg per meter (300 lbs. per lineal foot).
6. Load capacity for shelves of base units, wall cases and tall cases: 149 kg per meter (100 lbs. per lineal foot).

## 1.06 METAL FINISH PERFORMANCE

A. Chemical Resistance

Chemical resistance performance of the urethane powder coating shall match Fisher Hamilton's published ratings (Appendix E.1 dated 09/98) for each of the reagents listed for each of the various colors tested.

B. Abrasion Resistance

Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester No. E40101 with 1000 gm wheel-pressure and Calibrase No. CS10 wheel.

C. Hardness

Surface hardness equivalent to 4H or 5H pencil.

D. Humidity Resistance

Withstand 1000 hour exposure in saturated humidity at 100 degrees F.

E. Moisture Resistance

1. No visible effect to surface finish after boiling water trickled over test panel inclined at 45 degrees for five minutes.
2. No visible effect to surface finish following 100 hour continuous application of a water soaked cellulose sponge, maintained in a wet condition throughout the test period.

F. Adhesion

Score finish surface of test panel with razor blade into 100 squares, 1/16 inch by 1/16 inch, cutting completely through the finish but with minimum penetration of the substrate, and brush away particles with soft brush. Minimum 95 squares shall maintain their finish.

G. Salt Spray

Withstand minimum 200 hour salt spray test.

## 1.08 EPOXY RESIN WORK SURFACE PERFORMANCE

Chemical resistance performance of epoxy resin work surfaces (black) shall match Fisher Hamilton's published ratings (Appendix A.1 dated 07/98) for each of the reagents tested.

## 1.09 SOLID PHENOLIC LABORATORY TOPS PERFORMANCE

Chemical resistance performance of solid phenolic laboratory work surfaces (black) shall match SEFA 8 published ratings for each of the reagents tested.

## 1.10 SUBMITTALS

A. Shop Drawings – Casework

1. Provide 1:25 metric scale elevations of individual and battery of casework units, cross sections, rough-in and anchor placements, tolerances and clearances. Indicate relation of units to surrounding walls, windows, doors and other building components.

2. Provide 1:50-metric scale rough-in plan drawings for coordination with trades. Rough-in shall show free area.

B. Product Data

1. Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.

2. Include - Casework Materials; Hardware; Table Frames; Work Surfaces; Strut Framing System; Sink; Cup Sink; Mechanical Service Fixtures; Storage Cabinets.

C. Samples

1. Finishes and Colors Range; G

2. Finish and color samples, fittings, countertops, hardware and other samples to the extent requested at no cost to the AE or Government.

D. Test Reports - submit independent laboratory certified test reports verifying conformance to test performance specified.

E. Certificates

1. Installer Qualifications - Statement of installer qualifications.

2. Mechanical service fixtures - Certify that factory tests specified for mechanical service fixtures have been performed, and that products or systems meet or exceed specified requirements.

F. Manufacturer's Instructions - Maintenance and cleaning of casework

1.11 QUALIFICATIONS

A. Installer - Experienced, factory trained and/or certified by the manufacturer.

1.12 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of casework and equipment so that spaces are sufficiently complete that material can be installed immediately following delivery.

B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.

C. Casework, as installed, is considered to be finished equipment and shall be protected from damage by all trades. Protect work surfaces throughout construction period with 1/4-inch corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing - No Working".

D. In the case of high value items, such as service fittings, a secure, locked storage area shall be provided by the General Contractor to the Installer for use to safeguard this equipment prior to distribution to the proper trades for installation.

1.13 MOCK-UPS

A. Provide products and installation as specified in this Section for in-place mock-ups specified in Division 1.

## 2.00 PRODUCTS

2.01 MANUFACTURERS:

A. Kewaunee Scientific Corporation, Laboratory Division.

B. Hamilton Products, Division of Thermo Fisher Scientific, L.L.C. (Design Standard).

C. Mott Manufacturing, Ltd.

D. Substitutes are allowed subject to conformance with performance specifications, review and approval by Owner's representative.

2.02 CASEWORK MATERIALS

A. Sheet Steel - Mild, cold rolled and leveled unfinished steel. Minimum gauges:

1. 20 Gauge - Solid door interior panels, drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, security panels and sloping tops.

2. 18 Gauge - Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.

3. 16 Gauge - Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.

4. 14 Gauge - Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.

5. 11 Gauge - Table leg corner brackets and gussets for leveling screws.

6. Recycled Steel Content -

a.. All "Cold Rolled" Sheet Steel used in the fabrication of laboratory cabinets, fume hoods and modular laboratory systems shall have a minimum of 25 percent recycled steel content.

b.. The 25 percent minimum recycled content shall consist of 60 percent post-consumer content and 40 percent post industrial content. Manufacturer to provide documentation which illustrates the post consumer and post industrial content.

c.. Fabricator shall provide documentation that manufacturing fall-off is recycled to respective steel mills and neither enters the solid waste system nor becomes a product of landfill space.

B. Stainless Steel - ASTM A 240/A 240M, Type 304 18-8, except use Type 316 18-8 where shown or specified.

C. Tempered Safety Glass For Framed Sliding Glass Doors - ASTM C 1048, fully tempered, Type 1, transparent flat, Class 1 clear, Quality q3 select; ANSI Z97.1; 1/4 inch thick. Cut or drill to receive hardware.

D. Laminated Safety Glass For Unframed Sliding Glass Doors - ASTM C 1036 or ASTM C 1048, clear untinted, polished; ANSI Z97.1; laminated with 0.060 vinyl interlayer; 7/32 inch thick; exposed edges ground smooth. Cut or drill to receive hardware.

E. Sealant - Acid resisting type suitable for application. Color to match adjoining materials. Product as specified in Division 7 “Joint Sealants”.

## 2.03 CASEWORK FABRICATION

A. Base Units and Wall Cases

1. Base Units - End panels and back reinforced with internal reinforcing front and rear posts.

2. 49 Inch and 84 Inch High Cases - Formed end panels with front and rear reinforcing post channels; back shall be formed steel panel, recessed 3/4 inch for mounting purposes.

3. Posts - Front post fully closed with full height reinforcing upright. Shelf adjustment holes in front and rear posts shall be perfectly aligned for level setting, adjustable to 1/2 inch o.c.

4. Secure Intersection of Case Members With Spot and Arc Welds - Provide gusset reinforcement at front corners.

5. Base Unit Backs - Where utility chases are located behind base units, provide drawer units without backs and cupboard units with removable backs for access to services. At all other locations, provide fixed backs at drawer and cupboard units.

6. Bottoms - Base units shall have one piece bottom with front edge formed into front rail, rabbeted as required for swinging doors and drawers and flush design for sliding doors.

7. Top Rail For Base Units - Interlock with end panels, flush with front of unit.

8. Horizontal Intermediate Rails - Recessed behind doors and drawer fronts.

9. Base For Base Units - 4 inch high by 3 inch deep with formed steel base and die formed steel gussets at corners. Provide 3/8 inch diameter leveling screw with integral bottom flange of minimum 0.56 sq. in. area at each corner, accessible through openings in toe space.

10. Tops of Wall Cases - One piece, with front edge formed into front rail.

11. Panels and Fillers - Provide back, end, apron, stile, and removable base panels to close gaps and openings. At knee spaces, provide removable back panels.

B. Drawers

1. Drawer Fronts - 3/4 inch thick, double wall construction, pre-painted prior to assembly and sound deadened.

2. Drawer Bodies - Bottom and sides formed into one-piece center section with bottom and sides coved and formed top edges. Front and back panels spot welded to center section.

3. Drawer Suspension - Heavy duty coved raceways for both case and drawer with nylon tired, ball bearing rollers; self-centering and self-closing when open to within 3 inches of the closed position.

4. Provide Drawer With Rubber Bumpers - Friction centering devices are not approved.

5. Security Panels For Drawers - Provide security panels for drawers with keyed different locks.

6. File Drawers - Provide with 150# full extension slides for full access and operation.

C. Doors

1. Solid Panel Doors

3/4 inches thick, double wall, telescoping box steel construction with interior prepainted and sound deadened, top corners welded and ground smooth. Reinforce interior of front panel with welded steel hat channels. Hinges with screws to internal reinforcing in case and door. Hinges shall be removable; welding of hinges not approved. Doors shall close against rubber bumpers.

2. Frame Glazed Doors

Outer head to be one piece construction. Inner head to consist of top,

bottom and side framing members which are removable for installation or replacement of glass. Provide continuous vinyl glazing retainer to receive glass. In all other respects, framed glazed door construction and quality shall match solid panel doors.

D. Shelves

1. Form front and back edges down and back 3/4 inch. Form ends down 3/4 inch.

2. Reinforce shelves over 36 inches long with welded hat channel reinforcement the full width of shelf.

3. Pull out shelves: Same suspension as specified for drawers.

4. Depth and Weight Capacity: 305 mm , 180 pounds.

5. Vertical Shelf Adjustment: One inch increments.

E. Corner Base Guards - 102 mm high No. 304 stainless steel corner guards.

F. Hardware

1. Drawer and Hinged Door Pulls – Brushed Aluminum rectangular style finger pull.

2. Sliding Door Pulls - Recessed stainless steel, styled and sized to harmonize with drawer pulls.

3. Hinges - Institutional type, five knuckle projecting barrel hinges, minimum 2-1/2 inches long, Type 302 or 304 stainless steel. Provide two hinges for doors up to 36 inches high; three hinges for doors over 36 inches high. Drill each leaf for three screw attachment to door and frame.

4. Door Catches - Adjustable type, spring actuated nylon roller catches.

5. Elbow Catches - Spring type of cadmium plated steel, with strike of suitable design.

6. Locks - National Lock "Snap-In" Cam Pin Tumbler, heavy duty cylinder type. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers.

7. Keying - Locks shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non interchangeable master key groups.

8. Keys - Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:

A. 2 - for each keyed different lock.

B. 3 - for each group keyed alike locks.

C. 2 - for master keys for each system.

9. Label Holders - Formed steel with satin chrome finish, 1 inch by 1-1/2 inches, screw installed.

10. Shelf Clips - Die formed steel, zinc plated, designed to engage in shelf adjustment holes.

## 2.04 TABLE FRAMES

A. Table Frames - 4-1/2 inches high "C" channel front and back aprons, end rails and cross rails.

B. Table Drawers - Provide front and back rails; drawer unit, hardware and suspension same as specified for base unit drawers.

C. Legs - 2 inches by 2 inches steel tube legs with welded leg bracket. Attach legs with two bolts to front and back aprons and weld to end rails. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches in height.

D. Knee Space Frame - 2 inches high apron where no drawers required.

E. Leg Rails and Stretchers - Channel formed.

## 2.05 WORK SURFACES

A. General Requirements

1. Use maximum length pieces to minimize joints. Make countertops along walls 762 mm deep, island countertops 1524 mm deep, unless shown otherwise.

2. Provide one inch overhang, with drip groove along underside of exposed edge.

3. Make backsplash curbs 102 mm high. Provide where tops abut wall surfaces and at reagent ledges. Provide end curb where top abuts end walls, fume hoods, and tall cabinets.

4. Locate joints at least 610 mm from sink cutouts. Joints to be watertight and shall not exceed 2 mm .

5. Reagent ledge face shall permit installation of service fixtures and top shall be removable for access to service utilities. See plans for dimensions.

B. Epoxy Resin Work Surface

1. Material - Chemical and abrasion resistant, durable top of one inch thick cast material of epoxy resins and inert products, cast flat. Radius or chamfer edges.

2. Backsplash Curb - Same material as top, butt jointed and cemented to top.

3. Reagent Ledges - Same material as top.

4. Solid Phenolic Panel

   a. Material - Chemical and abrasion resistant, durable top of one inch thick material of phenolic resin and inert products, cast flat. Radius or chamfer edges.

   b. Backsplash Curb - Same material as top, butt jointed and cemented to top.

   c. Reagent Ledges - Same material as top.

D. Stainless Steel Work Surface

1. Material Gauge - Tops with integral sinks; 14 gauge. Tops without sinks; 16 gauge.

2. Tops - Form tops with 25 mm lip and 13 mm return flange, and provide 16 gauge stainless steel reinforcing channels applied to underside as required for rigidity and sound dampening. Form edges, flanges and curbs integrally with top, from one sheet of metal. Coat underside of tops which include integral sinks and/or drain boards with sound dampening material.

3. Joints - Electrically weld all shop joints; grind smooth and polish. Design field joints to be mechanically bolted and supported full length, resulting in a hair line seam with perfectly aligned, flat, level surfaces each side of joint.

4. Sound Dampening Material - Material shall be waterborne and non-flammable in its liquid state. Material to contain clay which will act as a flame retardant. Material shall contain no volatile organic compounds (VOC). Film thickness of spray-applied product shall be approximately 20 mil.

## 2.06 SINK AND CUP SINK ASSEMBLIES

A. Epoxy Resin: Sink walls 13 mm thick.

1. When top is epoxy resin, make sink integral with top.

2. Sink outlet; epoxy resin, open grid strainer with matching tail piece.

3. Basis of Design Manufacturer: Durcon.

B. Stainless Steel - 16 gauge; coved corners. Pitch bottom to drain. Sound deadened.

1. Make sinks integral with stainless steel tops by seamless welding. In epoxy tops; under-top mount. In other tops; self-rimmed.

2. Sink outlet at BSL-2; stainless steel, crumb cup strainer with matching tail piece.

3. Sink outlets of BSL-3 and BSL-3E; all stainless steel drain body and fittings using schedule 5 pipe, fully welded and integral to stainless steel sink.

C. Laboratory Sink Schedule

1. L -1: Epoxy resin, undermounted sink 24 inches long, (406 mm wide by 304 mm deep), BOD Model U56C.

2. L -2: Epoxy resin, undermounted sink 30 inches long (457 mm long, 355 mm wide by 267 mm deep), BOD Model U24C .

3. L -3: Stainless steel sink, integral to worksurface, 24 inches long, 16 inches wide by 12 inches deep.

4. L -4: Stainless steel sink 18 inches long, 14 inches wide by 10.5 inches deep.

5. CS-1: Cup sink, cast epoxy resin. Oval, 3 inches by 6 inches. Furnish with tailpiece integral with cup sink unit.

## 2.07 SPECIAL CASEWORK FEATURES AND ACCESSORIES

A. Metal Wall Framing System

Steel framing system by Unistrut Corporation; manufacturer's standard factory applied acrylic enamel finish. Include channels, fittings, spring and springless nuts, and other miscellaneous hardware as required.

B. Umbilical Drops

Removable steel panels supported on metal framing system from countertop or floor as noted on drawings to approximately 152 mm above ceiling. See Drawing QL0000 for sizes.

C. Ceiling Service Panel (CSP)

Metal ceiling panel with power and data receptacles and piped vacuum service inlaid in laboratory ceiling grid . Coordinate with requirements of Division 26 for installation of electrical, data, and telephone. Follow drawing s for locations and

for sizes.

D. File Drawer - Regular or lateral files as shown.

E. Pegboards

1. Size: As shown on plan.

2. Material: Stainless steel .

3. Stainless steel pegboard trough, with drain tube to sink below.

4. Pegs: Solid polypropylene, 3/8 inch diameter by 6 inches long, 6 inches OC, with protective shield.

5. Graduated Funnel Rack: Stainless steel .

## 2.08 MECHANICAL SERVICE FIXTURES

A. Manufacturer

1. Water Saver Faucet Company (Design Standard).

2. Chicago Faucet Company.

3. Broan.

B. Factory Testing - Test service fixture assemblies to 100 psi water pressure. Submit test report certifying leak free operation.

C. Material and Finishes -

1. General Laboratory Fixtures - Chrome-plated forged brass with clear phenolic (epoxy) coating.

2. Fume Hood Fixtures - Interior outlets and exterior valve handles; forged brass with acid and solvent resistant plastic coating. Remaining portion of exterior valve body and stem; chrome-plated forged brass, with clear phenolic coating.

3. Color Code - Four-arm handles with color coded plastic screw-type disc indicating type of service. Color code as follows:

| SERVICE | COLOR | MARKING |
|---|---|---|
| Cylinder Gas | Light Blue | CYL GAS |
| Deionized Water | White | DI |
| Distilled Water | White | DW |
| Hot Water | Red | HW |
| Hot and Cold Water (Fume Hoods) | Sepia Bronze | HCW |
| Vacuum | Yellow | VAC |

| | | |
|---|---|---|
| Carbon Dioxide | Pink | Co2 |

4. Mounting Shanks and Locknuts - Provide mounting shanks and locknuts as required.

D. Water Faucets

Include replaceable stainless steel seat and integral adjustable volume control. Faucets shall be readily convertible from compression to self-closing, without disturbing faucet body proper.

1. HCW-1: L2222 - TWI-10VB -3001-BH, Deck-mounted laboratory mixing faucet with 10-inch swing vacuum breaker gooseneck and L-55 aerator fitting and 4-inch wrist blade lever handles. Foot pedals provided on floor.

2. HCW-2: L2222-TWI -8VB-L300IL -MOD , Deck-mounted laboratory mixing faucet with 8-inch swing vacuum breaker gooseneck and L-55 aerator fitting, 4-inch wrist blade lever handles and ledge-mounted foot-operated self-closing mixing valve with extended foot pedal.

3. HCW-3: Elkay CHS1716C , wall mounted laboratory mixing faucet with 8 inch swing vacuum breaker gooseneck and L-55 aerator fitting, and foot operated self closing mixing valve with extended foot pedals.

4. HCW-4: L422-8VB, Deck-mounted laboratory mixing faucet with 8-inch swing vacuum breaker gooseneck and L-55 aerator fitting, 4-inch wrist blade lever handles.

E. Reverse Osmosis (RO) Water

Clear epoxy coated polished chrome with 6 serrations. Valve seat; stainless steel, easily removable.

1. RO-1: Countertop-mounted pure water fixture single straight pattern laboratory needle valve with removable serrated hose end and integral check valve. L7833.

F. Gas Outlets

Stainless steel or Monel metal, and needle valve hose ends with 6 serrations. Valve seat; stainless steel, easily removable.

1. V-1, CO2-1 : Wall -mounted turret base with single straight pattern laboratory needle valve with removable serrated hose end and integral check valve. L2960 -158 WSA.

2. V-2, CO2-2 : Countertop Mounted Outlets: Two outlets separated by 180 degree angle. Model L2960 -132 SWSA.

3. N2-1, A-1, O2-1: Panel-mounted, fine control needle valve with pressure regulator to support high purity gases - L3173-366-158WSA.

4. N2-2: Deck mounted, 180 degrees; fine control needle valve for precise flow control with pressure regulator to support high purity gases L2873-771-2SWSA.

G. Remote Operated Outlets

Interior panel mounted flange with angle hose end with 6 serrations, and panel mounted. Provide vacuum breakers external to fume hoods for water fixtures within hood; Model L-102. Provide unions at face of fume hood.

1. V-3 : Remote control assembly with remote needle valve, handle wall mounted, angled serrated outlet. L3185N-L022-WSA.

2. CW: Remote control assembly with panel mounted turret base and serrated hose end. L740W-9-L074WSA.

H. Emergency Eyewash

1. EW-1: Deck-mounted eyewash/face unit with two gentle spray outlet heads, stay-open ball valve and 90 degree swivel feature - Guardian G1805 or Watersaver EW1022BP .

## 2.09 SPECIAL CASEWORK UNITS

A. Chemical Storage Cabinets

1. Line acid storage cabinets with corrosion resistant polyethylene liner.

2. Furnish a half width corrosion resistant removable shelf.

3. Label cabinets with hazard warning signage on the door in compliance with ANSI Z535.1.

4. Vent cabinets into fume hoods when mounted below or adjacent to fume hoods. Provide 1-1/2 inch ID corrosion resistant vent pipe up to fume hood enclosure. Locate vent openings at rear of fume hood work area with raised lip to avoid acting as a drain to work surface. Vent to provide positive airflow directly into the fume hood exhaust system.

5. Do not use metal components in the interior of the cabinet unless they have been coated with an acid resistant coating.

B. Flammable Liquid Storage Cabinets

1. Comply with NFPA 30, Section 4.3 as applicable.

a.. Labels: Warning label in red Helvetica medium style letters: "FLAMMABLE - KEEP AWAY".

b. Cabinets are not to be vented.

## 2.10 METAL FINISH

A. Preparation

Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.

B. Application

Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high-grade laboratory furniture quality finish of the following thickness:

1. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.

2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

## 2.11 FINISHES AND COLORS

A. Steel

Manufacturer's standard chemical resistant, satin finish, baked or powder coat enamel.

B. Plastics and Resins - Follow direction on chemically resistant finishes and colors.

C. Stainless Steel - NAAMM No. 4 finish.

D. FINISH APPLICATION

Powder paint shall be sprayed and baked with a near zero (0.291 per gallon maximum) VOC (Volatile Organic Compounds) emissions. All powder coats shall comply with the GS (Green Seal) Standard 11 for allowable emissions.

## 2.12 CASEWORK HARDWARE

A. Reinforce Casework - Reinforce casework to receive hardware, or use shoulder screws to prevent compression of double wall construction.

B. Cabinet Door and Drawer Locks - 5-pin cylinder type.

1. See Drawings for items requiring locks. Underlined casework denotes lockable drawers and doors.

2. Provide keying system as directed; 2 brass keys per lock.

3. At drawer cabinets, provide multiple drawer locking system whereby lock in top drawer locks or unlocks lower drawers.

C Door and Drawer Pulls: Surface mounted.

1. Material: Aluminum with brushed satin finish.

2. Pull-Out Drawers: One pull per drawer, two pulls on drawers 25 inches or wider.

D Door Catches: Positive closure.

1. Strike Bracket: Nickel plated. Install at top edge of door.

2. Bolt: Self closing type. Recess bolt housing behind cross rail.

E. Hinges - Five knuckle institutional type; chrome plated, stainless steel, or finished to match cabinet; with smooth rounded joints, 2-1/2 inches long.

1. Hinge Pin: Encase in nylon self-lubricating bushing extending between knuckles; no metal-to-metal contact of moving parts. Design to prevent door removal when in closed position.

2. Encase hinge wings within door and within case.

3. Attach with screws to door (no welds), and screw or weld to case. For doors 45 inches high and over, provide additional hinge in center.

F. Drawer Slides - 125-pound capacity, full suspension type with interlocking slides; ball bearing rollers, positive stop; with positive closing action, self closing during last five inches of travel. Weld to drawer.

G. Label Holders - 1 inch by 2-1/2 inch minimum, with transparent shield. Provide one for each drawer, door or door pair.

H. Plug Buttons - Install in unused pre-drilled or pre-punched perforations in cabinet interiors.

I. Rubber Silencers - Provide two for each jamb, drawer, or sliding door leaf. Lock-in type only; no adhesive attachment.

J. Shelf Standards and Rests - Satin chrome steel standards with steel rests and rubber seats.

K. Shelf Standards and Brackets - Satin chrome steel standards with satin chrome steel arms.

## 3.00 EXECUTION

### 3.01 CASEWORK INSTALLATION

A. Set casework components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.

B. Align adjoining units and install matching filler pieces where equipment abuts walls or columns.

C. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16 inch tolerance.

D. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

E. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8 inch between top units.

F. Provide scribing, corner, and intermediate fillers to fit cabinets to space provided and to each other.

G. When wall hung cabinets are installed tight to ceiling, provide continuous metal filler between top of cabinet and ceiling, to permit door to swing clear of ceiling.

## 3.02 WORK SURFACE INSTALLATION

A. Where required due to field conditions, scribe to abutting surfaces.

B. Only factory prepared field joints, shown on approved shop drawings, are permitted. Secure joints in field, where practicable, in the same manner as in factory, with dowels, splines, adhesive or fasteners recommended by manufacturer.

C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

D. At changes in countertop height, make vertical transition with same material as adjacent countertop.

E. Seal around countertop penetrations.

## 3.03 SINK INSTALLATION

A. Set in chemical resistant sealing compound, and secure and support following manufacturer's recommendations.

## 3.04 ACCESSORY INSTALLATION

A. Install accessories and fittings in accordance with manufacturer's recommendations. Turn screws to seat flat; do not drive.

## 3.05 ADJUSTING

A. Repair or remove and replace defective work.

B. Adjust doors, drawers, hardware, fixtures and other operating parts to parts to function smoothly.

## 3.06 CLEANING

A. Clean shop finished casework, touch up as required.

B. Clean countertops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

## 3.07 SPECIAL PROTECTION

A. Provide all necessary protective measures to prevent damage to casework and equipment from exposure to other construction activity.

*END OF SECTION 12352*

# SECTION 12353
# ADAPTABLE LABORATORY CASEWORK

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This section includes the materials and labor for adaptable casework.
   1. Technical Cores
   2. Support structures.
   3. Suspended base cabinets/wall cases.

B. UNDIVIDED RESPONSIBILITY
   1. Work described in this section should be included with work in other casework sectons.
   2. Contractually include work of this Section with work of section 12 35 53.13 METAL LABORATORY CASEWORK.

### 1.02 SYSTEM DESIGN REQUIREMENTS

A. Modular dimensioned system of core and panel style support structures and table.

B. CORES - Support structure for tables, storage units and shelves, and service chase for all service and drain lines.

   1. Modular units shall be suitable for wall, peninsula or island configurations.
   2. Cores can be supported with floor plates bolted to floor; with fixed based cabinets; suspended ceiling or with lateral support legs.
   3. Equipped with easy to remove access panels with integral fasteners.

### 1.03 SYSTEM REQUIREMENTS

A. Independently support work surfaces, under-counter cabinets, and overhead storage components.

B. Structural components are essentially self supporting and independent of the building structure.

C. Core type support structures support cupsinks, service fittings, fixtures, and supply and waste lines using commercially available pipe clamps.

D. Core access panels feature integral snap-on "hook and loop" fasteners for quick, easy access to service chase area. All access panels are half width and can be removed even when cabinets are directly in front of the panel.

E. Wall cabinets are adjustable vertically and laterally can be removed without the use of tools.

F. Vertical height of table work surfaces, wall cases and shelves can be adjusted with simple, but positive mechanisms.

1.05 SUBMITTALS

A. Shop Drawings

1. Support Structures - Provide 3/4 inch equals 1 foot scale elevations of all components, cross sections, rough-in and anchor placements, tolerances and clearances. Provide 1/4 inch equals 1 foot rough-in plan drawings for coordination with trades. Rough-in shall show free area.

B. Certificates - Compliance Statement

1.06 SUBMITTALS REQUIREMENTS

Follow Section 12 35 53.13 METAL LABORATORY CASEWORK.

1.07 QUALITY ASSURANCE AND QUALIFICATIONS

Follow Section 12 35 53.13 METAL LABORATORY CASEWORK.

1.08 DELIVERY, STORAGE AND HANDLING

Follow Section 12 35 53.13 METAL LABORATORY CASEWORK.

1.09 PROJECT CONDITIONS

A. Do not deliver or install equipment until the following conditions have been met:

B. Windows and doors are installed and the building is secure and weather tight.

C. Ceiling, overhead ductwork and lighting are installed.

D. All painting is completed and floor tile is installed.

## 2.00 PRODUCTS

2.01 MANUFACTURERS

A. Fisher Hamilton.

B. Kewaunee.

C. Mott Manufacturing LTD.

D. Subject to Division – 1, substitutes manufacturers complying with the project's reference standards may be reviewed and approved by the Owner prior to the bidding deadlines for issuing Bid Bulletins.

2.02 SUPPORT STRUCTURES

A. General Requirements For Cores And Support Structures

1. Riser uprights - 16 gauge rolled steel supplies with leveling guides.

2. Frames - Rolled steel, resistance welded. Frame members and tie rail

brackets: 16 gauge; corner gussets: 14 gauge.

3. Tie Rails - 16 gauge cold rolled steel.

4. Base Over - 18 gauge cold rolled steel.

5. Slotted Adjustment Punched Into Riser Upright - Notched for one inch adjustment of components supported off riser upright.

6. Riser Cap - Flame resistant ABS plastic, color matched.

7. Closure Panel - 20 gauge cold rolled steel

8. Closure Panel Fasteners - "Dual-lock".

9. Adjustable Floor Clamps - Two per core or frame; 20-55-06 ductile cast iron.

10. Plug Caps - ABS flame retardant plastic, color matched.

B. Technical Core Panel

1. Nominal dimensions:
   a. Width: See casework Drawings
   b. Depth: 152 mm (6 inches)
   c. Height: 2134 mm (84 inches or 7 feet)

2. Cross rails: 16 gauge cold rolled steel.

3. Core shall be capable of having removable uprights and reagent shelf.

4. Core shall be capable of having reagent shelf and upright added after installation.

5. Core, when secured to floor and ceiling or floor plus supported by fixed casework or floor plus use of lateral bracing legs, shall be capable of supporting work-case loading conditions.

6. Hanging components (cantilever table frames, shelves, etc) shall be vertically adjustable in one inch increments.

7. Closure panels shall snap on without tools and shall be removable without tools and shall be removable of cantilever table frames or suspended cabinetry.

8. Installed 2134 mm (84 inches or 7 ft) high core shall support following components, each loaded to its maximum rating for a total of 1255 kg (2,761 lbs.).
   a. Two outside shelves 305 mm (12 in) - 82 kg .
   b. Wall cases - 136 kg (290 lb).
   c. One cantilever work surface - 272 kg (600 lb) each side.
   d. Suspended base cabinet - 136 kg (290 lb) each side.

## 2.03 FINISHES

A. Metal Finish

1. Preparation - Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final

seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.

2. Application - Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard stain finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness:

a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil average and 1.2 mil min,

b. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

B. Chemical Resistance

1. Test procedure - A finished test panel shall be laid flat and level on a horizontal surface. Chemical spot tests shall be made by applying 10 drops (approximately 0.5cm3) of each reagent identified to the surface to be tested. Each reagent spot shall be open to the atmosphere. Ambient temperature shall be 20-22 degrees C. After a test period of one hour, chemicals shall be flushed away with cold water and the surface washed with detergent, warm water at 65.50 degrees C and alcohol to remove surface stains. Surface shall be examined under 100 foot candles of illumination.

2. Evaluation ratings - Changing surface finish and function shall be described by the following ratings:

a. No Effect: No detectable change of finish film.

b. Excellent: Indicates excellent to superior integrity of finish film. Includes no effect or slight change in gloss and slight discoloration.

c. Good: Allows change of gloss or discoloration or surface discoloration while retaining integrity of finish film.

d. Fair: Objectionable changes in appearance due to slight swelling or change in gloss while retaining integrity of finish film.

e. Poor: Obvious and significant deterioration, including pitting or erosion of finish material.

## 2.04 TEST RESULTS

(Concentration By Weight) Modular Steel Casework (Based On Chameleon CH Color)

## 2.05 MANUFACTURERS

A. Compliance Statement

Manufacturer to provide "Independent" and "Certified" performance finish test results, for specified finish color with submittal of Compliance Statement.

| CHEMICAL | RATING |
|---|---|

| | |
|---|---|
| Acetic Acid - Glacial, 98 percent | Excellent - sl shadow |
| Formic Acid, 88 percent | Excellent - sl shadow |
| Hydrochloric Acid 25 percent | No effect |
| Nitric Acid, 25 percent | No effect |
| Nitric Acid, 60 percent | Excellent - sl yellowing |
| Phosphoric Acid, 75 percent | No effect |
| Sulfuric Acid, 25 percent | No effect |
| Sulfuric Acid 85 percent | Excellent - sl shadow |
| Ammonium Hydroxide, 28 percent | No effect |
| Sodium Hydroxide, 10 percent | No effect |
| Sodium Hydroxide, 25 percent | No effect |
| Acetone | Excellent - sl shadow |
| Sodium Hypochlorite, 2.25 percent | No effect |
| Ethyl Acetate | Excellent - sl shadow |
| Ethyl Alcohol | No effect |
| Ethyl Ether | Excellent - sl shadow |
| Formaldehyde, 37 percent | No effect |
| Hydrogen Peroxide, 30 percent | No effect |
| Methylethyl Ketone | Excellent - sl shadow |
| Phenol, 85 percent | Excellent - sl shadow |
| Xylene | Excellent - sl shadow |

## 3.00 EXECUTION

### 3.01 INSTALLATION

A. Furniture System Installation:

1. Install system in strict accordance with manufacturer's instructions.
2. Set system components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.

B. Install suspended casework, work surfaces, sinks and accessory items per Section 12352 METAL LABORATORY CASEWORK.

### 3.02 ADJUSTING

A. Repair or remove and replace defective work, as directed by Architect upon completion of installation.

### 3.03 CLEANING

A. Clean shop finished laboratory furniture system surfaces and touch up as required.

### 3.04 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent exposure of laboratory furniture system and attached components from exposure to other construction activity.

B. Advise contractor of procedures and precaution for protection of material, installed laboratory furniture system, casework and fixtures from damage by work of other trades.

*END OF SECTION 12353*

# SECTION 12354

# CUSTOM STAINLESS STEEL LABORATORY CASEWORK

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. Section Includes

1. Fabrication and installation of custom stainless steel laboratory casework components consisting of leg frames, work surfaces, shelves, and mobile cabinet units.
2. Cutouts in laboratory casework for the installation of mechanical and electrical services and devices.
3. Sealants that come into contact with materials specified in this Section.
4. Integral stainless steel sinks included in this Section complete with a tailpiece.
5. Service fittings and fixtures for custom stainless steel casework specified in this Section 12354.

B. Products Furnished But Not Installed Under This Section

1. Furnish service fittings and fixtures to Division 15 BUILDING SERVICES AND PROCESS PIPING SYSTEMS for installation.

### 1.02 REFERENCES AND STANDARDS

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

AMERICAN WELDING SOCIETY (AWS)

| | |
|---|---|
| AWS D1.6 | (1999) Structural Welding Code - Stainless Steel |

ASME INTERNATIONAL (ASME)

| | |
|---|---|
| ASME A112.18.1 | (2005) Standard for Plumbing Fixture Fittings |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A 240/A 240M | (2007e1) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications |
| ASTM A 276 | (2006) Standard Specification for Stainless Steel Bars and Shapes |

NSF INTERNATIONAL (NSF)

| | |
|---|---|
| NSF 61 | (2007a) Drinking Water System Components - Health Effects |

SCIENTIFIC EQUIPMENT AND FURNITURE ASSOCIATION (SEFA)

| | |
|---|---|
| SEFA 8 | (1999) Laboratory Furniture, Casework, Shelving and Tables, Recommended Practices |

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

| | |
|---|---|
| 21 CFR 177 | Indirect Food Additives: Polymers |

## 1.03 DEFINITIONS

A. Broom Clean: a condition in an interior area in which surface debris has been removed by dry methods.

B. Related Equipment: Items not generally manufactured by Casework subcontractor but furnished and installed as part of this Section.

C. Rough-In Point: Individual or common supply of mechanical, electrical, and heating, ventilating and air conditioning (HVAC) through wall, floor or ceiling generally located within the utility umbilical, equipment chase, or service space behind cabinets.

D. Service Fittings and Fixtures: Service fittings may include vacuum and special gas petcocks and turrets; lab type hot and cold water faucets; foot pedal operators, remote control valves for fume hoods; vacuum breakers; deck mounted eye-washers; laboratory sinks, and cup sinks.

## 1.04 PERFORMANCE AND DESIGN REQUIREMENTS

A. Components: Resistant to laboratory chemicals and disinfectants.

B. Components: Constructed with cleanable smooth surfaces with corners and edges ground smooth.

C. Components: Fabricated with no voids, concealed spaces or crevices.

D. Components: Installed on stand-offs to allow full distribution and penetration of decontamination agent. After decontamination components and surfaces must be accessible to wipe down.

E. Performance Characteristics: In accordance with SEFA 8.

## 1.05 SUBMITTALS

A. Shop Drawings - Casework;

1. Showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fixtures.

2. Indicate details and location of anchorages and fittings to partitions to maintain containment barrier.

3. Include layout of units with relation to surrounding partitions, doors, windows, and other building components.

4. Coordinate shop drawings with other trades involved including but not limited to sinks, foot controls, faucets and associated piping.

5. Indicate locations of work surface joints.

6. Indicate proposed or anticipate locations of stainless steel repair compound.

B. Samples

1. Leg frame assembly with stainless steel top and sink
2. Wall mounted countertop withstainless steel top
3. Shelves: One overhead open shelving shelf complete with 12-inch long section of support framing;
4. Each type of cabinet hardware
5. Each type of service fittings and fixtures

C. Closeout Submittals

1. Cleaning and maintenance instructions
2. Written Warranty

1.06 QUALITY ASSURANCE

A. Single Source Responsibility

1. Provide laboratory casework with tops, and integrally formed stainless steel sinks manufactured or furnished by a single laboratory casework company for single responsibility.

B. Manufacturer and Installer

1. Company having personnel skilled in the manufacturing and installing of custom stainless steel cabinet fabrication and having continuous proven experience within last ten years.
2. Submit a listing of at least three installations that are comparable to this installation and have been completed in the last ten years.

C. Installation Mock-Up

1. Locate where directed.
2. Allow five working days for review of mock-up before proceeding with work.
3. When accepted, mock-up will demonstrate minimum standard of quality required for installation of this work. Approved mock-up may remain as part of finished work.
4. Do not begin installation of remaining stainless steel casework until installation mock-ups have been approved.
5. Include: Installation of minimum 48-inch long complete unit consisting of:
   a. Leg frame assembly complete with stainless steel top with integral sink and foot controls, overhead open shelving, attachment to stand-offs and application of sealants.

D. Shop Fabrication

1. Fabrication of stainless steel items to take place in a shop exclusively used for stainless steel fabrication.

E. Welding

1. Qualify procedures and personnel according to the following:

a. AWS D1.6, Structural Welding Code - Stainless Steel.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver laboratory casework only after wall and floor coating installations are complete. Protect casework from damage during installation of building mechanical and electrical fixtures.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.08 SITE CONDITIONS

A. Environmental Conditions

1. Building shall be closed to the weather. Exterior envelope including roofing, wall systems, exterior glazing, paneling and doors shall be installed to protect casework from the elements and to provide security for casework delivered to the job site. Corridors shall be closed by either permanent or temporary methods.

2. No standing water shall be evident on the floor. Water producing operations shall be completed and cured prior to casework installation.

3. Rooms in which laboratory casework is to be installed shall be broom clean.

4. During cold weather provide temporary or permanent heat to maintain ambient room temperatures between 55 and 88 degrees F as recommended by manufacturer.

5. Maintain final design temperature and humidity in areas where casework is installed.

1.09 WARRANTY

A. Provide written warranty signed by the manufacturer guaranteeing to correct failures in products which occur within the warranty period indicated below, without reducing or otherwise limiting any other rights to correction which Government may have under the Contract Documents.

B. Correction may include repair or replacement. Correct failures which occur within the following warranty period(s) after Beneficial Occupancy Date: Components: 3 years.

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2.00 PRODUCTS

2.01 MATERIALS

A. Stainless Steel Plate, Strip And Sheet - Stainless steel plate, strip and sheet to ASTM A 240/A 240M, typically Type 304 except where Type 430 is indicated, No. 4 finish, all components.

B. Stainless Steel Bars, Angles and Shapes - Stainless steel bars, angles and shapes to ASTM A 276, Type 304, with No. 4 polished finish, all components.

C. Rod Anchors, Nuts and Washers - Rod anchors, nuts and washers: Type 304 stainless steel.

D. Casters - Stainless steel light-medium duty casters, minimum 550 kg (250 lb.) load capacity/caster, 75 mm (3-inch) diameter nylon wheel, top plate fastening, 100 mm (4-inch) overall height, swivel and rigid, each caster complete with brake.

E. Polypropylene Sheet - High strength-to-weight ratio, chemical-resistant, no moisture absorption, meets FDA 21 CFR 177.1520. Thickness indicated.

F. Magnets - Selected by fabricator, approved by AE.

G. Stainless Steel Repair Compound - Machineable repair compound with stainless steel filler to seal pin holes, voids and cracks in stainless steel fabrications.

1. Acceptable Products - Subject to compliance with specified requirements, acceptable products include but are not limited to: Aremco Pyro-Putty, Devcon Stainless Steel Putty, Loctite Fixmaster Stainless Steel Putty, or approved equivalent.

2. FABRICATION - GENERAL

a. Provide lab casework of modern design, constructed in accordance with the best practices of the Scientific Equipment and Furniture Association (SEFA).

b. Fabricate units in modular lengths and complete so units can be relocated without requiring field application of finished ends of other such parts.

c. Construct units with cleanable smooth surfaces. Corners and edges ground smooth.

d. Fill crevices and imperfections with stainless steel repair compound. Minimize use.

e. Fabricate components with no voids or concealed spaces.

f. Fabricate laboratory casework to details indicated.

g. Align end panels, top rails, bottoms and vertical members, at intersections in same plane, without overlap.

h. Provide minimum 14-gauge thick metal for tapping strips, gussets, and reinforcements.

i. Use minimum 16-gauge thick metal for cabinet top rails, frame and base.

## 2.03 WORK SURFACES

Fabricate laboratory countertops, backsplashes and shelves to details as indicated.

A. Stainless Steel Work Surfaces

1. Form work surfaces from minimum 16-gauge thick stainless steel sheet. Passivate stainless steel surfaces.

2. Design work surface to withstand 220 lb. point load. Reinforce as required.

3. Fabricate work surfaces to lengths indicated on drawings.

4. Form backsplash/sidesplash integral to work surface.

5. Welding: Argon Arc process. Fillers, solders, or spot welding will not be permitted. Welds shall be continuous, crevice free, ground and polished to adjacent finish. Where right angle work surfaces occur, the polishing and graining shall be such that a 45 degree line of demarcation is indicated.

6. Extend stainless steel under front work surface forming drip edge.

B. Integral Stainless Steel Sinks

1. Minimum 16-gauge thick, welded integrally into work surfaces without seams or joints. Radius inside to 5 mm cove and pitch bottoms to drain inlet. Sound-deadening material on underside of sink not permitted.

2. Equip laboratory sinks with tailpieces, cross strainers, plug and overflow unless otherwise indicated. Provide standing overflow, when in position, 22 mm (1 inch) below flood level of sink. Include perforated over-flow guard with top 9.5 mm (1/2 in) below flood level. Locate waste outlets where indicated.

3. Outlets: 38 mm (1.5 in) diameter, 5 mm (1/4 in) minimum length, fabricated of same material as sink. Provide strainers at outlets.

4. Sink size: As shown on Drawings.

## 2.04 LEG FRAMES

A. Material: Stainless steel sheet and shapes.

B. Leg frame assembly system is to provide independent rigid support for countertops, sinks and fittings including support for mechanical and electrical services.

C. Provide for leg frame to be installed freestanding, fixed to wall and assembled back-to-back.

D. Leg frame members: Stainless steel angle shape with stainless steel angle shape rails and supports at top. Provide stainless steel plate or angle support rail for fixture foot pedals where scheduled.

E. Each leg frame complete with foot levelers consisting of stainless 3/16-inch steel threaded studs, nuts, washers and 25 mm (1-inch) diameter shoes with nylon pad.

F. Precisely cut and weld leg frame components. Grind welds smooth and polish. Grind bar and angle corners smooth to 1.6 mm radius corners.

## 2.05 MOBILE BASE CABINET

A. Material: Stainless steel sheet, minimum 18-gage thick. Reinforcing members - Stainless steel, minimum 16-gage thick.

B. Design cabinet to be independent and mobile. Cabinets will be stored under countertops and leg frames as well as stand independent.

C. Cabinet sides: 25 mm flange on back edge with 19 mm flange 9.5 mm return.

D. Cabinet back: flat with top panel flange overlapping it.

E. Cabinet top: 25 mm flange on back and side edges with 19 mm flange and 3/8-inch return on front edge.

F. Cabinet bottom: 25 mm flange on side edges with 19 mm flange and 9.5 mm returns on front and back edges. Reinforce bottom with steel angles. Provide 102 mm by 102 mm reinforcing plate for attachment of casters at four corners.

G. Door: flat panel with 19 mm flange and 9.5 mm return on all edges. Provide hinge reinforcement. Complete with integral pull.

H. Drawer bin: one piece brake-formed and welded construction including bottom, two sides, front and back. Cove sides to 32 mm radius. Tack weld seams and fill with stainless steel filler to make waterproof. Provide integral drawer stop, but allow drawer to be removable without use of tools. Front edge of drawer complete with formed integral pull.

I. Shelves: Adjustable.

1. Shelf supports: Weld 6.35 mm diameter by 16 mm long steel pins to sides for shelf support. Provide three sets of four pins per cabinet to allow for three shelf positions. Spacing of shelf supports to be determined during mock-up.

2. Shelves: Edges turned down on all four sides 19 mm, return under on front and back 9.5 mm. Reinforce bottom with steel angles. Edges ground smooth. Grind corners to 1.7 mm radius. Notch shelf sides at shelf support locations.

## 2.06 CABINET HARDWARE

A. Hinges - Stainless steel lift-off flag hinges, tack welded to both door and case. Provide one pair of 64 mm high hinges for doors under 914 mm (36-inches) high.

B. Drawer Glides - Polypropylene cut to suit. Fasten to tabs on cabinet interior with stainless steel screws.

## 2.07 ADJUSTABLE OPEN SHELVES

A. Material:

1. Shelves and end brackets: Brake-formed from single piece of stainless steel sheet, minimum 18 gauge; reinforce bottom of shelf as required with L-shape sections.

2. Wall Supports: Stainless steel bar, double slotted at 25 mm on center.

B. Shelf Edges:

1. Without front lip: Turned down on front edge 19 mm , with 9.5 mm return under.

2. Back edge: As detailed.

3. Continuously weld seams.

C. Debur and grind sheared edges to smooth finish.

## 2.08 SERVICE FITTINGS AND FIXTURES

A. Foot Pedal Operator

1. ANSI/ASME A112.18.1 and NSF 61; extended type, foot pedals extending 355 mm (14-inches) from mounting substrate; foot pedals in lowered position maximum 38mm (1-1/2-inches) AFF.

a. Chicago Faucets Model 834-EPSLOCP, or approved equivalent.

B. Gas Cocks - Supplied as part of Section 12352 Metal Laboratory Casework.

C. Water Faucets - Include replaceable stainless steel seat and integral adjustable volume control. Faucets shall be readily convertible from compression to self closing, without disturbing faucet body proper.

1. HCW-2: Supplied as part of Section 12352 METAL LABORATORY CASEWORK.

2. HCW-3: Watersaver L171-8VB-L-55, panel mounted laboratory mixing faucet with 8 inch rigid gooseneck, vacuum breaker, aerator, and foot operator..

## 3.00 EXECUTION

### 3.01 INSPECTION

Obtain dimensions affecting work of this Section from site.

### 3.02 INSTALLATION

A. Use anchoring devices for materials encountered and usage expected.

B. Install items in accordance with manufacturer's instructions.

C. Set casework items plumb, square and true, securely and permanently anchored to building structure where scheduled.

D. Isolate to prevent electrolysis between dissimilar metals.

### 3.03 STAND-OFFS

A. Fasten components to internally threaded insert anchored in wall.

B. Design size of anchor to support load of storage shelving or bench.

### 3.04 CLEANING

A. On completion, touch up or refinish as required any marred or abraded finished surfaces.

B. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

*END OF SECTION 12354*

# SECTION 12356
# COUNTERTOPS

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This section includes corrosion resistant stainless steel countertops for custom stainless steel laboratory casework described in Section 12354.

B. Work in this section is intended to be sole-sourced along with the scope described in

### 1.02 REFERENCES AND STANDARDS

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.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A 1008/A 1008M | (2009a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened |
| ASTM A 167 | (1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip |
| ASTM A 325M | (2009a) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric) |
| ASTM F 594 | (2008) Standard Specification for Stainless Steel Nuts |
| ASTM F 836M | (2002) Standard Specification for Style 1 Stainless Steel Metric Nuts |

INTERNATIONAL CODE COUNCIL (ICC)

| | |
|---|---|
| ICC IPC | (2009) International Plumbing Code |

SCIENTIFIC EQUIPMENT AND FURNITURE ASSOCIATION (SEFA)

| | |
|---|---|
| SEFA 7 | (1996) Recommended Practice for Laboratory and Hospital Service Fittings |

### 1.03 SUBMITTALS

A. Product Data: Submit Manufacturer's catalog data for Corrosion-Resistant Steel, Steel Sinks, Service Fixtures, Accessories and Hardware

B. Samples: Include samples for the following: Countertop and Backsplash, one Each, 100 millimeter in width, submitted as one unit or as separate items. Accessories and Hardware, one each.

C. Certificates - Submit certificates for the following items showing conformance with the referenced standards contained in this section: Corrosion-Resistant Steel,

Steel Sinks, Service Fixtures, Accessories and Hardware

1.04 DELIVERY, STORAGE, AND HANDLING

A Deliver, store, and handle countertops [and backsplash] in a manner that will prevent damage and disfigurement.

B. Provide temporary skids under units weighing more than 200 kilograms.

1.05 DESIGN

A. Provide factory fabricated, prefinished steel countertops in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated.

1. Construct countertops as specified and meet the requirements of KCMA A161.1.

2. Accomplish fastenings to permit removal and replacement of individual units without affecting the remainder of the installation.

3. Provide counters with watertight sink rim when indicated.

## 2.00 PRODUCTS

2.01 GENERAL

A. Submit Manufacturer's Standard Color Charts for countertops showing the manufacturer's recommended color and finish selections.

B. Submit Manufacturer's Instructions for countertops including special provisions required to install equipment components and system packages. Include all special notices detailing impedances, hazards and safety precautions.

C. Provide the manufacturer's standard type countertops or as indicated on the drawings. Accomplish fastenings to permit removal and replacement of individual countertops without affecting the remainder of the installation.

2.02 MATERIALS

A. Provide Corrosion-Resistant Steel conforming to ASTM A 1008/A 1008M and ASTM A 167, Type 316, Finish 4.

B. Use Filler Material conforming to FS TT-F-336.

C. Provide fasteners conforming to the following:

1. Screws: ASME B18.6.1, Group, Type and Class as applicable

2. Anchoring Devices: FS FF-S-325, Group, Type, and Class as applicable

4. Nuts: ASTM F 594, corrosion-resistant steel

5. Bolts: ASTM A 325, heavy, hexagon head bolts corrosion-resistant steel

6. Nuts: ASTM F 836M, corrosion-resistant steel

7. Bolts: ASTM A 325M, heavy, hexagon head bolts corrosion-resistant steel

D. Corrosion-resistant Steel Sinks:

1. 1.3 millimeter corrosion-resistant steel, nonintegral, self-rimming

2. Drain holes in center of bowl
3. Underside coated with 3 millimeter thick sound deadener
4. Die-form, seamless, raised edges at front and ends
5. Cove corners to 13 millimeter radius
6. Equip with strainers and tail pieces
7. Sound deadening: conform to FS TT-C-520.

E. Provide Service Fixtures conforming to the following requirements:

1. Fixtures: In accordance with the water conservation policy as stated in the Standard Plumbing Codes, Appendix J.
2. Faucets: Deck mounted, cast brass, chrome plated, FS WW-P-541
3. Drains, strainers, and taps: Brass, chrome plated, FS WW-P-541
4. Index buttons: Plastic, color codes in accordance with SEFA 7

## 2.03 COUNTERTOP AND BACKSPLASH FABRICATION

A. Construct countertops and backsplash of Stainless steel covered with a shop-applied backing for rigidity according to ANSI A161.2].

1. Use a water-resistant type plywood, Grade B-D Douglas fir plywood, with a minimum thickness of 20 millimeter. Provide backsplash 20 millimeter thick by the height indicated, according to ANSI A161.2].]]
2. Provide steel no lighter than 0.85 millimeter corrosion-resistant steel for backed construction and not lighter than 1.3 millimeter corrosion-resistant steel for integral construction. Reinforce steel tops on edges and around sink-rim opening. Provide counters of one-piece construction; where corrosion-resistant sink bowls are provided, weld and polish smooth all joints. Make joints between sink, countertop, and backsplash watertight. Provide backsplash of the same material as countertop and form with square edges, and height as indicated.
3. Provide sink rims which are the standard products of a manufacturer regularly producing this type of equipment, fabricated from corrosion-resistant steel of the size necessary to receive the sinks.

## 2.04 SURFACING

A. Corrosion-Resistant Steel Surfacing

1. Form counters and work surfaces of 1.6 millimeter sheets with exposed edges returned.
2. Use hat-shaped channels, 1.6 millimeter, for reinforcement, spaced 760 millimeter on center.
3. Equip surfaces with wood strips under edges for fastening to cabinets.
4. Cove internal corners to 15 millimeter radius.
5. Coat underside with 3 millimeter thick sound deadener.
6. Electrically weld all joints, grind smooth, and polish to match adjacent finish.

## 2.05 ACCESSORIES AND HARDWARE

A. Mounting Adhesives

1. Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.

2. Provide spacers, if required, use type recommended by adhesive manufacturer. If adhesive will be visible in finished work, tint adhesive to match surfacing.

B. Joint Sealants - Use clear silicone sealant of type recommended by manufacturer for application and conditions of use. Provide anti-bacterial type in toilet and bath rooms, and food preparation areas.

C. Solvent - Use a product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives [and sealants].

D. Cleaning Agents - Use non-abrasive, soft-scrub type kitchen cleaners.

# 3.00 EXECUTION

## 3.01 INSTALLATION

A. Inspect material for defects prior to installation. Ensure materials throughout bear labels with the same batch number. Visually inspect materials used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on the project. Repair or replace damaged materials in a satisfactory manner.

B. Install countertops plumb with cabinetry level to within 1 millimeter in 3000 millimeter. Level base cabinets by adjusting leveling screws. Scribe and fit scribe strips to irregularities of adjacent surfaces. Gap openings exceeding 0.63 millimeter are not acceptable.

C. Secure countertops to cabinetry and wall construction using 6 millimeter diameter masonry anchors, spaced 760 millimeter maximum on center.

D. Submit installation drawings for countertops. Drawings must include location of cabinets, details of cabinets related and dimensional positions, and locations for roughing in plumbing, including sinks, faucets, strainers and cocks.

E. Preliminary Installation and Adjustment

1. Install materials in accordance to manufacturer's recommendations. Lift and place to avoid breakage.

2. Position materials to verify that materials are correctly sized and prepared. Make necessary adjustments.

a. If jobsite cutting, grinding, or polishing is required, use water-cooled tools. Protect jobsite and surfaces against dust and water. Perform work away from installation site if possible.

b. Gypsum drywall back walls which are not fire or acoustically rated may be routed up to half the thickness of the drywall to allow

countertop to fit.

c. Shim countertop drainage adjacent to sinks and where drainage is required, slightly to insure positive drainage.

F. Permanent Installation

1. After verifying fit, remove quartz surfacing from position, clean substrates of dust and contamination, and clean quartz surfacing back side and joints with solvent.

2. Apply sufficient quantity of mounting adhesive in accordance with adhesive manufacturer's recommendations to provide permanent, secure installation.

3. Install surfacing plumb, level, and square and flat to within 1.6 mm in 3 meters.

G. Joints

1. Joints between adjacent pieces of quartz surfacing: Joints must be flush, tight fitting, level, and neat.

2. Joints between backsplashes and countertops and around shower enclosures: Seal joints with silicone sealer.

3.02 CLEANING

A. On completion of cabinet installation, touch up marred or abraded finished surfaces. Remove crating and packing materials from premises.

B. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

3.03 INSPECTION

A. Examine casework grounds and supports for adequate anchorage, foreign material, moisture, and unevenness that could prevent quality casework installation.

B. Ensure that electrical and plumbing rough-ins for casework are complete. Do not proceed with installation until defects are corrected.

*END OF SECTION 12356*

# SECTION 12481
# ENTRANCE FLOOR MATS

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This Section includes the following:
   1. Entrance mats, surface mounted, frameless.

B. Related Sections include the following:
   1. Division 3 Section “Cast-in-Place Concrete”.

### 1.02 PROJECT CONDITIONS

A. Field Measurements: Confirm as-built floor dimensions prior to fabrication.

## 2.00 PRODUCTS

### 2.01 ENTRANCE MATS

A. Basis of Design Product: Provide Balco Metalines TransFormat I entrance mats with the following features:
   1. Surface mounted.
   2. Frameless.
   3. Single-piece.
   4. Nylon fusion bonded carpet inserts
      a. Color: To be selected from manufacturer’s standard range.
   5. Extruded aluminum rails with vinyl hinges complete with co-extruded soft durometer cushions.
   6. Acceptable other products are as follows:
      a. C/S Group
      b. Arden Architectural Specialties
      c. Substitutes may be considered following Division 1 requirements.

### 2.02 FABRICATION

A. Floor Mats: Shop fabricate units to required size. Provide single unit for each mat installation.

### 2.03 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural

Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

## 3.00 EXECUTION

### 3.01 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

A. Install surface mounted mats to comply with manufacturer's written instructions at locations indicated; coordinate with entrance door swings and traffic patterns.

1. Install necessary shims, spacers, and anchorages for proper location.

### 3.03 PROTECTION

A. After installing mats, maintain protection until construction traffic has ended and Project is ready for the final inspection.

*END OF SECTION 12481*

# SECTION 12494
# ROLLER SHADES

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This Section includes:

1. Roller shades light-blocking shades;

2. Roller shade blackout shades;

3. Motorized shade operators.

B. Related Sections include the following:

1. Division 6 Section "Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

2. Division 16 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

### 1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

1. Motorized Shade Operators: Include operating instructions.

2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

2. Wiring Diagrams: Power, system, and control wiring.

C. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.
4. Motorized shade operator.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## 2.00 PRODUCTS

## 2.01 ROLLER SHADES

A. Products: Subject to compliance with requirements, provide one of the following:

1. Draper Inc.

2. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company.

3. Lutron Shading Solutions by VIMCO.

B. Shade Band Material: PVC-coated fiberglass.

1. Fabric Width: As indicated on Drawings.

2. Color: Black.

3. Bottom Hem: Straight.

4. Trim: As indicated by manufacturer's designation for style and color.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated on Drawings.

D. Direction of Roll: Regular, from back of roller.

E. Mounting Brackets: Galvanized or zinc-plated steel.

F. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

G. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

H. Audiovisual Light-Blocking Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with headbox and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.

1. Side Channels, Sill Channel or Angle, and Perimeter Seals: Manufacturer's standard design, including sill light seal attached to bottom bar, for eliminating light gaps when shades are closed.

2. Shade Band Retention System: Manufacturer's standard design for guiding shade band material through range of travel and holding shade band flat with edges of material within side channels.

I. Shade Operation: Motorized operator.

## 2.02 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: Matching or coordinating with shade band color, unless otherwise indicated.

## 2.03 MOTORIZED ROLLER SHADE OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Elero USA Inc.

2. SIMU US, Inc.

3. SOMFY Systems.

B. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

C. Comply with NFPA 70.

D. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc. E. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.

2. Motor Characteristics: Single phase, 24V, 50 or 60 Hz, Including 120V step-down transformer.

3. Motor Mounting: Within manufacturer's standard roller enclosure.

F. Position of Motor and Electrical Connection: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.

G. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations: Momentary contact, three-position, rocker style, wall switch-operated control station with open, close, and center off functions.

a. Color: Ivory.

## 3.00 EXECUTION

### 3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

## 3.03 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

## 3.04 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of final inspection.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect.

## 3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 1 Section Demonstration and Training."

*END OF SECTION 12494*

# SECTION 12500
# FURNITURE SYSTEMS

## 1.00 GENERAL

### 1.01 SCOPE OF WORK

A. This section includes the Owner's furniture systems for the new office space which are to be coordinated with the Contractor.

B. Meetings to discuss furniture will be in the future.

C. Workstation Specification Guide

1. This specification establishes the minimum requirements for the acquisition and installation of a complete and usable system of workstations composed of panels, stacking panel-frames, spine walls, freestanding work surfaces or base units, supporting components, electrical hardware, communications, special electrical features, and accessories.

2. Workstation requirements and configurations shall be in accordance with the furniture layout and typical workstation types shown in drawings and specified herein. Provide components and hardware from a single manufacturer; they shall be standard products as shown in the most recent published price lists or amendments.

3. Electrical components shall be products of a single manufacturer to the extent practicable (different types of components may be of different manufacturers, but all units of a given component shall be from a single source). The completed installation shall comply with NFPA 70 and NFPA 101.

4. 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.

### 1.02 QUALITY ASSURANCE

A. REFERENCES AND STANDARDS

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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2004) Safety Glazing Materials Used in Buildings

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C 1048 | (2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass |
| ASTM C 423 | (2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method |
| ASTM D 1972 | (1997; R 2005) Standard Practice for Generic Marking of Plastic Products |
| ASTM E 2129 | (2005) Standard Practice for Data Collection for Sustainability Assessment of Building Products |
| ASTM E 290 | (2009) Bend Testing of Material for Ductility |
| ASTM E 84 | (2009c) Standard Test Method for Surface Burning Characteristics of Building Materials |

BIFMA INTERNATIONAL (BIFMA)

| | |
|---|---|
| BIFMA X5.5 | (1998) Desk Products |
| BIFMA X5.6 | (2003) Panel Systems |

GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)

| | |
|---|---|
| GEI | Greenguard Standards for Low Emitting Products |

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

| | |
|---|---|
| NEMA WD 1 | (1999; R 2005) Standard for General Requirements for Wiring Devices |
| NEMA WD 6 | (2002; R 2008) Standard for Wiring Devices - Dimensional Requirements |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 101 | (2009; Amd 1 & 2 2009) Life Safety Code |
| NFPA 255 | (2005; Errata 2006) Standard Method of Test of Surface Burning Characteristics of Building Materials |
| NFPA 265 | (2006) Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls |
| NFPA 70 | (2008; AMD 1 2008) National Electrical Code - 2008 Edition |

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

| | |
|---|---|
| SCS | Scientific Certification Systems (SCS)Indoor Advantage |

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

| | |
|---|---|
| TIA-569-B | (2004; Addenda 1 2009) Commercial Building Standard for Telecommunications Pathways and Spaces |

U.S. GREEN BUILDING COUNCIL (USGBC)

| | |
|---|---|
| LEED | (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC) |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 1286 | (2008; Rev thru Nov 2009) Office Furnishings |
| UL 723 | (2008) Standard for Test for Surface Burning Characteristics of Building Materials |

B. Samples

Submit four sets of the finish samples listed below:

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

b. Panel, spine wall, work surface, modesty panel, and component finish. Minimum 60 by 75 mm with label designating the manufacturer, material composition, thickness, color, and finish.

c. Task lights.

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

C. Mock-up

Submit a Mock-up of an actual workstation. Reflecting approved finishes and fabrics in the workstation mock-up. Locate the mock-up installation at [the local dealership][approved off-site location][_____]. Do not order furniture systems for the project until the mock-up has been approved. Review of the mock-up may result in adjustments to the product, layout and finishes. The approved mock-up can be used in installation.

D. ALTERNATE DESIGN

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 shall meet or exceed the following criteria. Alternate designs that are submitted but do not meet these criteria will be rejected. The alternate design shall 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.

1. Component Requirements

The types of components or elements utilized shall be as shown on the drawings and as specified in PART 2 PRODUCTS of this specification. The storage capacity, number of workstations accommodated, width of aisles, or workstation configuration shall not be reduced.

a. 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.

E. Performance Requirements

Panels, spine walls, frames and frame covers, connection system, work surfaces, pedestals, shelf units, overhead door cabinets, lateral files, locks, accessories, and miscellaneous hardware shall meet testing as specified. ISO 9001 certified manufacturers may perform inhouse 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.

1. Selected Components

Workstations shall conform to the requirements of BIFMA X5.5 and BIFMA X5.6 with the following exceptions: Panels, spine walls and panel, or spine wall supported components shall be tested and pass in accordance with the requirements of BIFMA X5.6 and representative items shall 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 load to the center of the keyboard shelf for a period of 5 minutes. Any loosening of attachments, permanent deflection or damage to the operation of the drawer or shelf will be cause for rejection.

2. Panel Acoustics

Provide acoustical panels with a minimum noise reduction coefficient (NRC) of [0.65] [0.80] [_____] when tested in accordance with ASTM C 423 and a minimum sound transfer coefficient (STC) of [14] [20] [24] [26] [_____] when tested in accordance with ASTM E 290. Conduct the test on the entire assembled panel, full face area (the complete core, adhesive, decorative fabric, frame and joining components).

3. Panel Glazing

Tempered glass shall conform to ASTM C 1048, Kind FT, Condition A, Type I, [Class 1 Transparent] [Class 3 - Light reducing, tinted or translucent].

F. Pattern and Color

Pattern and color of finishes and fabrics for panels [and spine walls], components, and trim shall be [in accordance with Section 09 06 90 COLOR SCHEDULE] [as shown on the drawings] [_____].

## 1.03 PERFORMANCE REQURIMENTS

A. General Safety

Provide workstation products free of rough or sharp edges. [Panel and spine wall supported components shall have 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.] [ Desk-based workstation components shall have the option for a positive, integral locking device that secures components to the base units.]

B. Fire Safety

Components shall meet requirements for flame spread and smoke development as specified by NFPA 101 except as follows. Testing shall have been conducted in accordance with either ASTM E 84, UL 723, or NFPA 255 on the entire assembled panel and each different combination of fabric and interior construction. In addition, fabric shall meet the requirements of NFPA 265. Panel flame spread shall not exceed [[25 for Class A] [75 for Class B] [200 for Class C]] and panel smoke development shall not exceed 450 for Class A, B and C.

C. Electrical System

Task lights shall be UL approved and shall meet the requirements of NFPA 70. The electrical system shall meet the requirements of UL 1286.

D. 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. Drawing requirements, which are the furniture manufacturer's responsibility, shall be provided as a single submittal. Provide electronic drawings to the user for future re-configuration in the software package requested by the user. The electronic drawings shall include all modifications made during installation. As a minimum, submit the following:

1. Overall reference drawings: Drawings showing workstation locations and overall plan view within each floor. The scale shall be [1:400 (1/16 inch = 1 foot)] [1:200 (1/8 inch = 1 foot)]. Layouts shall reflect field verified conditions.

2. Installation drawings: Drawings showing workstations, panels, spine walls, components, and plan view within each floor. Workstations shall be identified by workstation type. Scale of drawings shall be identical to Architectural plans. Installation drawings shall reflect field verified conditions.

3. Workstation elevations: Dimensioned workstation elevations showing each type of workstation with panel frame [and spine wall frame] configurations and all components identified with manufacturer's catalog numbers. Elevations shall be drawn at 1:50 (1/2 inch = 1 foot) scale.

4. Panel drawings: Panel [and Spine Wall] drawings showing panel [and spine wall] locations and critical dimensions from finished face of walls, columns, panels, including clearances and aisle widths. Assemblies shall be keyed to a legend which shall include 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. Panel placement shall be coordinated with location of electrical, voice/date LAN,[ SIPRNet,][ NIPERNet,] mechanical and fire protection fixtures. Drawings shall reflect field verified conditions.

5. 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) shall be identified and a legend provided as applicable.

6. Wire management capacity drawings.

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

8. 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.

9. 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.

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

## 1.04 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand, item identification, and project reference clearly marked thereon. Remove furniture system components 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.

## 1.05 WARRANTY

Warrant the furniture systems for a period of 10 years with the following exceptions: fabrics and other covering materials, and paper handling products shall be guaranteed for 3 years. [Electromagnetic ballasts shall be warranted for 2 years.] [Electronic ballasts shall be warranted for 3 years.] [The electronic ballast warranty shall include a $10 labor allowance for each ballast.] Warranties shall 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.

## 1.06 MAINTENANCE SERVICE

Collect information from the manufacturer about [maintenance agreement] [green lease] options, and submit to Contracting Officer. Services shall reclaim materials for recycling and/or reuse. Services shall not landfill or burn reclaimed materials. When such a service is not available, local recyclers should be sought after to reclaim the materials.

## 2.00 PRODUCTS

### 2.01 MATERIALS

a. Plastic Identification: Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D 1972. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual.

aa. Type 1: Polyethylene Terephthalate (PET, PETE).

bb. Type 2: High Density Polyethylene (HDPE).

cc. Type 3: Vinyl (Polyvinyl Chloride or PVC).

dd. Type 4: Low Density Polyethylene (LDPE).

ee. Type 5: Polypropylene (PP).

ff. Type 6: Polystyrene (PS).

gg. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

A. Metal

[Steel shall contain a minimum of [25] [30] [_____] percent recycled content, with a minimum of [16] [_____]percent post-consumer recycled content.] [ Aluminum shall contain a minimum of [75] [100] [_____] percent recycled content.]

B. Composite Wood and Fiberboard

[Provide documentation that composite wood and agrifiber products [are third-party certified as meeting ANSI standard requirements for formaldehyde emissions.] [contain no added urea-formaldehyde resins.]] [Particleboard and fiberboard shall contain a minimum of [80] [100] [_____] percent recycled content.] [ Agrifiber products shall contain a minimum of [100] [_____] percent recycled content.][ Virgin wood products shall be FSC-certified.]

C. Plastic

[HDPE furniture shall contain a minimum of [_____] percent recycled content.]

D. Fabric

[PET fabric shall contain a minimum of [_____] percent recycled content.] [Biobased fabrics shall be a minimum of [85] [95] [_____] percent organically grown cotton, wool, or ramie.] Synthetic fabrics shall contain 100 percent post-consumer recycled content. Dyes shall be nontoxic, containing no mutagens, carcinogens, bioaccumulative or persistent toxins, heavy

metals, or endocrine disrupters. Chemical treatments, including wrinkle-resistant treatment, fire-resistant treatment, and moth treatment, are [permitted with written approval from the Contracting Officer.] [not permitted.] Submit Material Safety Data Sheets for fabrics.

E. Paints and Coatings - As specified in Division 9 PAINTS..

2.02 [PANEL SYSTEM] [SPINE WALL SYSTEM] [DESK-BASED SYSTEMS]

A. Panel System

Accessories and appurtenances for a completely finished panel assembly shall be supplied complete 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. Panels shall be [tackable][capable of accommodating fabric covered tackboards,] [acoustical,] [stackable,] [segmented [as designated on the drawings] and segments shall be field removable from both sides of the panel]. The panel system shall be available in a variety of nominal widths and heights as designated on the drawings. Heights shall be measured from the finished floor to the top of the panel. Powered and nonpowered panels shall be compatible in height. Coordinate panel heights with the HVAC and electrical designs.[ System shall have 100% off-modular capability with no defacement of any element caused by components when used in an off-modular application. Off modular connections shall not require a unique panel frame.] Submit Assembly Manuals as specified in the Submittals paragraph.

B. Stacking Panel-Frame System

Supply accessories and appurtenances for a completely finished panel assembly within the system. Provide a system capable of structurally supporting cantilevered work surfaces, shelves, files, and other components in the configurations shown on the drawings plus more than 1 fully loaded component per panel per side. Panels shall be [tackable,] [capable of accommodating fabric covered tackboards,][acoustical,][stackable,] [segmented [as designated on the drawings]and segments shall be field removable from both sides of the panel]. The system shall be capable of lowering or raising the overall panel assembly height, at horizontal connections, by either removing or adding panel-frames on-site without disturbing adjacent panel components. The panel system shall be available in a variety of nominal widths and heights as designated on the drawings and shall be vertically stackable. Heights shall be measured from the finished floor to the top of the panel assembly. Coordinate panel heights with the HVAC and electrical designs.[ System shall have 100% off-modular capability with no defacement of any element caused by components when used in an off-modular application. Off modular connections shall not require a unique panel frame.] Submit Assembly Manuals as specified in the Submittals paragraph.

C. Spine Wall System

Supply accessories and appurtenances for a completely finished spine wall assembly within the system. Provide a wall system capable of structurally supporting cantilevered work surfaces, shelves, files, and other components in the configurations shown on the drawings, as well as allow various off module attachment locations horizontally for these components plus more than one fully loaded component per panel per side. Spine wall covers shall be easily removable while panels and workstation components are attached. Panels shall be [tackable,] [capable of

accommodating fabric covered tackboards,][acoustical,][stackable,] [segmented [as designated on the drawings]and segments shall be field removable from both sides of the panel]. The spine wall panels shall be available in a variety of nominal widths and heights as designated on the drawings. [Wall height may be lowered or raised at horizontal connections by either removing or adding wall tiles on-site without disturbing adjacent wall components.] Heights shall be measured from the finished floor to the top of the panel. Coordinate wall heights with the HVAC and electrical designs. Electrical and data management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Cables shall be laid in the system, not threaded through the frame.[ System shall have 100% off-modular capability with no defacement of any element caused by components when used in an off-modular application. Off modular connections shall not require a unique panel frame.] Submit Assembly Manuals as specified in the Submittals paragraph.

D. Desk-Based Systems

Supply accessories and appurtenances for a completely finished desk-based assembly within the system. The desk-based system shall be 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. The system shall be available in a variety of nominal widths as defined on drawings.

E. Finishes

a. The panels shall be available in the following options: [safety glazed,] [open frame] [_____]. Exposed panel trim shall have a [factory baked enamel or epoxy powder] [wood,] finish. [Filler trim shall either match the panel trim or be fabric covered to match the panel fabric.] [Filler trim shall not be provided.] Each fabric-faced panel shall have a seamless width of fabric stretched over the entire face of the panel and the color of each fabric utilized shall be consistent throughout the installation. Curved panels may use adhesives on curved sections. The fabric shall be attached securely and continuously along the entire perimeter of the panel and shall allow for easy removal and replacement in the field (with the exception of curved panels). Fabric shall be factory installed and panel fabric content shall be [_____]. [Provide perforated metal panels [below worksurface height][within workstations] [not to include corridor side of workstation].]

b. The stacking panel-frames shall accommodate covers which are available in the following options: [safety glazed,] [open pass through frames,] [wood veneer,] [upholstered,] [laminate/vinyl,] [cable access channels,] [marker surface,] [tackable surface,] [slat tile,] [_____].[ Frame covers may have different options on either side of the frame.] Exposed panel trim shall have a [factory baked enamel or epoxy powder][wood] finish.[ Filler trim shall either match the panel trim or be fabric covered to match the panel fabric.][ Filler trim shall not be provided.] Each upholstered frame cover shall have a seamless width of fabric stretched over the entire face of the cover, and the color of each fabric used shall be consistent throughout the installation. The fabric shall be attached securely and continuously along the entire perimeter of the cover and shall allow for easy removal and replacement in the field. Fabric shall be factory installed and panel fabric content shall be [_____].

c. The spine wall frames shall accommodate covers which are available in the following options: [safety glazed,] [painted] [wood veneer] [upholstered] [laminate/vinyl] [tackable surface] [marker surface] [paper management] [vertical storage] [cable access] [_____]. Frame covers may have different options on either side of the frame. Exposed trim shall have a [factory baked enamel or epoxy powder] [wood] [metal] finish. Each fabric-faced frame cover shall have a seamless width of fabric stretched over the entire face of the cover, and the color of each fabric used shall be consistent throughout the installation. The fabric shall be attached securely and continuously along the entire perimeter of the cover and shall allow for easy removal and replacement in the field. Fabric shall be factory installed and have a content of [_____].

F. Raceways

Raceways shall be an integral part of the panel and spine wall. Provide panels and spine walls, whether powered or nonpowered, with a raceway cover. Magnet held base covers will not be accepted.

G. Leveling Glides

The system shall provide precise alignment of adjacent panels and spine walls and shall include leveling glides to compensate for uneven floors. On panel-to-panel products, each panel shall have 2 leveling glides. On panel-to-post products each connector shall contain a leveling glide. On stacking panel frames each vertical panel assembly shall have two leveling guides. A minimum 19 mm adjustment range is required for all systems.

H. Connection System

The system shall have connectors which accommodate a variety of configurations as shown on the drawings. 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]. The connector system shall provide tight connections with continuous visual and acoustical seals. All two-way and T connections should have plastic, painted metal, fabric or wood finish to match system. The connector system shall allow removal of a single panel or spine wall within a typical workstation configuration, without requiring disassembly of the workstation or removal of adjacent panels or spine walls. The connector system shall provide for connection of similar or dissimilar heights. Provide dissimilar height panel assemblies with trim pieces to finish the exposed edge. Right angle (90 degree) connections between panels shall not interfere with the capability to hang work surfaces and other components on any adjacent panel. The connector system shall provide, as required, for the continuation of electrical and communications wiring within workstations and from workstation to workstation. Filler posts shall be level with the top rail.

I. Wall Mounted Panels

Use wall-mount accessories when it is necessary to attach panels or vertical panel-frame assemblies to the building walls. Wall panels shall have structural support as required.

J. Glazed Panel Inserts

Glazed panel inserts shall be comprised of tempered glass in accordance with ANSI Z97.1. Acrylic glazing will not be accepted.

K. Door Panels

Door panels shall have a rigid metal frame with rails, a threshold, and a [wood] [laminate] [safety glazed] [_____]clad door adaptable to either hand swing. Door panels shall be of a dimension that will allow for a 810 mm clear opening. Door panels shall include connectors, hinges, and [brushed chrome] [epoxy powder] [baked enamel] finished ADA compliant door knob.

L. Sliding Doors

Sliding or rolling doors shall be attached to the panel [in locations shown on the drawings][_____]. The direction in which door slides shall be able to be changed in the field. Door shall be [translucent][_____] and shall be the same width or wider than the opening to be covered. Door pulls shall be provided for each side of door. Door frame shall match the panel frame color.

## 2.03 WORK SURFACES

A. General Requirements

Construct work surfaces to prevent warpage.[ Work surfaces shall be either fully supported from the panels [or spine wall] or supported jointly by the panels[ or spine wall] and supplemental legs, pedestals, or furniture end panels. Supplemental end supports shall be used only under work surfaces when the work station configuration does not permit full support by the panels[ or spine wall]. Use metal support brackets to support work surfaces from the panels[ or spine wall], provide metal-to-metal fitting to the vertical uprights of the panels[ or spine wall], vertically adjustable, to lock the work surfaces in place without panel[ or spine wall] modifications.][ Work surfaces shall be fully floor supported with legs, pedestals, or furniture end panels.] Abutting work surfaces shall mate closely and be at equal heights when used in side-by-side configurations in order to provide a continuous and level work surface. Work surfaces shall either have pre-drilled holes to accommodate storage components, pedestals and additional supports, or holes shall be able to be drilled at the job site to accommodate these items. Work surfaces shall be provided in sizes and configurations shown on the drawings. Work surfaces shall be available in nominal depths of [510 mm,][ and ][610 mm,][ and ][760 mm,] plus or minus 50 mm, nominal lengths from 610 to 1830 mm, and a nominal thickness from 25 to 45 mm. Work surfaces shall be height adjustable in 25 to 40 mm increments from 630 to 1040 mm above the finished floor. Work surfaces abutting at equal heights shall provide a continuous and level work surface. [Corner work surfaces,] [peninsula work surfaces,] [ and ][counter/transaction work surfaces] shall be provided as shown on the drawings and shall include hardware necessary to provide firm and rigid support.[ Work surfaces shall have 100% off-modular capability with no defacement of any element caused by components when used in an off-modular application.][ Mobile half round round table shall have casters of which a minimum 2 shall be locking[, and table shall lock to the adjacent worksurface].]

B. Finishes

The work surfaces shall have a finished top surface of [high pressure plastic laminate], [veneer] and shall have a smoothly finished underside. The work surface shall not be affected by ordinary household solvents, acids, alcohols, or salt solutions, and shall be capable of being cleaned with ordinary household cleaning solutions. Metal support brackets shall match the color and finish of trim. Edges shall be [post formed or vinyl molding] [solid wood].

## 2.04 PEDESTALS

Drawer configurations and pedestal height shall be as shown on the drawings. The deepest possible pedestal shall be provided for each work surface size specified. [Mobile pedestals shall be free standing, and have[ an attached upholstered seat cushion,][ a handle for moving,][ and ] casters. Mobile pedestals shall be load bearing and be equipped with counterbalance as standard. Mobile pedestals shall be of a height to be stored under standard height worksurface.]

A. Construction

Pedestals and drawers shall be of steel construction[ with the exception of drawer fronts]. Drawer faces shall be securely attached to the drawer front.

B. Finishes

The finish of steel surfaces shall be a factory baked enamel finish or powder coated. Drawer fronts shall be [either steel, plastic laminate, or molded plastic] [veneer].

C. Drawer Requirements

Pedestals shall be field interchangeable from left to right, and right to left, and shall retain the pedestal locking system capability. Design pedestals to protect wires from being damaged by drawer operation. Pedestals shall be [work surface hung,][support work surfaces,][free standing][mobile]; as shown. Drawers shall stay securely closed when in the closed position and each drawer shall contain a safety catch to prevent accidental removal when fully open. File drawers shall have either a cradle type or full extension ball bearing suspension with hanging folder frames or compressor dividers. File drawers shall be 305 mm high.[ Box drawers shall be provided with pencil trays.] [Center pencil drawer shall be mounted under the work surface.]

## 2.05 STORAGE CAPACITY

Provide Storage Units in the sizes and configurations shown on the drawings. [Overhead cabinets][ and ][shelf units] shall accommodate task lighting and shall have a [depth to accommodate a standard three ring binder][depth to accommodate [_____]].[ Attached storage shall have 100% off-modular compatibility with no defacement of any element caused by components when used in an off-modular application.]

A. Shelf Unit Construction

The shelf pan shall be of metal construction with formed edges. Shelf supporting end panels shall be constructed of metal, high density particle board, molded phenolic resin, or molded melamine. Shelf units shall accommodate relocatable shelf dividers.

B. Overhead Cabinet Construction

Provide metal construction overhead cabinets. Units shall remain securely fastened when in the locked position. Doors shall utilize a suspension system. [Overhead cabinet door shall retract over the top of the cabinet[ and shall be curved].][ Overhead cabinet door shall retract into the cabinet.] [Overhead cabinet shall be ADA accessible.]

C. Lateral File[, Vertical File][, Pedestal][ and Book Case] Construction

Units shall be of steel construction and file fronts, top and end panels shall be of metal construction. File drawers shall have full extension ball bearing drawer slides or rack and pinion suspension. File drawers shall have hanging folder frames or rails and shall be capable of hanging side-to-side or front-to-back. [Vertical files shall have dividers.]

D. Personal Storage Tower Construction

Personal storage tower and components shall be of steel construction. The personal storage tower shall be [the same height as the surrounding panels][_____] and include the following: One full height wardrobe unit with coat rod, two file drawers, bookcase with 2 adjustable shelves and hinged lockable doors [_____].

E. Finish

Shelves, dividers and top dust cover shall have a factory baked enamel or epoxy powder coat finish. Shelf supporting end panels shall have either a factory baked enamel, epoxy powder coat or laminate finish. Shelf bottom shall match end panel color. Metal doors shall have an exterior finish of [factory baked enamel][factory installed fabric covering] and an interior finish of factory baked enamel or epoxy powder coat. Metal drawers shall have a factory baked enamel finish or epoxy powder coat.[ Overhead cabinet doors shall have fabric finish.] Fabric content of overhead cabinet doors shall be [_____]. [[Overhead cabinets][ and ][lateral files] shall have a wood veneer surface.]

## 2.06 LOCKS AND KEYING

Provide drawers, [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. Each workstation shall be individually keyed, and locks within a workstation shall be keyed alike. Drawers within a pedestal shall be lockable either by a central lock that controls all pedestals under one work surface or an individual keyed lock in each pedestal. Central file and storage units which are grouped together but are not a part of a workstation shall be keyed alike unless otherwise specified. Two keys shall be provided for each lock or 2 keys per workstation when keyed alike, and 3 master keys shall be provided per area as shown on the contract drawings. Keys and lock cylinders shall be numbered for ease of replacement. Locks shall be clearly labeled with a key number, except for

those manufacturers who have removal format locks. [Door panels shall have keyed [door knob][_____] set.]

## 2.07 POWER AND COMMUNICATIONS

Provide both powered and nonpowered panels [and spine walls] with base raceways capable of distributing power circuits, [communication cables] [and] [data lines]. Nonpowered bases shall be capable of easy field conversion to powered base without requiring the panel [spine wall] to be dismantled or removed from the workstation. The system shall use copper [cable assemblies,] [wiring harnesses][ or ][electrified bus] and shall meet requirements of UL 1286 and NFPA 70, Article 605. Conductors shall consist of 20 amp [90] [75] degree C, #12 AWG wires (unless indicated otherwise) or the equivalent in the bus configuration. 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 shall conform to the requirements of Division 16 INTERIOR DISTRIBUTION SYSTEM.

### A. Panel Raceways (Option)

Panels shall 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. The raceway shall not extend past either [panel face] [frame cover] by more than 13 mm. Provide metal or plastic covers which attach securely to the raceway as required and match the finish and color of the panel trim. Raceways [in full size over 610 mm powered panels] [on panel frames] shall have a minimum of 2 knockouts (doors) per side for power receptacles and communications jacks as indicated elsewhere. Other raceways shall be flush with [panel face][frame covers].

### B. Spine Wall (Option)

Provide spine walls able to support lay-in cabling and having a large capacity for power and data. The interior of the spine wall frame shall provide ample space for storing excess wires and fiber optic cables. Power and data systems shall be easily accessed in the spine wall without having to move return panels or components. The spine wall system shall have the ability to provide power to a wall-attached panel system and/or an adjacent desk system. Locate raceways in numerous places such as the base, beltline, and below and above the beltline. Spine wall frames shall 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. The base raceway shall not extend past the spine wall face by more than 13 mm. Other raceways shall be flush with the wall face. Metal or plastic raceways covers shall match the finish and color of the panel trim, unless otherwise stated. A termination center or utility closet may be utilized in the wall or at the end of a spine wall run.

### C. Power Distribution

Provide power distribution as indicated on the drawings. The panels[ and ][spine wall] shall have an internal [power][ and ][communications] raceway and the capability of disconnecting and connecting external circuits to the electrified raceway in the panel[ and ][spine wall]. The

communications receiving raceway shall have capacity for at least [six][twelve][twenty] 4-pair category 5 cables. Power and communications wiring may share a common wireway if a metal divider is included to ensure electrical isolation. Doors or access openings shall be included for entry of communications cable. The electrified power raceway shall be of the [8-wire][6-wire][ or ][5-wire] configuration indicated.[ Unless otherwise indicated, conductors of the 8-wire system shall be allocated as follows: the three-phase system shall have one equipment ground, one isolated ground, [one neutral] [one oversized (133 percent minimum) neutral], and two each dedicated phase.] [Unless otherwise indicated, conductors of the 8-wire system shall be allocated as follows: the three-phase system shall have one equipment ground, one isolated ground, [one neutral per phase] [one oversized (133 percent minimum) neutral per phase], and one each dedicated phase.]

1. Receptacles

Provide power receptacles in the powered panels [and spine walls]. 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] [multiple] [_____] vertical increments throughout the frame via power harnesses.] Unless otherwise indicated, receptacles shall be [15 amp (NEMA 5-15R)] [20 amp (NEMA 5-20R)] commercial grade conforming to NEMA WD 1 and NEMA WD 6. If receptacles are not interchangeable or will not permit field adjustment of phase and circuit selection, 10 percent spare devices of each type shown on these plans shall be provided. [All][General use] receptacles shall be of the duplex configuration; unless otherwise indicated, special use receptacles shall 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 [and spine wall] trim. Isolated ground receptacles shall [be orange] [or] [have distinct markings] [be of a different color than other receptacles]. Field applied identification shall be permanent; stick-on or non-setting adhesives shall not be used. The contractor shall provide [5][_____] percent spare devices for each configuration and type of receptacle. A minimum of [5][_____] receptacle removal tools shall be provided for systems that require special tools for proper receptacle removal.

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. Variations shall be approved in advance. 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.)

3. Electrical Connections

a. Internal Connections

Internal panel-to-panel [spine wall-to-spine wall] [spine wall-to-panel] power connections shall utilize [straight or flexible plug/receptacle connector assemblies] [hardwired connections] and shall be installed to provide the powered configurations shown on the drawings.

b. Connections to Building Services

Supply external [power][ and ][communications] services to the panels [spine walls] via [direct-wired [top][base] entry modules.][hard wired [top][base] entry junction box assemblies.][ Wiring from building services shall be extended to the entry modules or panel [spine wall] bases in metal conduit or tubing or in flexible liquid tight conduit 1830 mm maximum.][ Wiring from building services shall be extended to junction box assemblies in metal conduit or tubing. Wiring from junction boxes shall be flexible liquid-tight conduit 1830 mm maximum or in metal conduit or tubing.] Cord and plug assemblies shall not be used for any portion of external links.[ Base feed modules shall plug into the end or either side of the raceway at receptacle doors.][ Top entry [modules][junction box assemblies] shall extend the [power][ and ][communications] wiring into service entry poles attached to the electrified panels.] External wiring shall conform to Division 16 INTERIOR DISTRIBUTION SYSTEM.

c. Wire Management

Provide wire management capability at all workstations. Actual wire management capacity shall accommodate all cable types specified, including the applicable manufacturer required bending radius at corners. Raceways and interfaces to the raceways shall be designed to accommodate the bend radius as shown in TIA-569-B for Category [5][5e] [_____][ and ][fiber optic cables] communication wiring [whichever is greater]. 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). Grommet kits or another suitable finish arrangement shall be provided for all cable cutouts. Accessories for an externally mounted vertical and horizontal wire management and concealment system shall be provided [as indicated on the contract drawings] [as recommended by the manufacturer]. Horizontal wire managers shall be supplied for mounting under all work surfaces. The wire managers shall be attached either to the underside of the work surface or to the vertical panel [and spine wall] without damaging the face. Exposed or loose wiring will not be acceptable. Wire managers shall be prefinished and shall secure, conceal, and accommodate outlet cords as well as electrical and communications wiring. Wire channels shall match color of panel [and spine wall] trim, attach by means of clip-on attachment, and shall conceal wires routed vertically. Power wiring shall be separated from communication wiring by use of separate raceways or by placement of channels in joint use troughs or wireways.

D. Circuit Layout

The circuit layout for workstations shall be as shown on the drawings. Devices shall be connected to the designated circuits in the neutral and ground configurations indicated.

Connections shall be made to the building electrical distribution system as shown on the contract drawings and in accordance with Division 16 INTERIOR DISTRIBUTION SYSTEM.

E. Service Entry Poles

Provide service poles, as indicated on the contract drawings, and capable of minimally accommodating the [8-wire][_____] power configuration described in paragraph Powered Panels and the equivalent of [six] [twelve] [twenty] 4-pair category 5 cables.[ Poles shall have metal barriers or channels to separate power and communications wiring.] Pole dimensions shall be allowed to be equal to maximum panel [spine wall] thickness. The pole finish and color shall [match the finish and color of the panel [spine wall] trim][conform to requirements shown on the plans]. Designated poles shall have the capability of being opened along the vertical access to permit the lay-in of wiring. Each pole shall have a wiring interface, an end cap and a ceiling trim plate which extends a minimum of 40 mm from all sides of the pole. Poles for power service shall include a junction box either as part of the pole assembly or in a field installed configuration. Service poles shall be securely attached to the panels [spine wall] and shall be installed plumb. Wiring and interface components shall be provided as required to connect the building power supply to power poles.

F. Communications

Communications wiring shall be extended to, and installed in, the electrified panels [and spine walls] as shown on the plans. Communications jacks shall be installed at designated locations.[ Provide a communication consolidation point at the end of the cubicle. The consolidation point shall consist of a [24][48] port patch panel that is rated for Category [5][5e]. The panel that covers the consolidation panel shall be lockable. All locks shall be keyed alike. these locks shall 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 shall conform to the requirements of [Division 16 - INTERIOR DISTRIBUTION SYSTEM] [Division 16 - BUILDING TELECOMMUNICATIONS CABLING SYSTEM] and all interfaces shall be properly coordinated.

## 3.00 EXECUTION

### 3.01 INSTALLATION

Install the workstations using certified installers in accordance with manufacturer's recommended installation instructions. Workstation components shall be installed level, plumb, square, and with proper alignment with adjoining furniture. The components shall be securely interconnected and securely attached 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.

### 3.02 CLEANING

As specified in Division 1- CLOSEOUT. Upon completion of installation, all products shall be cleaned and polished and the area shall be left in a clean and neat condition. Any defects in

material and installation shall be repaired, and damaged products that cannot be satisfactorily repaired shall be replaced. Submit Maintenance Manuals as specified in the Submittals paragraph.

## 3.03 WASTE MANAGEMENT

Separate corrugated cardboard and packing materials in accordance with the Waste Management Plan and reuse or recycle.

*END OF SECTION 12500*