2. Form all interior and exterior door frames from 16-gage steel, except frames at pairs of doors shall be 14 ga. steel.

3. Provide 4 wall anchors per jamb, plus a floor anchor, with mortar boxes for all hardware, 16 ga.

4. All rabbets shall be sized, typically equal-sized double rabbets, and hinge preparations performed to accommodate seals and gaskets (to allow doors to close properly).

B. Door Silencers: Except on weatherstripped frames or frames with smoke or sound seals, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Clearances: Not more than 1/4 inch at jambs and heads; 3/4" at sill to allow for ½" threshold and door shoe.

B. Fabricate exposed faces of doors and panels from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.
F. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

G. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

H. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units.

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

1) In metal-stud partitions and existing walls, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
2) Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
3) Non-Fire-Rated Steel Doors:
   a) Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b) Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
   c) At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
   d) Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
4) Fire-Rated Doors: Install doors with clearances according to NFPA 80.

5) Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

C. Glazing: Comply with installation requirements in Section 088000 - Glazing and with hollow-metal manufacturer's written instructions.

1) Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 081113
SECTION 081210 - INTERIOR ALUMINUM DOOR FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Related Documents:
   1. Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes:
   1. Aluminum door frames, some with sidelights, for interior use.

C. Related Sections:
   1. Section 081113 – Hollow Metal Doors and Frames.
   2. Section 081416 – Flush Wood Doors.
   3. Section 087100 - Finish Hardware for all finish hardware for doors, including locksets, hinges, closers, and trim accessories.
   4. Section 088000 - Glazing.

1.2 SUBMITTALS
A. Product Data: Submit for frames and sidelights.
   1. Include information for factory finish, glazing gaskets, accessories and other required components.

B. Shop Drawings: Submit schedule indicating opening identification number, frame types, dimensions, swing, label, and hardware requirements. Use same reference numbers for openings as Contract Drawings.

C. Include elevations and details indicating frame types, profiles, conditions at openings, methods and locations of anchoring, glazing requirements, hardware locations, and reinforcements for hardware, details of connections to special construction and other custom features.

D. Samples: Sample of finished frame section.

1.4 QUALITY ASSURANCE
A. Single Source Responsibility: Provide aluminum frames, aluminum and glass doors, and accessories produced by a single manufacturer for each type of product indicated.
B. Manufacturer’s Qualifications: Manufacturer shall demonstrate previous experience in manufacturing of interior aluminum door and office front framing for a period of not less than 10 years on comparable sized project.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver frames and doors in cartons to provide protection during transit and storage at project site.
B. Inspect frames and doors upon delivery for damage.
   1. Repair minor damage to pre-finished products by means as recommended by manufacturer
   2. Replace frames and doors that cannot be satisfactorily repaired.
C. Store frames and doors at project site under cover and as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Do not begin installation of frames or doors until area of work has been completely enclosed and interior is protected from the elements.
B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy. If necessary, provide temperature control and ventilation to maintain required environmental conditions.

1.7 WARRANTY
A. Warrant against defects in manufacturing of materials for a period of 2 years from date of substantial completion.
B. Warrant framing finish against defects, including cracking, flaking, blistering, peeling, and excessive fading, chalking and non-uniformity in color for a period of 5 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS
A. Manufacturers:
   1. Meet or exceed standards of manufacture, appearance, performance, function, and design of one of the following:

      RACO Interior Products, Inc., Duane Tuohy, 602/909-5358.

INTERIOR ALUMINUM DOOR FRAMES 081210 - 2
Western Integrated Metals, Jim Clark 480/704-6601.

B. Acceptable Products:

1. Interior Door Frames: RACO Classic Freestanding fixed throat frames to accommodate wall thicknesses indicated on Drawings (typically 5”); height of system as indicated on Drawings.
   a. Equal by Western Integrated Materials.
2. Interior Borrowed Light: RACO Classic Free Standing, fixed throat frames to accommodate wall thicknesses indicated on Drawings; height to match door frames.
   a. Equal by Western Integrated Materials.
3. Coordinate for frames to accept hinges, locksets and other hardware specified and provided in Section 087100 – Finish Hardware.

2.2 MATERIALS
A. Aluminum: Meeting requirements of ASTM B221, 6063T5 alloy, and as otherwise required to assure compliance with dimensional tolerances and maintain color uniformity. Billets shall be composed of at least 33% recycled aluminum.
B. Anchorage Devices, Clips and Fasteners: Manufacturer’s standard type, compatible with materials being secured.
C. Accessories: As necessary for complete system.

2.3 EXTRUDED ALUMINUM FRAME AND DOOR FABRICATION
A. Assemble all sidelights and windows with the use of clips.
B. Do not exceed maximum size of window or door to meet applicable code requirements.
C. Factory pre-machine door frame jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

2.4 FINISHES
A. Factory finish extruded frame and door components so that all parts exposed to view upon completion of installation are uniform in finish and color. Exposed surfaces shall be free of scratches and other serious blemishes.
B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
3.1 EXAMINATION
A. Examine project conditions and verify that project is ready for work of this section to proceed. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. Verify wall thickness does not exceed manufacturer's recommended tolerances of specified throat size.

3.2 INSTALLATION
A. Comply with frame and door manufacturer's printed installation instructions and approved shop drawings. Do not attempt installation in areas where wall thickness exceeds tolerances of specified throat size.
B. Install frames plumb and square, free from warp or twist, securely anchored to substrates with fasteners recommended by frame manufacturer. Maintain dimensional tolerances and alignment with adjacent work. Ensure joints are hairline tight and surfaces flush with adjacent components.
C. Set all doors in correct locations as shown on the drawings, level, square, plumb and in alignment with other work in accordance with the manufacturer's installation instructions and approved shop drawings.
D. Install glass in accordance with Section 08800.

3.3 ADJUSTING AND CLEANING
A. Protect exposed portions of aluminum surfaces from damage.
B. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

3.4 PROTECTION
A. Protect as required to assure that frames and doors will be without damage until Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent and location of each flush wood door is indicated on drawings and in schedules.

B. Type of doors required is the following:

1. Solid core flush wood doors with wood veneer faces.

C. Shop-priming, factory-finishing, and factory-premachining for hardware for wood doors is included in this section.

D. Hollow metal frames and doors are specified in Section 081113.

E. Interior aluminum frames are specified in Section 081210.

F. Door hardware is specified in Section 087100.

G. Glazing is specified in Section 088000.

1.3 SUBMITTALS:

A. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

2. Architectural Woodwork Standards Edition 1 of Architectural Woodwork Institute (AWI) and the Woodwork Institute, Section 9 – Doors, for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWMA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.

1. For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

D. PRODUCT DELIVERY, STORAGE, AND HANDLING: Protect doors with plastic bags during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

1.5 PROJECT CONDITIONS: Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction.
period to comply with the following requirements applicable to project's geographical location:

1.6 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective solid core interior doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, delamination, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include reinstallation and refinishing which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

2. Warranty shall be in effect during following period of time after date of Substantial Completion: Lifetime of installation.

PART 2 - PRODUCTS

2.1 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors for Transparent Finish: Comply with the following requirements:

1. Faces: Plain sawn Yellow Birch, book matched.
2. AWI Grade: A
3. Construction: PC-5 (Particleboard core, 5-ply faces), with stiles and rails glued to core and sanded before laminating, and all doors assembled with Type I adhesive. Provide solid wood blocking for closers, exit devices, and locksets. Stiles and rails shall be of solid
hardwood, 1-1/8" minimum for rails, 1-3/8" minimum for stiles. Surrounds for light openings shall be compatible hardwood, 6" minimum on all sides.

B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

2.2 FABRICATION:

A. Fabricate flush wood doors to produce doors complying with following requirements:

1. In sizes indicated for job-site fitting.
2. Doors shall be machined for hardware at the site.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

2.3 FACTORY FINISHING:

A. General: Comply with referenced AWS quality standard including Section 5 – Finishing to prefinish wood doors at factory.

B. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect and sheen. Finish all surfaces of doors. Reseal all surfaces cut or trimmed after finishing doors. Finish shall be a VOC-compliant water-based type.

1. AWS Grade: Custom.
2. Finish: AWS System 9 or 10 – UV curable – epoxy or water-based.
3. Staining: None – transparent finish
4. Effect: Open grain finish.
PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Hardware: Coordinate with Section 087100 - Finish Hardware.

B. Manufacturer's Instructions: Install wood doors in HM frames to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal all cut surfaces after fitting and machining (including cutouts, edges, tops and bottoms of doors).
   1. Fitting Clearances for Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of floor finish. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
   2. Bevel doors 1/8" in 2" at lock and hinge edges.

D. Factory-Finished Doors: Restore finish before installation as required. The Owner will not accept doors which show signs of repair. Seal all edges or penetrations cut after finishing or cut in the field for fitting or hardware installation.

FLUSH WOOD DOORS
3.3 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors and panels as recommended by manufacturer to ensure that they will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 081416
SECTION 084126 - ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior manual-swinging all-glass entrance doors.
   2. All-glass transoms.
   3. Interior all-glass storefronts.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for overhead-steel support for all-glass systems.
   2. Section 088000 "Glazing" for general glass requirements.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller.
1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: Show fabrication and installation details, including the following:
   1. Plans, elevations, and sections.
   2. Details of fittings and glazing, including isometric drawings of all fittings.
   3. Door hardware locations, mounting heights, and installation requirements.

C. Other Action Submittals:
   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For all-glass systems, accessories, and components, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Accessible All-Glass Entrance Doors: Comply with applicable provisions in the ICC/ANSI A117.1.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.
   1. Class 1: Clear monolithic.
      a. Thickness: 1/2 inch
   2. Exposed Edges: Machine ground and flat polished.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.

2.2 METAL COMPONENTS

A. Fitting Configuration:
   1. Manual-Swinging, All-Glass Entrance Doors and Transoms: Patch fittings at head and sill on pivot side, and for lock at sill of swing side.
   2. All-Glass Storefronts: Recessed glazing channel at top and bottom

B. Patch Fittings: Aluminum.

C. Anchors and Fastenings: Concealed.

2.3 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch fittings.

B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
      a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
3. Opening-Force Requirements:
   a. Accessible Interior Swinging Doors: Not more than 5 lbf to fully open door.

C. Push-Pull Set: Offset tubular pulls exterior and push bar interior.

D. Single-Door and Active-Leaf Locksets: Center-housing combination deadbolt and latchbolt with lever handles.
   1. Deadbolt operated by key outside and lever inside.

E. Cylinders: A[s specified in Section 087100 – Door Hardware.

F. Threshold: Not more than 1/2 inch high.

2.4 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
   1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lute.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

ALL-GLASS ENTRANCES AND STOREFRONTS
B. Set units level, plumb, and true to line, with uniform joints.
C. Maintain uniform clearances between adjacent components.
D. Lubricate hardware and other moving parts according to manufacturer's written instructions.
E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
F. Install joint sealants as specified in Section 079200 – Joint Sealers.

3.3 ADJUSTING AND CLEANING
A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.
   1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.
B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084126
SECTION 084413 - ALUMINUM DOORS, ENTRANCES AND FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of aluminum entrance and framing work:

2. Frames for entrances.
3. Storefront-type framing systems for openings.
5. Breakmetal sections.

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

1. Joint sealers are specified in Section 079200.
2. Interior aluminum frames for doors and other openings are specified in Section 081210.
3. Finish hardware is specified in Section 087100 – Finish Hardware. Contractor shall coordinate to ensure that hardware is provided for all new doors on the project.
4. Overhead ADA door operators are specified in Section 087113.
5. Glazing requirements for aluminum entrances and storefront are included in Section 088000 - Glazing.
6. Sliding aluminum doors are specified in Section 084500.
1.3 FRAMING SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide aluminum doors, entrances and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.

B. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.

1. The system shall be capable of withstanding a metal surface temperature range of 180 deg F without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.

C. Design Requirements: Provide aluminum entrance and storefront systems that comply with structural performance, air infiltration, and water penetration requirements specified below.

1. Wind Loads: Provide aluminum entrance and storefront assemblies capable of withstanding wind pressures of 20 psf inward and 20 psf outward acting normal to the plane of the wall.

D. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2 percent of their clear span.

1. Deflection Normal to the Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the wind load specified above. Deflection shall not exceed 1/175 of the clear span, when subjected to uniform load deflection test.

2. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.65 times the wind pressures specified above. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75 percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8 inch. The clearance between the member and an operable door or window shall be at least 1/16 inch.
3. The Manufacturer who supplies the project shall analyze system requirements, including configuration and height of members, and provide supplementary reinforcing for framing members as required to meet structural criteria.

E. Air Infiltration: Provide aluminum entrance and framing systems with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area (excluding operable door edges) when tested at a test pressure of 6.24 PSF in accordance with ASTM E 283.

F. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of Storefront - 8 lb. per sq. ft.

1.4 SWING DOOR PERFORMANCE REQUIREMENTS

A. Structural: Resistance to corner racking shall be tested by the Dual Moment Load test as follows:

1. Test section shall consist of a standard top door corner assembly; side rail shall be 24" long and top rail section shall be 12" long.

2. Anchor top rail positively to test bench so that the corner protrudes 3" beyond the bench edge. Anchor a lever arm positively to the side rail at a point 19" from inside edge of the top rail. Attach weight support pad at a point 19" from inner edge of side rail.

3. Test section shall withstand a load of 245 lbs. on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 deg.

B. Air Infiltration for Doors: Air infiltration shall be tested in accordance with ASTM E 283, at a pressure differential of 1.567 psf. A single 3070 entrance door and frame shall not exceed .70 CFM per linear foot of perimeter crack. A pair of 6070 doors and frame shall not exceed 1.0 CFM per linear foot of perimeter crack.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
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NORTHWEST CAMPUS EXPANSION
50% CONSTRUCTION DOCUMENTS

1. Provide the following:
   a. Manufacturer's standard details and fabrication methods.
   b. Data on finishing, hardware and accessories. Provide paint finish samples to verify match to existing.
   c. Recommendations for maintenance and cleaning of exterior surfaces.

2. Shop drawings for each aluminum door, entrance, storefront and curtainwall system required, including:
   a. Layout and installation details, including relationship to adjacent work.
   b. Elevations at 1/4-inch scale.
   c. Detail sections of typical composite members.
   d. Section and elevation of shading fins.
   e. Anchors and reinforcement.
   f. Hardware mounting heights.
   g. Provisions for expansion and contraction.
   h. Glazing details.

3. Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified for each opening. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include cut sheets with pictures, item name, name of the manufacturer and complete designations of every item required for each door opening.

4. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer's Qualifications: Provide aluminum entrances and framing systems produced by a firm experienced in manufacturing systems that are similar and equal to those indicated for this project and that have a record of successful in-service performance.
C. Design Criteria: The drawings and specifications indicate the size, profile, and dimensional requirements of aluminum entrance and framing work required, as well as all performance criteria, and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect, and another system meets all performance criteria. The burden of proof of equality is on the proposer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum entrance and framing components in the manufacturer's original protective packaging.

B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulins or polyethylene sheeting to permit circulation of air. Stack framing components to prevent bending and damage. Store hardware in a locked and secure location.

1.7 PROJECT CONDITIONS

A. Field Measurements: If possible, check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.

1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.8 WARRANTY

A. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:

1. Structural failures including excessive deflection, excessive leakage or air infiltration.
2. Deterioration of metals, metal finishes and other materials beyond normal weathering.

B. Warranty Period: 2 years after the date of Substantial Completion.
C. The warranty shall not deprive the Owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1. MANUFACTURER: Provide framing and doors meeting plans and specifications manufactured by one of the following:

Arcadia
Arch
OldcastleBE
Kawneer

2.2 MATERIALS

A. Aluminum Members: 6063-T5 alloy and temper; comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire. Use same material for frames and subframes.

   1. Breakmetal: 1/8" aluminum, same alloy and temper as framing members.

B. Carbon steel reinforcement of aluminum framing members shall comply with ASTM A 36 for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 for hot rolled sheet and strip.

C. Glass and Glazing Materials: Comply with requirements of Section 088000 - Glass and Glazing. Glaze aluminum systems with manufacturer's standard elastomeric glazing gaskets.

D. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material in accordance with ASTM A 164, warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.

   1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.

E. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

F. Concrete and Masonry Inserts: Provide cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.

G. Compression Weatherstripping for Heads and Jambs: Manufacturer’s standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

H. Door Bottom Weatherstripping: For each swing door provide center-mounted brush sweep (not vinyl).

J. Glazing Gaskets: EPDM extrusions to suit system, UV and heat resistant.

2.3 HARDWARE

A. General: Refer to Section 087100 - Finish Hardware for requirements for hardware items. GC shall coordinate who provide hardware for each type of door.

B. Provide heavy-duty hardware units as indicated, scheduled, or required for operation of each door, including the following items of sizes, number, and type recommended by manufacturer for service required; finish all items in a Clear anodized finish or other finish to match US26D being used for remainder of finish hardware.

1. Offset Pivot Sets: Comply with ANSI A156.4, Grade 1, top and bottom each door. Provide exposed parts of cast aluminum alloy.
   a. Provide an intermediate pivot for each exterior entry door.

2. Thresholds: Extruded aluminum thresholds of sizes needed, types for use with offset pivots, clear anodized finish, complete with anchors and clips. ADA accessible.
2.4 COMPONENTS

A. Framing Systems: Provide framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and reinforcing members of the type required or indicated. Shop-fabricate and preassemble frame components where possible.

1. Storefront System: Nominal 4-1/2" deep X 2" wide two part center glazed typical.
2. System shall drain to the exterior.
3. System equal to Arcadia C470 (Thermal) Compensating Stick Center Glazed or Kawneer Trifab Versaglaze 451 – center glazed. Systems by Arch, Vistawall, or another manufacturer which meet performance criteria are acceptable.

B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer’s standards. Reinforce as necessary to support required loads.

C. Stile-and-Rail Type Swing Doors: Provide tubular frame members minimum .125" thickness, fabricated with mechanical clip fastened joints, with SIGMA deep penetration and fillet welds with heavy inserted reinforcing plates.

1. Glazing: Fabricate doors to facilitate replacement of glass, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, .050" thickness, with exterior stops anchored for nonremoval. Doors will be glazed with safety glazing as specified in Section 08800.

2. Design: Provide 1-3/4-inch-thick doors of design indicated.

   a. Medium stile
      Vertical Stiles: 3-1/2"
      Top Rail: 3-1/2"
      Bottom Rail: Minimum 10" for ADA compliance

2.5 FABRICATION

A. General: Fabricate aluminum components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.
B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.

2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

3. Preglaze door and frame units to greatest extent possible.

C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.

1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

D. Reinforcing: Install supplementary reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.

F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.

1. Uniformity of Metal Finish: Abutting extruded aluminum members shall not have an immediately perceptible color or texture variation.

G. Fasteners: Conceal fasteners wherever possible.

H. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge. Provide weatherstripping at bottom of door.
2.6 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.

1. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

C. Construction Tolerances: Install aluminum entrances and framing to comply with the following tolerances:

1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.

2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.

3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

D. Separate aluminum and other corrodiile metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
2. Paint dissimilar metals where drainage from them passes over aluminum.
3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.

E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

F. Thresholds: Set on concrete using appropriate expansion anchors. Grout cavity under all thresholds using a nonshrink grout during installation.

G. Refer to Section 088000 - Glazing for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by manufacturer.

3.3 ADJUSTING: Adjust operating hardware and operators to function properly, for smooth operation without binding, and for weathertight closure.

3.4 CLEANING: Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings. Clean glass surfaces after installation, complying with requirements contained in the Section 08800 for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.5 PROTECTION: Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 084413
SECTION 084500 - SLIDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes manual sliding aluminum-framed and fixed glass door systems for exterior locations (at Student Life).

B. Related Sections include the following:

1. Section 079200 - Joint Sealers for joint sealants installed in exterior perimeter joints around sliding aluminum-framed glass doors.

2. Section 082120 - Interior Aluminum Framing.

3. Section 084413 - Aluminum Doors, Entrances and Framing for exterior storefront framing and aluminum swing doors.

4. Section 087100 – Finish Hardware.

5. Section 088000 - Glazing for glazing requirements for sliding aluminum-framed glass doors, including those specified to be factory glazed.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sliding aluminum-framed glass doors.

B. Shop Drawings: For sliding aluminum-framed glass doors. Include plans, elevations, sections, details, and attachments to other work.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed sliding aluminum-framed glass door installations similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1. Installer's responsibilities include fabricating and installing sliding aluminum-framed glass doors and providing professional engineering services needed to assume engineering responsibility.

1.5 System Description

A. General: In addition to requirements shown or specified, comply with:


C. Performance Requirements: Each assembly shall be tested by a recognized testing laboratory or agency in accordance with specified test methods.


D. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.

1.6 PROJECT CONDITIONS

1. Field Measurements: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating sliding aluminum-framed glass doors without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sliding Aluminum-Framed Glass Doors:
   a. Arcadia Architectural Products, Inc. – ULT-5000 Series Non-Thermal

Or equal by other manufacturers including:
   b. Kawneer Company, Inc.; an Alcoa company.
   c. OldcastleBE
   d. Arch

2.2 MATERIALS

A. Aluminum Extrusions: Provide alloy and temper recommended by sliding aluminum-framed glass door manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.100" for sill members and not less than 0.072" for all other members including frame, panel, and horizontal muntins. Aluminum shall be free of defects which impair strength and performance.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with sliding aluminum-framed glass door members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.

2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and sliding aluminum-framed glass door accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 (Severe) service conditions; provide enough strength to withstand design pressure indicated.
D. DOOR FABRICATION:

1. Sill shall have a full-length roll-formed 0.025” thick, stainless steel track cap.

2. Operable sash shall be equipped with two steel tandem ball bearing (all stainless steel tandem rollers and housings optional).


4. Operating panels shall have an extruded 3/4” diameter 8” O.C. aluminum wire pull handle set in clear anodize finish.

5. Fixed and/or sliding sash members shall be constructed to allow for either factory or field glazing. Sash glazing shall be accomplished using a “marine” style reusable, wraparound black flexible PVC or EPDM material per commercial standard CS230-60 without the need for separate glazing beads or putty style bedding compounds. The glazing channel shall be provided with the unit for either 1” insulating glass or 3/16” or 1/4” single glass.

6. All assembly and installation screws shall be 18-8 or 410 stainless steel.

7. Screens made of extruded aluminum frame and screened with 18 x 16 fiberglass mesh – dark gray.

2.3 GLAZING

A. Glass: Provide clear safety glazing as specified in Section 088000 – Glazing.

2.4 ACCESSORY MATERIALS

A. Joint Sealants: For installation in perimeter joints around sliding aluminum-framed glass doors, use elastomeric sealant as specified in Section 079100 - Joint Sealers.

2.5 FABRICATION

A. General: Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling panel framing.
C. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and with glazing system indicated. Provide glazing stops to match panel frames.

2.6 ALUMINUM FINISHES

A. 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 II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   2. Coordinate door installation with other built-in components.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing doors, hardware, accessories, and other components.

B. Set doors level, plumb, and true to line, without warp or rack of frames and panels. Provide proper support and anchor securely in place.
   1. Separate aluminum and other corroding surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.
   2. Set threshold in full coating of mastic.
3.3 ADJUSTING
A. Adjust operating panels and hardware to provide a tight fit at contact points for smooth operation. Lubricate hardware and moving parts.

3.4 CLEANING
A. Clean aluminum surfaces immediately after installing sliding aluminum-framed glass doors. Avoid damaging protective coatings and finishes. Remove excess glazing and sealants, dirt, and other substances.
B. Clean glass of factory-glazed doors immediately after installing sliding aluminum-framed glass doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels from glass surfaces.
C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the Construction Period.

3.5 PROTECTION
A. Protect sliding aluminum-framed glass doors from damage or deterioration until time of Substantial Completion.

END OF SECTION 084500
SECTION 087100 - FINISH HARDWARE AND HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK: Furnish all Finish Hardware and related items to complete work shown and specified. See drawings, schedules and details for items requiring hardware and for installation details.

A. Hollow metal doors are specified in Section 081113.
B. Wood doors are specified in Section 081416.
C. Aluminum entrances and framing are specified in Section 084413.

1.3 WORK EXCLUDED: Items generally known as rough hardware, or items of Finish Hardware when noted elsewhere in the Specifications as being furnished or included with items by other suppliers or Contractors, are not included.

A. Owner will provide cylinders and final keying for all locksets. General Contractor shall provide his own lockset cylinders and keys during construction as needed for project security.

1.4 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's immediate vicinity for a period of not less than 2 years, and who is, or employs on a full time basis, a registered Architectural Hardware Consultant member of the Door and Hardware Institute to properly detail work, order materials, and supervise installation.

1. The firm proposing to supply Finish Hardware for this project must be a regular stocking distributor of the hardware it proposes to furnish.
2. The Hardware Supplier shall make periodic inspections of project (upon receipt of hardware at project, during installation and at completion of installation) so that at the completed installation, Supplier can certify that said hardware is properly installed according to manufacturer's printed instructions. Forward copy of certification from Hardware Supplier in duplicate to Architect as soon as possible after installation of all hardware.

C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

   A. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

   B. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.5 GENERAL REQUIREMENTS: Confirm appropriateness of all hardware and provide hardware that installs without conflict with other hardware and is compatible in size and configuration for installation in the doors and frames as detailed and specified. Supply all template information necessary for installation to the Contractor and hardware installer. Furnish hardware to match templates provided.

   A. Supply templates to door and frame manufacturers, as required to enable proper and accurate sizing and locations of cutouts for hardware.

   B. Items of hardware not specified but required for completion of the work shall be furnished of type and quality suitable to the service required and comparable to adjacent hardware at no additional cost to the Owner.

1.6 SUBMITTALS:

   A. Product Data: Submit manufacturers' technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation,
instructions for maintenance of operating units and, finish, and other pertinent data.

B. Hardware Schedule: Prior to delivery of hardware, the Finish Hardware supplier shall prepare and submit complete schedules of all Finish Hardware required. Hardware sets on schedule shall be designated in the same manner as on the hardware schedule at the end of this section.

1. Based on builders hardware indicated, organize hardware schedule into hardware sets, in a vertical format, indicating complete designations of every item required for each door opening. Include the following information:

   Type, style, function and finish of each hardware item.

   Name and manufacturer of each item and representative catalog cuts for each item.

   Manufacturer's complete catalog number.
   Fastenings and other pertinent information.

   Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.

   Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

   Mounting locations for hardware.

   Door and frame sizes and materials.

C. Operation and Maintenance: Provide Owner with manufacturer's parts list and maintenance instructions for each type of hardware supplied, include necessary wrenches and tools required for proper maintenance and adjustment of hardware, all as supplied with hardware when shipped to Contractor.

D. Certification: Inspect the installation of all hardware and related items. At the completion of installation, submit certification that material is properly installed, according to manufacturer's printed instructions.
E. Guarantee: Provide written guarantee for all hardware against defects in materials and workmanship for one year. Repair, replace, or otherwise correct deficient materials at no additional cost to the Owner.

1.7 DELIVERY, STORAGE AND HANDLING:

A. Package each item of hardware and each lock separately in individual containers, complete with necessary screws, keys, instructions and installation templates for spotting mortising tools. Mark each container with heading number and number corresponding to numbers shown on Finish Hardware schedule.

B. Inventory hardware jointly with representative of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. The hardware shall be fitted prior to finishing doors, as applicable, and then removed and finishing completed before final installation of hardware.

D. The Contractor shall prepare a suitable storage space for all Finish Hardware and shall keep it under lock after it has been delivered to the building. He shall take full responsibility for all items of hardware after delivery. Install all hardware without marring or damaging hardware or other work. Replace all marred or damaged work. Adjust hardware for easy operation.

1.8 COORDINATION AND QUALITY OF WORKMANSHIP: Install closers, stops and other hardware as scheduled. Contractor shall coordinate for provision of extra support blocking for all interior and exterior applied hardware as needed for secure installation.

A. All hardware shall be installed by workmen skilled in this type of work, and the installation of the hardware shall in no manner detract from the appearance of the doors. Faulty workmanship shall be cause for rejecting the doors. Where manufacturers specify certain requirements in installing doors, these requirements shall be called to the attention of the workmen, and they shall be followed.
PART 2 - MATERIALS

2.1 HAND OF DOOR: The drawings show the direction of swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown. Notify the Architect of discrepancies.

2.2 BASE METALS: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FG-G-111, FS FF-H-116, and FS FF-H-121. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

2.3 FASTENERS: Furnish finish hardware with all necessary screws, bolts, or other fastenings of suitable size and type to anchor the hardware in position for heavy use and long life and of compatible material and finish. Furnish fastenings with anchors according to material to which it is applied, and as recommended by the manufacturer. Fasten closers on wood or mineral core doors with sex nuts and through bolts.

A. Manufacture hardware to conform to the published templates and prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

B. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners.

2.4 KEYING: All new locksets shall be provided less cylinders. Owner will key and install cylinders at the completion of the project.
A. Construction cylinders: The Contractor shall provide suitable construction cylinders for use to secure the work. At time of completion the Contractor shall remove construction cylinders to allow installation of Owner-supplied permanent cylinders.

2.5 FINISH: Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer’s standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

A. Provide finishes which match those established by the BHMA.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standard, but in no case less than specified for the applicable units of hardware by referenced standards.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in "Materials and Finishes Standard 1301" by the BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. Typical Finish: US26D (626); flatwork and accessories provided in stainless steel (32D) or another finish to match.

2.6 ACCEPTABLE MANUFACTURERS: Acceptable manufacturers for particular items of hardware are listed below.

A. Butts: Hager, McKinney, Stanley

B. Locksets, Passage Sets and Privacy Sets: Arrow (no substitution)

C. Push/Pull Plates, Kickplates, Armorphlates: BBW, Quality, Trimco

D. Stops and Bumpers: BBW, Quality, Trimco

E. Exit Devices: Von Duprin (no substitution)
F. Seals and Trim: Pemko, National, Zero

2.7 HINGES: Provide all hinges, ball-bearing type, standard weight for interior doors; with non-rising pins; provide flush button top and bottom tips on reverse bevel doors. Provide non-removable pins for exterior doors.

A. Width: Determine correct clearances and provide butt width as required for proper operation.

Length: 4-1/2" for doors to 36" wide.

Number required: 3 butts for doors over 60" high to 90" high

2.8 LOCKSETS AND PASSAGE SETS:

A. All locksets, passage sets and privacy sets shall be Q series (Grade 1), with lever handle, Arrow "Sierra" trim (SR), furnished without cylinder. Functions as scheduled. Exterior lever sets shall be provided with vandal-resistant freeswinging levers – Q Series “Overdrive”.

B. All strikes shall be full size and furnished with curved lips.

C. All locksets and deadbolts shall be 2-3/4" backset.

2.9 STOPS AND BUMPERS: Provide wall type where conditions permit, otherwise provide floor type. Preferred floor type for interior work, if wall type is not applicable, is BBW 806 Series as required, or equal.

2.10 KICKPLATES: 10” H x 34” W, .050” brushed stainless steel with beveled edges.

2.11 EXIT DEVICES:

At Aluminum Doors: Von Duprin 33A Slimline Series, rim type, ANSI A156.1-2001 Grade 1. Provide dogging on non-fire-rated exits. Typical trim ANSI Function 08, locking/unlocking lever.

At Doors other Than Aluminum: Von Duprin 99A, rim type, ANSI A156.1-2001 Grade 1. Provide dogging on non-fire-rated exits. Typical trim ANSI Function 08, locking/unlocking lever.
Exit Only: Provide no exterior trim.

2.12 GASKETS AND WEATHERSTRIPPING: At smoke control and exterior doors, provide metal retainer elastomeric gasket complying with Smoke, Air Leakage: Comply with NFPA 105. Equal of Pemko 294_V.

Fire Rated Doors: Provide adhesive mounted bulb gasketing equal Pemko S88D.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mount hardware units at heights indicated in "Recommended Locations of Builders Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed.

B. Install each item of hardware in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reapplication or reinstallation or application of surface protections with finishing work specified in the Division 9 sections. Do not install surface mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards. Set thresholds in mastic using suitable manufacturer-supplied expansion anchors.

3.2 ADJUST AND CLEAN: Adjust and check each operating item of hardware and each door, to ensure the proper operation or function of each unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
A. **FINAL ADJUSTMENT:** Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to final acceptance and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final balancing and operation of heating and ventilating equipment. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.3 **CONTINUED MAINTENANCE SERVICES:**

A. The General Contractor shall arrange the following to ensure a complete job:

1. Approximately six months after the acceptance of the hardware in each area, the installer, accompanied by the representative of the lockset distributor, shall return to the project and readjust every item of hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation. Prepare a written report of current and predictable problems in the performance of the hardware.

**PART 4 - HARDWARE SCHEDULE**

General: While the following hardware sets are intended to cover all doors and establish a type and standard of quality, it shall be the specific duty and responsibility of the finish hardware supplier to examine the plans and specifications and furnish proper hardware for all openings, whether listed or not.
HARDWARE SCHEDULE: For each door provide the following:

**Hardware Set 1 (Aluminum Single Exterior Exit)**
Closer
Pivots
Exit Device (Function 08)
Threshold
Weatherstrip
Bottom sweep
Stop

**Hardware Set 1A (Aluminum Single Exterior Exit w/Electronic Security)**
Closer
Pivots
Exit Device (Function 03)
Threshold
Weatherstrip
Bottom sweep
Stop

**Hardware Set 2 (Aluminum Single Exterior)**
Closer
Pivots
Push/Pull
Deadbolt with lever
Threshold
Weatherstrip
Bottom sweep
Stop

**Hardware Set 3**
Hinges
Classroom Lockset
Kickplate
Stop

FINISH HARDWARE
Hardware Set 3A
Hinges
Classroom Lockset
Closer
Seals
Kickplate
Stop

Hardware Set 4
Hinges
Storeroom Lockset
Closer w/HO
Weatherstrip
Threshold
Door Bottom

Hardware Set 5
Hinges
Storeroom Lockset
Stop

Hardware Set 5A
Hinges
Storeroom Lockset
Closer
Seals
Stop

Hardware Set 6
Hinges
Closer
Push/Pull Set
Deadbolt-Classroom
Stop
Weatherstrip
Door bottom
Threshold

FINISH HARDWARE

087100-11
Hardware Set 7 (Aluminum Interior Single)
Closer w/Cushion Stop
Push/Pull Set
Deadbolt w/lever
Pivots

Hardware Set 8
Hinges
Office Lockset
Kickplate
Stop

Hardware Set 9
Hinges
Closer
Exterior Lockset
Weatherstrip
Threshold
Drip
Door Bottom

Hardware Set 10
Hinges
Closer w/HO
Storeroom Lockset
Kickplate
Seals
Auto Door Bottom

Hardware Set 11
Hinges
Indicator Bolt
Kickplate
Stop
Hardware Set 12
Hinges
Closer
Exit Device EO
Weatherstrip
Threshold
Door Bottom
Drip

END OF SECTION
SECTION 087113 - AUTOMATIC DOOR OPERATOR

(Locations? – If Any)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

A. Aluminum Storefront and Doors are specified in Section 084413.
B. Finish hardware is specified in Section 087100.

1.2 DESCRIPTION OF WORK: Furnish radio-activated push-button actuated automatic door operators for doors scheduled on the drawings. Coordinate with supplier of doors and finish hardware for proper installation of operators.

1.3 QUALITY ASSURANCE: Manufacturers of door operators shall be a member of the Association of Automatic Door Manufacturers Association. Installers shall have participated in and be certified by the AADM as having participated in the installation training programs for automatic doors and shall be thoroughly conversant with ANSI A156.10 (BHMA 1601), Power Operated Pedestrian Door Standard.

A. Obtain automatic door operators as a system warranted by one supplier.
B. Handicapped Requirements: Provide and install hardware in compliance with the Americans with Disabilities Act.
C. UL Standard: Provide powered door operators that comply with UL 325.

1.4 GENERAL REQUIREMENTS: Supply templates to door and frame manufacturers, as required to enable proper and accurate sizing and locations of cutouts for hardware.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturers’ technical information and installation instructions for operators. Provide wiring diagrams.
B. Operation and Maintenance: Provide Owner with manufacturer's parts list and maintenance instructions.

C. Certification: Provide copies of AADM certificates for each installer.

PART 2 - PRODUCTS

2.1 AUTOMATIC DOOR OPERATOR: The operator shall be a low-energy self-contained, electro-mechanical type. Operator shall be powered through a DC motor for opening and closing shall be by spring force. Manual operation of the door shall not harm the operator. Controls shall be switchable between automatic operation (by button or by push start) or automatic/manual (by button or manual pushing). Opening and closing speeds of the operator shall be adjustable from 4-6 seconds in compliance with ANSI A156.9. Time delay before closing adjustable from 2 - 30 seconds. Provide optional Soft-Touch safety feature which reopens the door if it is stopped during the closing cycle.

A. Operation: Doors shall be actuated by a wall-mounted push plate wireless switch, equal Horton C1260-4, which activates the door operator by radio frequency. Provide one each side of door located as shown on drawings.

B. Operator requires 120 VAC 60 Cycle, 1 phase, 15 Amp electrical service.

C. Operator shall have cover and shall be integrated into head of aluminum framing to greatest extent possible. Finish shall match aluminum framing – clear anodized.

D. Approved Models include:

Horton Easy Access, Series 7000
LCN Auto Equalizer 4810/4820
Nabco, Gyrotech GT500
PART 3 - EXECUTION

3.1 PREPARATION: Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary, for coordination of the automatic entrance door installation.

3.2 INSTALLATION: Comply with manufacturer's specifications and recommendations. Provide electrical connections as specified in Division 26000 and shown on drawings. Locate push plates as shown.

3.3 ADJUSTMENT: Adjust doors for smooth operation. Demonstrate controls to Owner's personnel.

END OF SECTION
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following locations, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Lights in doors and interior and exterior framing (aluminum or hollow metal).

B. Types of glazing materials include:

1. 1" insulated units with clear glazing and low-E coating for exterior window openings
2. ¼" clear safety glazing for exterior doors.
3. ¼" clear glazing – safety as needed – for interior openings.

C. Hollow metal doors and frames are specified in Section 081113.

D. All glass entry and wall systems are specified in Section 084126.

E. Aluminum frames and windows are specified in Section 084413.

F. Exterior decorative structural glass is specified in Section 088001.
1.3 DEFINITIONS

A. Deterioration of Insulating Glass: Failure of hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, condensation within the unit, or discoloration.

1.4 SUBMITTALS

A. General: Submit product data for each glass product and glazing material indicated.
B. Product certificates signed by glazing materials manufacturers certifying that their products comply with specification requirements.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual."


1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

2. Glaze openings with safety glass as required by local codes and as shown on the drawings.

C. Insulating Glass Certification Program: Provide insulating glass units permanently marked on either spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency - Insulating Glass Certification Council.
1.6 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer agreeing to furnish replacements for those insulating glass units that deteriorate as defined in the "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within 10 years after substantial completion. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.

PART 2 - PRODUCTS

2.1 FLOAT GLASS

A. ASTM C 1048, Type I, kind FT, thickness 1/4".

TINT: None, Clear
Safety Glazing: As needed for location – see drawings.

USE: Typical lights in interior doors and other interior openings.

2.2 INSULATING GLASS PRODUCTS

A. Insulating Glass Units: Preassembled units consisting of organically sealed lights of glass separated by a dehydrated air space complying with ASTM E 774 and with other requirements indicated. Lite surface No. 2 shall have a low-E coating.

- Exterior: 1" insulating Low-E clear units, equal of Oldcastle BuildingEnvelope SunGlass Low-E #2 Clear. Tempered as needed for safety glazing locations.

GLAZING
Visible Transmittance: 50%
UV Transmittance: 4%
Solar Transmittance: 20%
Winter U: 0.29
Shading Coefficient: 0.29
Solar Heat Gain Coeff: 0.25

Spacer shall be manufacturer’s standard color. Provide a dual seal of primary and secondary sealants, manufacturer’s standards.

B. Exterior Doors: ¼” clear units, fully tempered.

2.3 GLAZING SEALANT: Comply with sealant and glass manufacturers for selection of glass sealants which suit project application and installation conditions and which are compatible with surfaces contacted. Provide color of exposed sealants is selected by Architect.

A. 1-Part Non-Acid-Curing Silicone Glazing Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to uses indicated, O; low modulus with additional capability to withstand an increase or decrease in joint width of 50 percent of joint width and a tensile strength of 45 psi or less per ASTM D 412 at 100 percent elongation after 14 days at 77 deg. F (25 deg. C).

B. Cleaners, Primers and Sealers: Type recommended by manufacturer of sealants.

C. Blocks and Spacers: Neoprene, EPDM or silicone as required for compatibility with glazing sealants; of 80 to 90 Shore A hardness for setting blocks and, for spacers and edge blocks, of hardness recommended by glass and sealant manufacturer for application indicated.

D. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, 5-10 psi compression strength for 25 percent compression.
2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800.

2.5 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS: Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 PREPARATION: Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications. All openings shall be glazed air- and watertight using the most appropriate method.

1. Comply with aluminum manufacturer's recommendations and use standard elastomeric extrusions for glazing aluminum framing.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics. Set low-E units with correct side to exterior as indicated on each unit.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
3.3 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each lite is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from
glass. Install pressurized gaskets to protrude slightly out of channel to eliminate
dirt and moisture pockets.

3.5 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from
construction operations including weld splatter. If, despite such protection,
contaminating substances do come into contact with glass, remove them
immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, abraded, or
damaged in any way, including natural causes, accidents and vandalism, during
construction period.

C. Clean glass on both faces in each area of Project prior to date scheduled for
inspections that establish date of Substantial Completion. Clean glass as
recommended by glass manufacturer.

END OF SECTION 088000
SECTION 088001 – DECORATIVE POINT SUPPORTED STRUCTURAL GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following locations, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Point supported structural glass system.

B. Types of glazing materials include:

1. Clear tempered glazing laminated with colored vinyl interlayer.
2. Support hardware.

C. Hollow metal doors and frames are specified in Section 081113.

D. All glass entry and wall systems are specified in Section 084126.

E. Aluminum frames and windows are specified in Section 084413.

F. Conventional glazing is specified in Section 088000.
1.3 SUBMITTALS

A. General: Submit product data for each glass product and glazing material indicated. Submit complete shop drawings showing fabrication and attachment of all glazing units. Shop drawings shall be prepared and stamped by a structural engineer licensed in the State of Arizona.

B. Samples: Provide 2 – 12" x 12" samples of laminated glazing, and a sample of each support accessory.

C. Structural Calculations: Provide structural calculations for the glazing system prepared and stamped by a structural engineer licensed in the State of Arizona. Work shall comply with standard glass quality and performance criteria as defined by ASTM C 1036, ASTM C 1172, ASTM 1048, ASTM 1464, ASTM E 773, and ASTM E 774 as applicable.

1.4 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Structural Glazing System: Two years.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLASS UNITS: 9/16" total thickness clear fully tempered float glass, laminated with a .030 poly vinyl butyral interlayer, equal Vanceva 1467. Fabricated with appropriate flat polished edges and clearance holes.

   Manufacturer: Innovative Structural Glass, 559-561-7000, Manuel Marinos.

2.2 SUPPORT HARDWARE: Stainless steel alloy 316 fitting assemblies with articulating glass fastener assemblies with exterior disc in #4 satin polished stainless steel. Equal to Innovative Structural Glass, Inc. CSF-310.
A. Cleaners, Primers and Sealers: Type recommended by manufacturer of glazing system.

2.4 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS: Fabricate structural point supported glass and other glazing products in sizes indicated for Project.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Protect glass from edge damage during handling and installation.

B. Verify location of all support hardware and mount as shown on shop drawings.

C. Mount all glass units as shown on shop drawings. Work shall be straight and plumb, and securely and permanently attached to mounting hardware.

3.5 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

C. Clean glass on both faces in each area of Project prior to date scheduled for inspections that establish date of Substantial Completion. Clean glass as recommended by glass manufacturer.

END OF SECTION 088001
SECTION 890001 - EXTERIOR SUN CONTROL DEVICES (SHADES)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide fixed Custom Sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation.

B. The drawings show the extent of the work, the dimensioned profile and depth of the sunshades to be provided.

C. Related work specified elsewhere:

1. Structural Steel - 051200

1.02 SUBMITTALS

A. Product Data: Submit specifications, data, and installation, instructions from the manufacturer of the Sunshades.

B. Submit shop drawings for the system. Show anchorage, details and connections for all the component parts.

1. Drawings shall include elevations, sections and specific details for each unit, condition.

C. Samples: Submit one sample minimum 24" long of each material to be utilized at each Sunshade with appropriate finish.

D. Warranty: Provide written warranty to the owner that all screen products will be free of defective materials or workmanship for a period of one year from date of installation.

E. Quality Assurance:

1. Single subcontract responsibility: Subcontract the work to a single firm that
has had not less than ten years experience in the design and manufacturing
of work similar to that shown and required.

2. Performance requirements: Design sunshade components to accommodate
local requirements for snow and wind loading. Analysis of Blade Deflection to
be limited to L/120, 3/4", or as required by code.

PART 2 - PRODUCTS

2.01 PRODUCTS

Sunshades shall be fixed custom model as manufactured by;
Construction Specialties, Inc. located at
49 Meeker Avenue, Cranford, New Jersey 07016.
Tel. 1- 800-631-7379
Or equal by another manufacturer.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B211, Alloy 6063-T5.

B. Fasteners: Fasteners shall be aluminum or stainless steel. Provide types,
  gauges and lengths to suit unit installation conditions.

C. Anchors and Inserts: Use non-Ferrous metal, stainless steel or hot dip
galvanized anchors and inserts for installation and elsewhere as required
for corrosion resistance. Use stainless steel or lead expansion bolt devices for
drill-in place anchors. Furnish inserts, as required, to be set into concrete or
masonry work.

2.03 FABRICATION, GENERAL

A. Provide fixed Sunshades and accessories of design, material, sizes, depth,
   arrangement, and thickness as indicated or as required for optimal performance
   with respect to strength; durability; and uniform appearance.

B. Include supports, anchorage, and accessories required for complete assembly
2.04 SUNSHADE CONSTRUCTION

A. Components: All fascia, blades and outrigger components shall be 6063-T5 aluminum alloy.

1. Wall brackets shall be fabricated from aluminum plate and designed to receive and anchor the airfoil blades to the steel substructure.

2. Blades shall be 8" airfoil blade style. Blades shall be factory assembled to outriggers using stainless steel, type F, thread cutting screws. Blades to be spaced to provide a sun cut-off angle of 56 degrees from horizontal.

2.05 ALUMINUM FINISH

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products assembly. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine openings to receive the work. Do not proceed until any unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer’s instructions and recommendations for installation of the work.
B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.

C. Anchor Sunscreen to building substructure as indicated on architectural drawings.

D. Erection Tolerances:
   1. Variation from level: +/- 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.
   2. Offsets in end-to-end or edge-to-edge alignment of consecutive members 1/32".

F. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly as directed.

G. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

H. Set units level, plumb and true to line, with uniform joints

END OF SECTION 089001
SECTION 092116 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes gypsum board shaft-wall assemblies for the following:
   1. Shaft-wall enclosures.
   2. Chase enclosures.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:
   1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
2. Sprayed fire-resistive materials applied to structural steel framing.
3. Elevator equipment, including hoistway doors, elevator call buttons, and elevator floor indicators.
4. Wiring devices in shaft-wall assemblies.
5. Doors and other items penetrating shaft-wall assemblies.
6. Items supported by shaft-wall-assembly framing.
7. Mechanical work enclosed within shaft-wall assemblies.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. G-P Gypsum.
5. USG Corporation.

2.2 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
   1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
   2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

2.3 PANEL PRODUCTS

A. Recycled Content: Provide gypsum panel products with recycled content to greatest extent possible.

B. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.
   1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.
      a. Core: 1 inch thick.
      b. Long Edges: Double bevel.

C. Gypsum and Tile Backing Units: As specified in Section 092900 - Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 09 Section Gypsum Board that comply with gypsum board shaft-wall assembly manufacturer’s written recommendations for application indicated.

C. Gypsum Board Joint-Treatment Materials: As specified in Division 09 Section "Gypsum Board."

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

E. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

F. Sound Attenuation Blankets within shaftwall assembly: 3" mineral wool, with foil face vapor barrier with flame spread maximum of 25. 80% recycled content. Equal Thermafiber FS-25 Fire Safety Blankets.


2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES

A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing agency.

B. Fire-Resistance Rating: 2 hours.

C. Studs: Manufacturer’s standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: 4-inches.
2. Minimum Base-Metal Thickness: 0.0220 inch
D. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.

1. Minimum Base-Metal Thickness: 0.0329 inch.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

F. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0329 inch thickness.

G. Room-Side Finish: As indicated.

H. Shaft-Side Finish: As indicated.

I. Insulation: Mineral fiber blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

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

3.2 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Division 09 Section Gypsum Board for applying and finishing panels.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

1. At elevator hoistway entrance door frames, provide jamb struts on each side of door frame.

2. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip with 0.0312-inch minimum thickness of base (uncoated) metal, accurately positioned and secured behind at least 1 gypsum board face-layer panel.

D. Integrate stair hanger rods with gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.

E. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

F. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

G. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

H. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.

I. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

J. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 4 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch-thick, gypsum board cants covering tops of projections. No recesses allowed (at steel beams especially).
1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.

2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft-wall framing.

K. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116
PART 1 - GENERAL

A. RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. DESCRIPTION OF WORK:

1. Types of work include:

   Gypsum drywall including screw-type metal support system for perimeter wall furring and interior partitions. Sound attenuation blankets for partitions as shown.

   Backing boards for application of other finishes.

   Drywall finishing, including trim, priming and texturing.

2. Exterior sheathing for soffits is specified in Section 061600.

3. Gypsum board shaft systems are specified in Section 092116.

4. Painting of drywall is specified in Section 099000.

C. QUALITY ASSURANCE:

1. Gypsum Board Standard: Comply with applicable requirements of ANSI/ASTM C 840 for application and finishing of gypsum board, unless otherwise indicated.

2. Steel Framing Standard: Comply with applicable requirements of ASTM C 754 for installation of steel framing for gypsum board.


D. SUBMITTALS:

1. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component. Submit statement of typical recycled content of steel studs and type of content (pre or post).

2. Samples: Submit 2 - 1' x 2' samples of drywall with variations of specified texture for Architect's approval.

E. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

2. Credit MR 5 – Regional Materials submit distance to and location of extraction and manufacture for materials. Submit material cost.

F. DELIVERY, STORAGE AND HANDLING:

1. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

2. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat and support to prevent sagging.

3. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.
G. PROJECT CONDITIONS:

1. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

2. Cold Weather Protection: When ambient outdoor temperatures are below 55 deg F maintain continuous, uniform, comfortable building working temperatures of not less than 55 deg F for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.

3. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

A. METAL SUPPORT MATERIALS:

1. Ceiling Support Materials and Systems:

   a) General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.

   b) Main Runners: Steel channels with rust inhibitive paint finish, hot or cold-rolled.

   c) Hanger Wire: ASTM A 641, soft, Class 1 galvanized, 8 ga.

   d) Metal Studs for Ceilings and Soffits: 20 ga, depth as indicated.

   e) Hanger Anchorage Devices: Screws, clips, bolts, or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven.
through standard construction practices or by certified test data. Size devices for 3x calculated load supported.

2. Wall/Partition Support Materials:
   a) Studs: ASTM C 645. Manufacturers are encouraged to use post-industrial or post-consumer recycled materials in the fabrication of metal framing members; submit statement as specified above.

      Depth of Section: 3-5/8”, 6” or as otherwise indicated.

      Thickness: 20 ga. for typical partitions; 25 ga. for perimeter wall furring.

   b) Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

   c) Partition Bridging: ½” black-iron channel.

3. PARTITION MATERIALS:
   a) GYPSUM WALLBOARD: ASTM C 36, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.

      Type: Regular or Type X, as needed.

      Thickness: 5/8”

   b) TILE BACKING: Abuse-, water-, mold-, and fire-resistant. Contains 95% recycled content. Provide at all thinset tile applications, and at all toilets and janitor closets with painted drywall partitions.

      Equal USG Fiberock Interior Panel – Aqua Tough

      Thickness: 5/8”

   c) CEILINGS: Lightweight, sag-resistant panels.

      Equal USG Sheetrock Interior Ceiling Panel Sag-Resistant
Thickness: ½”

Note: Contractor may elect to use standard 5/8” drywall.

4. TRIM ACCESSORIES: Provide manufacturer’s standard trim accessories, formed of galvanized steel (no plastic), with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, J-trim, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.

5. JOINT TREATMENT MATERIALS:
   a) General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
   b) Joint Tape for Drywall: Perforated paper type.
   c) Joint Compound: Provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or vinyl-type powder type for topping, meeting ASTM C 475. Provide type suitable for use at moisture resistant partitions, as required.
   d) Texturing Compound for walls, soffits, and ceilings: A ready-mixed joint compound/topping compound or USG Ready-Mixed Texture Finish, or equal by Hamilton.
      Texture: Light Orange Peel as approved from submittal samples.
   e) Surface Primer: Latex primer for preparation of drywall surface prior to application of texture as acceptable to drywall and texture material manufacturer, low V.O.C.

6. MISCELLANEOUS MATERIALS: Sealants and adhesives shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 23).
a) General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

b) Gypsum Board Screws: Comply with ASTM C 646. Provide recommended corrosion resistant type for fastening moisture resistant and cement board.

c) Adhesive: Construction adhesive, complying with ASTM C557, VOC-compliant.

d) Sound Attenuation/Insulation Battls: Battls as specified in Section 072100.

7. ACOUSTICAL SEALANT

a) Acoustical sealant shall be non-skinning, non-hardening, flexible sealant specifically designed for sealing gypsum wallboard. Sealant shall be capable of spanning 1/2-inch wide by 3/8-inch deep gaps. Synthetic rubber based products comply with ASTM Standard D-217 and acrylic latex based products comply with ASTM Standard C-834 and shall be VOC-compliant.

Acceptable Products: Tremco (800-321-7906), USG acoustical sealant, Pecora AC-20 FTR (800-523-6688), or approved equivalent.

PART 3 - EXECUTION

A. PREPARATION FOR METAL SUPPORT SYSTEMS:

1. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that structural anchorage provisions have been installed to receive ceiling hangers.

2. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement as follows:
a. Where partition and wall framing abuts overhead structure or structural walls:
   1) Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

b. See drawings for related requirements.

B. INSTALLATION OF METAL SUPPORT SYSTEMS:


   a. Ceiling Support Suspension Systems: Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to studs, clips, rods, channels, or other anchorage devices or fasteners as required or indicated.

   b. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

   c. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

   d. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

   e. Space furring members as indicated or recommended in handbook.

   f. Stud Ceilings/Soffits: Attach runners to ceilings and sidewalls, spaced as indicated, placing fasteners close to outside flange of runner. On stud walls, space fasteners to engage studs. Provide bracing members in accordance with handbook. Fasten at intervals and using fasteners in accordance with Gypsum Construction Handbook and drawings for a braced soffit.

   g. Install auxiliary framing or blocking at termination of drywall work, and at openings for light fixtures and similar work, as required for support
of both the drywall construction and other work indicated for support thereon.
2) Wall/Partition Support Systems:
   
a) Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures and casework, equipment, services, wall-mounted door stops, heavy trim, grab bars, toilet accessories, furnishings and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook".

b) Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

   1) Exterior wall furring: Hold runner tracks at least 3/8" - 1/2" away from wall to prevent thermal bridging. Support back to wall at 8'-0" o.c. at midspan and top of furring.

c) Extend partition stud system as indicated to the structural support and substrate above the ceiling except where partitions are indicated to terminate at suspended ceilings. Cut studs 3/4" short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

   1) For fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

d) Stud Spacing: Space studs 24" o.c. at perimeter wall furring. Spaces studs for interior partitions 16" o.c., unless otherwise indicated.
e) Bridging: Provide continuous channel bridging at mid-height of typical partitions, and at third points in full-height partitions; friction fit or connect at each stud.

f) Frame door openings with double 20 ga. studs to comply with details indicated or if not otherwise indicated, to comply with "Gypsum Construction Handbook". Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for jack studs) at head and secure to jamb studs.

1) Provide 3 studs at all corners.

g) Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

h) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

i) Install sound batts in framing at indicated locations. Fit between framing members and trim neatly around penetrations and obstructions. Fill gaps with insulation.

C. GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS:


2. Install wall boards to minimize joints requiring treatment, as well as to minimize end butt joints. Locate exposed end-butt joints as far from center of walls and ceilings as possible.

3. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".

4. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges.
and ends with not more than 1/16" open space between boards. Do not force into place.

5. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

6. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

7. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

8. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

9. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage. Cut and fit gypsum board around pipes, ducts, conduits, and structural members projecting below underside of floor/roof decks.

10. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" space and trim edge with U bead edge trim. Seal joints with acoustical sealant.

11. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer’s recommendations, except as otherwise indicated.

12. **ACOUSTICAL SEALANT USAGE** Sound Attenuating Construction: Where partitions are indicated to receive sound insulation, coordinate for installation of cotton batts with Section 0721000. Seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant. Comply with acoustical construction details, and
manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings and the sealing of all penetrations through partitions.

1) Use acoustical sealant to form an airtight seal at all penetrations and perimeter of sound-rated partitions, floors and ceilings. Comply with ASTM C919. Use backer-rod where gaps to be sealed exceed 3/8-inch.

2) Apply acoustical sealant as a continuous bead along gypsum board face layer at all head and sill conditions of sound-rated partitions and around the perimeter of resilient ceilings.

3) Apply expanding foam sealant where multiple pipes or conduits penetrate sound-rated construction.

4) Apply mildew-resistant elastomeric sealant around all penetrations in tile-backing board.

D. GYPSUM DRYWALL APPLICATION:

1) Ceilings: Apply ceiling boards prior to installation of wall boards if at all possible.

2) Fastening Methods: Apply single layer gypsum boards to supports with screws.

E. INSTALLATION OF DRYWALL TRIM ACCESSORIES:

1) General: Apply trim as shown and as specified herein. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

2) Install metal corner beads at external corners of drywall work.

3) Install metal edge trim whenever edge of gypsum board would be exposed or semi-exposed. Provide type with face flange to receive joint compound. Install L-type trim where work is tightly abutted to other work, and install
 specials kerf-type where other work is kerfed to receive long leg of L-type trim.  
Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled  
(including expansion joints).

4) Install control joints as follows:

Partition - interior            max. 30' o.c.  
Ceiling - interior             max. 50' o.c.  
with perimeter relief      max. 30' o.c.
without perimeter relief

Installation of control joints will be reviewed and if quantity or placement is  
not according to specification, work shall be removed and replaced as  
directed.

F. FINISHING OF DRYWALL:

1) General: Apply treatment at gypsum board joints (both directions), flanges  
of trim accessories, penetrations, fastener heads, surface defects and  
elsewhere as required to prepare work for final finish. Prefill open joints and  
rounded or beveled edges as recommended by manufacturer.

2) Apply joint tape at joints between gypsum boards, except where trim  
accessories are indicated.

3) Levels of Gypsum Board Finish: Provide the following levels of gypsum  
board finish per GA-214.

   a. Level 1 for ceiling plenum areas, concealed areas, and where indicated,  
      unless a higher level of finish is required for fire-resistive-rated assemblies  
      and sound-rated assemblies.

   b. Level 2 where water-resistant backing board panels form substrates for tile.

   c. Level 4 for all remaining gypsum board surfaces unless otherwise indicated.

1) For level 4 gypsum board finish, embed tape in joint compound and  
apply three separate coats of joint compound over joints, angles,  
fastener heads, and accessories. Touch up and sand between coats.
and after last coat as needed to produce a surface free of visual defects ready for decoration.

\[ \text{d. Seal and treat joints in tile backing board by embedding joint tape in same mortar as being used for setting tile.} \]

G. APPLICATION OF PRIMER AND TEXTURE FINISH:

1) Primer Application: Mix in accordance with manufacturer’s instructions. Apply a full coverage coat with roller or preferably spray gun. Allow to dry before proceeding with texturing application.

2) Finish Application: Mix and apply texture finish to drywall wall, soffits, and ceilings, and other surfaces indicated to receive finish in strict accordance with manufacturer’s instructions to produce a uniform texture without starved spots or other evidence of thin application, and free of application patterns. Final texture application shall be match that selected by Architect from submitted texture samples.

3) Remove any texture droppings or overspray from door frames, windows and other adjoining work.

H. PROTECTION OF WORK:

1) Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION 092900

GYPSUM DRYWALL SYSTEMS 092900-14
SECTION 093000 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Glazed ceramic wall tile and trim.
   2. Ceramic mosaic tile at floors, with trim.

B. Tile backing board for tiled walls is specified in Section 092900 - Gypsum Drywall.

1.3 SUBMITTALS

A. General: Submit product data for each type of product specified.

B. Samples of each type and color of tile and grout to be provided for Architects review.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.5 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
1. New Tile and Trim Units: Furnish 5% maintenance stock of each type and color of tile installed.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile".

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. WALL TILE: White-bodied ceramic wall tile, bright glazed, 4-1/4" x 4-1/4", equal DalTile, or another manufacturer.
   1. Trim: 4" straight base at tiled walls; surface and corner bullnoses as needed at wall tops.

D. CERAMIC MOSAIC TILE: Typically 2" x 2" unglazed porcelain ceramic mosaic tile, cushion edges. DalTile Keystones, or equal.

E. Colors and patterns as shown on the drawings.

F. Transition Trim from Tile to Concrete, VCT, etc.: Equal Schluter-SCHIENE, I-shaped profile with 1/8" wide visible surface, and integrated anchoring leg for installation under tile surface.
   2. Height: As required (nominally 3/8").

2.2 SETTING MATERIALS:

A. Mortar for Walls and Floors: Single component polymer-modified thin-set mortar, needing only the addition of water in the field. Complies with ANSI A118.4, equal of Mapei Ultraflex 2.
2.3 GROUTING MATERIALS


1) Colors: As selected.


2.4 MIXING MORTARS AND GROUT: Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials and water; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Tile Protection: Test tile to determine if it can be stained by grout installation and take measures to protect the tile as needed.

3.2 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard
Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.


C. Trim: Set floor trim at transitions prior to laying of tile. Install straight and level.

D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

F. Jointing Pattern: Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Extend wainscots to full tile height. Provide uniform joint widths, nominal width 1/8" for glazed wall tiles and nominal ¼" – 3/8" for floor tiles.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where joints occur in substrate behind tile. Do not saw cut joints after installation of tiles.

3.3 WALL TILE INSTALLATION METHODS

A. Install wall tile to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:


3.4 FLOOR TILE INSTALLATION METHODS:

A. Install floor tile to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
1. Ceramic Tile on Concrete: F115.  
   Grout: Latex-modified cement grout.

3.6 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile 
   surfaces so they are free of foreign matter.

   1. Remove grout residue from tile as soon as possible. Keep traffic off 
      floor for period recommended by manufacturer, or at least 72 hours, 
      whichever is greater.

   2. Leave finished installation clean and free of cracked, chipped, broken, 
      loose, and otherwise defective tile work.

B. Provide final protection and maintain conditions in a manner acceptable to 
   manufacturer and installer that ensures that tile is without damage or 
   deterioration at time of Substantial Completion. Protect installed tile work with 
   kraft paper or other heavy covering during construction period to prevent 
   staining, damage, and wear.

C. Before final inspection, remove protective coverings and clean tile using a 
   neutral cleaner.

D. Sealing: Apply spray sealer to all tile grout joints in accordance with 
   manufacturer’s instructions, after cure of grout joints (minimum 21 days per 
   manufacturer).

END OF SECTION 093000
SECTION 095133 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes acoustical panel ceilings as follows:

   2 x 4 panels, mineral fiber, suspended
   15/16" wide steel suspension grid.

1.3 RELATED WORK:

A. Drywall ceilings are specified in Section 092900.

1.4 SUBMITTALS: Submit product data for each type of product specified. Submit samples of each type of panel.

1.5 COORDINATION OF WORK: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, and partition system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.
1.7 EXTRANL MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish 1 box of ceiling panels installed.

1.8 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   
   2. Identify materials with appropriate markings of applicable testing and inspecting agency.

   2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mineral Base Panels, fine smooth non-directional finish; butt edge, 5/8" thick

1. Minimum Performance Values
   
   NRC .50
   CAC 35
   Light reflectance: Minimum 0.83.
   VOC Formaldehyde – No added
   Moisture Resistance – HumiGuard Plus and Antimicrobial
a. 24" x 48"

1) Armstrong Dune 1776
2) USG Mars Climaplast 88185

USE: Typical

2.2 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for Metal Suspension System: Provide 15/16" wide metal suspension for 2'x2' panels that complies with applicable ASTM C 635 requirements.

B. Finish and Color: Provide manufacturer’s factory-applied paint finish - white.

C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Edge Moldings and Trim

1. Angle-moldings (L) for all areas.

2.3 DIRECT-HUNG SUSPENSION SYSTEMS

A. Narrow-Face Double-Web Steel Capped Suspension System: Main and cross-runners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet; Intermediate-Duty System; Cap: steel, painted white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine structure to which ceiling systems attach to make sure all is ready to receive suspension systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine drywall ceilings to receive tile to determine that they are flat as possible with no protruding joints or fasteners.

ACOUSTICAL PANEL CEILINGS
3.2 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders.

3.3 INSTALLATION

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."


B. Suspend ceiling hangers directly or indirectly from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countering, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezoids or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
6. Connect wires or other supports to structure.

C. Install edge moldings at perimeters of acoustical ceiling areas, at terminations (such as building columns), and where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

D. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

3.4 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove chipped or dented panels and replace at completion of work.

END OF SECTION 095133
SECTION 096500 – RESILIENT FLOORING AND RESILIENT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Resilient wall base, transition and reducer strips.
   2. Vinyl composition tile flooring.

B. Ceramic tile is specified in Section 093000.

C. Modular carpet is specified in Section 096900.

1.3 SUBMITTALS

A. Submit product data for each type of product specified.

B. Submit full range of samples for verification purposes of sheet flooring, rubber base, and termination accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet flooring and accessories to site in original manufacturer's unopened packages and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.

B. Close spaces to traffic during installation.

1.6 SEQUENCING AND SCHEDULING: Install flooring and accessories after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS: Deliver extra materials to Owner. Furnish extra materials matching products installed, packaged with protective covering for storage and identified with labels clearly describing contents. Furnish not less than 3 yds. X full width of each pattern/color or sheet flooring, and one box of rubber base.

PART 2 – PRODUCTS

2.1 RUBBER WALL BASE: FS SS-W-40, Type I; 4” high; 1/8” gage 100% extruded virgin synthetic rubber; with matching end stops; standard toe cove.

2.2 VINYL COMPOSITION TILE: Class 2 (through-pattern tile). Equal Armstrong Standard Excelon Tile.

a. Wearing Surface: Smooth

b. Thickness: 0.125 inch

c. Size: 12 by 12 inches

d. Fire-Test-Response Characteristics:

1) Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2) Color: Equal to color scheduled on drawings.

2.3 STATIC-DISSIPATIVE VINYL COMPOSITION TILE (called Anti-Static on drawings): 1/8” thick, through color, meeting same criteria as standard vinyl composition tile, and as follows:
Electrical Resistance: ESD-S7.1 and ASTM F-150 10e6 to 10e9 ohms Point to point, and point to ground, when installed as a system.

Static Generation :: ESD STM 97.2 at 40% R.H.:<10 volts; at 12% R.H.:<100 volts when installed as a system, flooring in combination with ESD footwear and a person.

Static Decay: Fed Test 101c, Method 4046 (5000 volts to zero) in < 0.5 sec. when installed as a system, flooring in combination with ESD footwear and a person.

Color: As selected.

Product: Armstrong Excelon Static Dissipative Tile (SDT) or equal.

2.3 TRANSITION AND EDGE STRIPS: As detailed or needed by the work, rubber, 1/8" gage; color as selected by Architect. Transitions may include carpet/vct.

2.4 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Patching/leveling compounds: Cementitious high-strength underlayment, trowelable and quick-setting. Equal of ARDEX SD-F or K-55, as appropriate for work.

C. Adhesives (Cements): Water-based, water-resistant, low-V.O.C. type, only as recommended by each flooring and rubber base manufacturer, respectively, for installation of their products.

1. Static Dissipative Tile: Use only manufacturer's recommended adhesive to maintain performance. Provide copper grounding strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Concrete Moisture Test: Perform moisture tests on concrete floors regardless of the age or grade level with a minimum of three tests for the
first 1000 square feet. The test shall be a calcium chloride test. One test shall be conducted for every 1000 sq. ft. of flooring. The test shall be conducted around the perimeter of the room, at columns and where moisture may be evident.

For the most accurate results, the weight of the calcium chloride dish shall be made on the job site at the start and end of each test. A diagram of the area showing the location and results of each test shall be submitted to the architect, general contractor or end user. If the test results exceed the limitations, the installation shall not proceed until the problem has been corrected.

2. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 9, it must be neutralized prior to beginning the installation to a minimum of 5.

3. Slab substrates are dry and free of materials which would interfere with bonding of adhesive, such as mastic or carpet glue and subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

4. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive floor covering materials.

1. Use trowelable cementitious-based leveling and patching compounds per floor covering manufacturer's direction to fill cracks, holes, and depressions in substrates.

2. Broom or vacuum clean substrates to be covered by floor covering immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust. Solvent procedures may be used to remove old adhesive residues or similar materials from existing floors, but do not grind or use other mechanical means that cause dusting of the surface or distribution of surface dust into the air.

3. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply according to manufacturer's directions.
3.3 INSTALLATION

A. General: Strictly comply with tile or sheet flooring manufacturer's installation instructions.

1. Lay out tile flooring to comply with the following requirements:

   a. Maintain uniformity of floor covering direction.
   a. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 6 inches away from parallel joints in flooring substrates.
   b. Match edges of floor coverings for color shading and pattern at seams.

2. Scribe, cut, and fit tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture, including cabinets, pipes, outlets, edgings, thresholds, and nosings.

3. Extend into toe spaces, door reveals, closets, and similar openings.

4. Maintain reference markers, holes or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

5. Adhere floor covering to flooring substrates by method approved by floor covering manufacturer.

   a. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
   b. Comply with floor covering manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
   c. SDT: Provide grounding strips at 2' length one per 500 sf of floor. Ground per electrical details and manufacturer's recommendations.

6. Hand roll floor covering in both directions from center out to embed floor covering in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.
7. Rubber Base: Clean, patch or fill surface of wall if required to provide sound surface to receive new base. Apply base in lengths as long as practicable to walls, columns, and all permanent fixtures where indicated. Provide in areas to receive carpet, linoleum flooring, and all areas where new drywall partitions are installed. Mitered outside corners are not acceptable. Sand back of base lightly as needed to ensure secure adherence to wall.

   a. On irregular surfaces, fill voids behind base and along top edge with manufacturer’s recommended adhesive filler.

8. Install transition trips at edges of flooring which would otherwise be exposed or at changes of flooring materials.

3.4 CLEANING AND PROTECTION

   A. Immediately after completing flooring installation:

      1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.

         a. Sweep or vacuum floor thoroughly.
         b. Do not wash floor until after time period recommended by manufacturer.
         c. Damp-mop flooring to remove black marks and soil.

   B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use methods recommended by flooring manufacturer.

   C. Clean prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Wet wipe rubber base to remove dust and marks.

   D. Owner is advised to use only recommended dissipative polish on the SDT.

END OF SECTION 096500
SECTION 096900 - MODULAR CARPET

PART I - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes modular carpet (carpet tile) and installation.

Related Sections:
Section 096500- Resilient Flooring and Accessories for wall base and moldings.

1.3 SUBMITTALS

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

Product Data for each type of carpet tile material and installation accessory specified. Submit manufacturer's printed data on physical characteristics, durability, fade resistance, and fire-test-response characteristics. Submit methods of installation for each type of substrate.

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. Label each sample with the manufacturer's name, material type, color, pattern, and designation indicated on Drawings and carpet tile schedule. Submit the following:

Full-size sample of each type of carpet tile required.

24-inch (450-mm) Samples of each type of exposed edge stripping and accessory item.

Schedule of carpet tile using same room designations indicated on Drawings.

Maintenance data for carpet tile to include in the operation and maintenance manual specified in Division I. Include the following:
Methods for maintaining carpet tile, including manufacturer's recommended frequency for maintaining carpet tile.

Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.

1.4 QUALITY ASSURANCE

Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.

Single-Source Responsibility: Obtain each type of carpet tile from one source and by a single manufacturer.

Fire-Test-Response Characteristics: Provide carpet tile with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet tile - with appropriate markings of applicable testing and inspecting agency.

- Flammability Passes DOC-FF-1-70 Pill Test.
- Flooring Radiant Panel Test Meets NFPA Class 1 when tested under ASTM E-648 glue down
- Smoke Density NBS Smoke Chamber NFPA-258 – Less than 450 Flaming Mode

Comply with Manufacturer Specification when a specific carpet is identified.

DELIVERY, STORAGE, AND HANDLING

General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."

Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

PROJECT CONDITIONS

General: Comply with CRI 104, Section 6: "Site Conditions."

Space Enclosure and Environmental Limitations: Do not install carpet tile 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.

Subfloor Moisture Conditions: Moisture emission rate of not more than 3 Lb/1000 sq. ft./24 hours (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104. 6.2.1 with sub floor temperatures not less than 55 deg F (12.7 deg C).

Subfloor Alkalinity Conditions: A pH range of 5 to 9 when sub floor is wetted with potable water and pHdrion paper is applied.

WARRANTY

General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

Special Carpet Tile Warranty: Submit a written warranty executed by carpet tile manufacturer and Installer agreeing to repair or replace carpet tile that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to more than -10 percent loss of face fiber, tile curling, snags, runs, and delamination.

Warranty Period: 5 years from date of Substantial Completion.

EXTRA MATERIALS

Furnish extra materials described below that match products installed, are packaged with protective covering for storage and are identified with labels clearly describing contents.

Carpet Tile: Before installation begins furnish quantity of full-size units equal to 5 percent of amount installed.
PART 2-PRODUCTS

CARPET TILE

Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the products specified in each carpet tile Product Data sheet at end of this Section.

INSTALLATION ACCESSORIES

Concrete-Slab Primer: Non-staining type as recommended by carpet tile manufacturer.

Trowelable Underlayments and Patching Compounds: As recommended by carpet tile manufacturer.

Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and sub floor conditions indicated and to comply with flammability requirements for installed carpet tile as recommended by carpet tile manufacturer.

PART 3-EXECUTION

3.1 EXAMINATION

Examine subfloors and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet tile. Do not proceed with installation until unsatisfactory conditions have been corrected.

Verify that subfloors and conditions are satisfactory for carpet tile installation and comply with requirements specified in this Section and those of carpet tile manufacturer.

3.2 PREPARATION

General: Comply with carpet tile manufacturer's installation recommendations to prepare substrates indicated to receive carpet tile installation.

Level subfloor within 1/4 inch in 10 feet (6 mm in 3 m), noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by carpet tile manufacturer.

Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

Broom or vacuum clean subfloors to be covered with carpet tile. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

Concrete-Subfloor Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by carpet tile manufacturer.

3.3 INSTALLATION

General: Comply with CRI 104, Section 13: "Carpet Modules (Tiles)."

Where demountable partitions or other items are indicated for installation on top of finished carpet tile floor, install carpet tile before installation of these items.

Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

Install borders parallel to walls.

3.4 CLEANING

Perform the following operations immediately after completing installation:

Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
Remove protruding yarns from carpet tile surface.
Vacuum carpet tile using commercial machine with face-beater element.
3.5 PROTECTION

General: Comply with CRI 104, Section 15: "Protection of Indoor Installation."

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure carpet tile is without damage or deterioration at the time of Substantial Completion.

PRODUCT DATA SHEET I - CARPET TILE DESIGNATION

1. The following specifications are based on specific performance requirements for quality, durability and design to match Modular Tile product grouping installed at Desert Vista and East Campus.

A. Specifications: To match existing at adjacent classroom spaces:

Style Name: Shaw Contract "No Rules Collection"
1. Style Name and Number: Color Play 59358
   Color: TO BE SELECTED
2. Fiber – eco-worx Solution Q
3. Construction: Multi-level pattern loop
4. Dye Method: 90% solution, 10% space dyed with Shaw Soil Protection
5. Style: Modular
7. Gauge: 1/12" 47.2/10 cm
8. Stitch Count – 9.0 per Inch 37/10 cm
9. Average Density – 7,624 oz/sy
10. Size: 24"x24"
11. Static Propensity – Less than 3.5 kV
12. Warranty – Lifetime Commercial Limited

All carpets meeting or exceeding the specifications must be submitted to College Representative with detailed specifications and specific warranties from the manufacturer 7 days prior to bid date. Consideration will not be given to any substitutes that are not approved in writing prior to bid opening date.

Request for substitutions must be submitted to the College in writing. Approval or denial will be at the College discretion as to equality of the product and ability to meet color requirements.
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK: All interior and exterior work, except as noted.

A. Work also includes:

1) Painting exterior HM doors and frames, and miscellaneous metal trim.

2) Painting interior drywall partitions and ceilings, door frames.

3) Penetrating water repellent for masonry.

4) Penetrating water repellent for horizontal concrete at walkways and stairs.

5) Painting backboards at IT, mechanical and electrical rooms.

B. Steel (hollow metal) doors and frames are specified in Section 081113.

C. Gypsum drywall is specified in Section 092900.

1.2 Particular paint colors and their area of use are indicated on the drawings in the color schedule. Types of paint and coating finishes for various substrates are specified in this section.

1.3 "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.4 Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas.
1.5 Paint mechanical, electrical, or plumbing equipment that is exposed to public view. If equipment is in a mechanical/electrical room or within a screen at ground level, painting is not required.

Paint all exposed wiring, conduit, raceways, or piping.

1.6 Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications.

A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.

B. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such typical items as (but not limited to) wood doors, casework, exterior insulation finish system, and light fixtures.

C. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces and duct shafts.

D. Finished Metal Surfaces: Metal surfaces of stainless steel, galvanized, factory-painted aluminum, toilet partitions, and others with factory applied finish, and similar finished materials will not require finish painting, unless otherwise indicated.

E. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

F. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.9 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material.

PAINTING
proposed for use. Provide certification of VOC content for each type of coating material.

B. Submit a list of specific paint items (type, manufacturer, formulation, and catalog number) for the Architect's review.

C. The Contractor shall submit 2 - 8-1/2 x 11 samples of each paint finish in the specified sheens. Identify samples with color name and number and location on the job.

1.10 DELIVERY AND STORAGE:

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

Name or title of material.
Manufacturer's stock number and date of manufacture.
Manufacturer's name.
Chemical composition.
Supplier's name and address.
Color name and number.
Application instructions.
Material Safety Data Sheets.

B. Maintenance Stock: Contractor shall supply, new and unopened, 2 gallons of each type and color of each finish used on the project as maintenance stock for Owner. Label as indicated above and deliver for Owner's storage.

1.11 JOB CONDITIONS:

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by paint manufacturer's printed instructions.

B. Do not apply paint in rain, or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.
C. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES:

A. Colors are indicated on the color schedule and are typically non-stock tints, specified by a manufacturer’s color numbers. The particular manufacturer who supplies paint for project shall match these colors, subject to approval of Architect.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers/finishes or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.2 MATERIAL QUALITY: The following manufacturers’ premium products have been used to set a standard of quality for the project. Products have been selected around the Sherwin Williams color line to establish a standard of quality. All paints shall be at least VOC compliant, if not better.

1. Other acceptable paint manufacturers include: Frazee, Glidden, Dunn Edwards, Pittsburg, Sinclair

2. Penetrating Water Repellent for Concrete and Masonry: 100% active oligomeric silane and alkyl-alkoxy siloxane self-emulsifying concentrate liquid. Equal Monopole Inc. Aquaseal ME.
3. Fire Resistant Coatings: Flame Control Coatings, or equal.

2.3 EXTERIOR PAINT SCHEDULE:

A. Ferrous Metal:

Prep – SSPC-SP2
1 coat – DTM Acrylic Primer Finish
2 coats – A-100 Exterior Latex Satin

B. Zinc-Coated Metal:

Prep – SSPC-SP2
1 coat – DTM Acrylic Primer Finish
2 coats – A-100 Exterior Latex Satin

C. Masonry – Water Repellent

1 coat – Light coat to fully wet surface
1 coat – Saturating coat with 6” – 8” rundown
Backroll
D. Concrete – Water Repellent

1 coat – Light coat to fully wet surface
1 coat – Saturating coat
Backroll and remove any material that does not soak in and standing material immediately

2.4 INTERIOR PAINT SCHEDULE

A. Gypsum Drywall:
Prep – S-W 8 or 12

Satin - Cleanable
1 coat – PrepRite Classic Latex Primer
2 coats – ProClassic Waterborne Interior Acrylic Satin B20
Use: Typical interior

B. Gypsum Drywall
Prep – S-W 8 or 12

Water-Based Epoxy
1 coat – ProGreen 200 Low VOC Primer
2 coats – Pro Industrial Hi-Bild WB Catalyzed Epoxy
Use: Science classrooms, janitor and prep areas as noted

C. Metal
Prep – S-W 14
1 coat – DTM Acrylic Primer/Finish (omit if primed, use for touchup)
2 coats – ProClassic Waterborne Interior Acrylic Satin B20

D. Fire Resistant Paint System:

1 coat – Flame Control Type 100A Intumescent Fire Retardant Paint
1 coat – Flame Control Type 400 Fire Resistant Paint
PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

1) Starting of painting work will be construed as Applicator’s acceptance of surfaces and conditions within any particular area.

2) Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, loose materials, or other conditions detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer’s instructions and as herein specified, for each particular substrate condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Cover items that cannot be removed. Following completion of painting of each space or area, reinstall removed items.

C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

1) Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

   a) Touch-up shop-applied prime coats on structural steel, doors and frames, wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
2) Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent. Etch or otherwise prepare surface as recommended by paint manufacturer.

3) Masonry: Clean free of all dust, dirt, oils, loose aggregates, etc. Repoint loose or missing mortar. Fill all joints. Mortar and repairs shall cure fully before application of sealer.

4) Drywall: All surfaces dust-free, clean and dry. Allow all texture to thoroughly dry.

5) Concrete: Surface shall be clean and free of curing or parting compounds. If alkali, lime, or efflorescence exists it should be cleaned off with a neutralizing agent (such as muriatic acid/water 1:4) and allowed to thoroughly dry. Concrete must be cured at least 28 days prior to application.

3.3 MATERIALS PREPARATION:

A. Mix and prepare painting materials in accordance with manufacturer’s directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material.

3.4 APPLICATION:

A. General: Apply all coatings in accordance with manufacturer’s directions, using only recommended materials and methods. Use type of applicators and techniques best suited for substrate and type of material being applied.

B. All interior areas to be painted shall be dust-free and illuminated to no less than 1 watt per square foot.

C. Final paint thickness recommended by manufacturer is only a minimum; all paint systems shall totally cover and consistently hide the substrate upon which they are applied. Apply additional coats when undercoats, stains or other conditions show
through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

D. Paint surfaces behind movable equipment same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or cabinetry with prime coat only before final installation of equipment.

E. Paint exposed-to-view mechanical, electrical, or plumbing equipment to match adjacent surfaces. Do not paint mechanical or electrical equipment on roofs or in mechanical rooms or yards.

F. NOTE: Prime coat, 1st coat and finish coat shall have different colors to distinguish the level of coat applied. Submit such variation with submittals for Architect's reference.

G. Sand lightly between each succeeding enamel coat.

H. Omit first coat (primer) on metal surfaces which have been shop-primed, touch-up painted or prefinished, unless otherwise indicated.

I. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1) Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

J. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer, and to totally and consistently cover surface to which it is applied without gaps, skips, runs, and holidays.

K. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
L. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

M. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

N. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 CLEAN-UP AND PROTECTION:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day and dispose of properly.

B. Upon completion of painting work, clean window glass, pre-finished window frames, and other paint-spattered surfaces. Remove spattered paint by proper methods of cleaning and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

1) Protect floors to remain exposed during overhead painting work.

D. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

E. Disposal of Waste Materials: Recycle waste paint and empty containers if possible. Do not dump paint or clean brushes in building drains.

END OF SECTION 099100
SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Painted steel toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:
   1. Particular color selections are specified in Section 090000 – Materials and Finishes.
   2. Division 10 Section Toilet Accessories for grab bars, wall and ADA toilet partitions hooks and similar accessories. Most accessories are furnished and installed by the Owner.

1.3 SUBMITTALS

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

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcements for compartment-mounted grab bars.
   2. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: Provide manufacturer’s standard colors and chips for selection. Colors may vary from campus to campus.
1.4 QUALITY ASSURANCE
B. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities"] [and] [ICC/ANSI A117.1] for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS
A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Aluminum Castings: ASTM B 26/B 26M.
B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
D. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 STEEL UNITS
A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Accurate Partitions Corporation.
2. All American Metal Corp.
4. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. Flush Metal Partition Corp.
8. Global Steel Products Corp.
9. Hadrian Manufacturing Inc.
11. Metpar Corp.
12. Sanymetal; a Crane Plumbing company.

B. Toilet-Enclosure Style: Floor and ceiling anchored.

C. Urinal-Screen Style: Wall hung with integral flanges.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.

E. Urinal-Screen Construction:
1. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches thick.

F. Facing Sheets and Closures: Electrolytically coated or hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.036 inch.
2. Panels: Manufacturer's standard thickness, but not less than 0.030 inch.
3. Doors: Manufacturer's standard thickness, but not less than 0.030 inch.
4. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.030 inch.

G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel or aluminum.

I. Steel-Sheet Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder coating finish. Comply with coating manufacturer's written instructions for applying and baking.

1. Color: One color as selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated zamac.
2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
6. Hook and Bumper: Provide manufacturer's standard projecting rubber-tipped door bumper with hook at inswinging doors.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with thief-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.
2.4 FABRICATION

A. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

B. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113
SECTION 102226 - PAIRED PANEL OPERABLE PARTITIONS
(ADDITIVE ALTERNATE NO. 1)

PART 1 - GENERAL

1.01 DESCRIPTION

A. General

1. Furnish and install operable partitions and suspension system. Provide all labor, materials, tools, equipment, and services for operable walls in accordance with provisions of contract documents.

1.02 RELATED WORK BY OTHERS

A. Preparation of opening will be by General Contractor. Any deviation of site conditions contrary to approved shop drawings must be called to the attention of the architect.

B. All header, blocking, support structures, jambs, track enclosures, surrounding insulation, and sound baffles as required in 1.04 Quality Assurance.

C. Prepunching of support structure in accordance with approved shop drawings.

D. Paint or otherwise finishing all trim and other materials adjoining head and jamb of operable partitions.

1.03 SUBMITTALS

A. Complete shop drawings are to be provided prior to fabrication indicating construction and installation details.

1.04 QUALITY ASSURANCE

A. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions

B. The partition STC (Sound Transmission Classification) shall be achieved per the standard test methods ASTM E90.

C. Noise isolation classifications shall be achieved per the standard test methods ASTM E336 and ASTM E413.

D. Noise Reduction Coefficient (NRC) ratings shall be per ASTM C423.

E. Rack testing for 10 years. (tensile strength stress test)

F. The manufacturer shall have a quality system that is registered to the ISO 9001 standards.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Proper storage of partitions before installation and continued protection during and after installation will be the responsibility of the General Contractor.
1.06 WARRANTY
   A. Partition system shall be guaranteed for a period of two years against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MATERIALS
   A. Product to be top supported Series 642 paired panels as manufactured by Hufcor Inc. or equal by Modernfold or Panelfold.
      1. Panels shall be nominally 4” thick, to 48” in width, and hinged in pairs.
      2. Panel faces shall be laminated to appropriate substrate to meet the STC requirement in 2.04 Acoustical Performance.
      3. Frames shall be of 16 gauge painted steel with integral factory applied aluminum vertical edge and face protection.
      4. Vertical sound seals shall be of tongue and groove configuration, ensure panel-to-panel alignment and prevent sound leaks between panels.
      5. Horizontal top seals shall be retractable, provide 1” nominal operating clearance, and exert upward force when extended. All panels, including pass door panels and lever closure panels must have retractable top and bottom seals.
         Optional top seals: Horizontal top seals shall be fixed continuous contact dual 4 finger vinyl.
      6. Horizontal bottom seals shall be retractable, provide up to 2” nominal operating clearance, and exert downward force when fully extended.
         Optional bottom seals: Horizontal bottom seals shall be fixed continuous contact 4-finger vinyl.
      7. Horizontal trim shall be of aluminum.
      8. Low profile hinges on basic panels shall be of steel and project no more than 1/4” beyond panel faces. Each pair of panels to have a minimum of three hinges.

   B. Weight of the panels shall be 7.8-10.9 lbs./sq. ft. based on options selected.

   C. Suspension system:
      1. Track shall be of clear anodized architectural grade extruded aluminum alloy 6063-T6. Track design shall provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. Track shall be connected to the structural support by pairs of minimum 3/8” dia. threaded steel hanger rods. Guide rails and/or track sweep seals shall not be required.
         a. Each panel shall be supported by one 4-wheeled carrier. Wheels to be of hardened steel ball bearings encased with molded polymer tires.
      2. Plenum closure (by others): Design of plenum closure must permit lifting out of header panels to adjust track height. Plenum closure required for optimum sound control of partition.
D. Finishes
   1. Face finish shall be:
      a. Factory applied reinforced vinyl fabric with woven backing, weighing not less than 15 oz. per lineal yard. Color shall be selected from manufacturer's standard color selector.
      2. Exposed metal trim and seal color shall be Gray (standard).
      3. Aluminum track shall be clear anodized

2.03 OPERATION
A. Panels shall be manually moved from the storage area, positioned in the opening, and seals set.
B. Retractable Horizontal Seals
   1. Retractable horizontal seals shall be activated by a removable quick-set operating handle located approximately 42" from the floor in the panel edge.
   2. All retractable seals in each hinged panel group shall be operated simultaneously.
   3. Seal activation requires a 190 degree turn of the removable handle.
C. Final partition closure to be by lever closure panel with expanding jamb which compensates for minor wall irregularities and provides a minimum of 250 lbs. seal force against the adjacent wall for optimum sound control. The jamb activator shall be located approximately 45" from the floor in the panel face and be accessed from either side of the panel. The jamb is equipped with a mechanical rack and pinion gear drive mechanism and shall extend 4"-6" by turning the removable operating handle.
D. Stack/Store Panels
   1. Retract seals with removable operating handle and move to storage area. Panels may be stored at either or both ends of the track or in a pocket.

2.04 ACOUSTICAL PERFORMANCE
A. Acoustical performance shall be tested at a laboratory accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) and in accordance with ASTM E90 Test Standards. Standard panel construction shall have obtained an STC rating of _54__.
   1. Complete, unaltered written test report is to be made available upon request.
PART 3 – EXECUTION

A. Installation. The complete installation of the operable wall system shall be by an authorized factory-trained installer and be in strict accordance with the approved shop drawings and manufacturer's standard printed specifications, instructions, and recommendations.

B. Cleaning
   1. All track and panel surfaces shall be wiped clean and free of handprints, grease, and soil.
   2. Cartoning and other installation debris shall be removed to onsite waste collection area, provided by others.

C. Training
   1. Installer shall demonstrate proper operation and maintenance procedures to owner's representative.
   2. Operating handle and owners manuals shall be provided to owner's representative.

END OF SECTION
SECTION 102800 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. General: Submit product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

1.3 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.4 WARRANTY: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

A. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Bobrick numbers are used for specification purposes. Other manufacturers' products that are acceptable include:

2. American Specialties, Inc.
4. McKinney/Parker.

TOILET ACCESSORIES 102800 - 1
2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.


G. Fasteners: Screws, bolts, and other devices of galvanized steel where concealed.

2.3 TOWEL DISPENSER: By Owner.

2.4 TOILET TISSUE DISPENSERS: By Owner.

2.5 SOAP DISPENSERS: By Owner.

2.6 GRAB BARS: 18 ga. stainless steel, concealed mounting with snap flange, 1-1/4" diameter with peened or other abrasive finish. Equal of ASI 3700 series of lengths and configurations as shown on the drawings.

2.7 MIRRORS: Stainless steel channel-framed mirror. Equal Bobrick B-165 1830.

2.8 SINGLE HOOKS: Stainless steel with integral bumper, equal of Bobrick B-212682.

A. Quantity: 2 each toilet located by Architect
2.9 FABRICATION

A. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

B. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446. Install baby changers to withstand loading of their listed capacity. Coordinate for support/blocking in walls.

C. Provide sanitary sealant, as specified in Section 079200 - Joint Sealers, concealed under surface flanges against walls.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800
SECTION 104413- FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.

B. Provide extinguishers with cabinets located as shown on the drawings.

1.3 SUBMITTALS

A. General: Submit product data for fire extinguishers and cabinets, including rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

1.4 QUALITY ASSURANCE

A. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standards that comply with local codes.
B. Multipurpose Dry Chemical Type: UL-rated 3A-40BC, 5-lb nominal capacity, in enameled steel container with chrome-plated brass valves.

2.2 CABINET

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Cabinet equal of JL Companies Cosmopolitan Series.

B. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semi-recessed into standard partitions.

2. Trim Style: 2-1/2" rolled trim returning to wall.

C. Door and Trim Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Satin stainless steel.
2. Door Glazing: Full glazed, tempered clear.

D. Door Hardware: Provide pull with roller catch and continuous hinge.

2.3 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

2.4 STEEL CABINET INTERIOR FINISHES:

A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

B. Factory-Priming for Field-Painted Finish: Apply shop primer immediately following surface preparation and pretreatment.

C. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for
applying and baking to achieve a minimum dry film thickness of 2.0 mils. Paint entire cabinet inside and out, color - white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 104413
SECTION 115310 – LABORATORY CASEWORK AND OTHER FURNISHINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wood Laboratory Casework
B. Metal Laboratory Casework and Movable Tables
C. Cabinet Hardware
D. Laboratory Work Surfaces
E. Electronics Bench
F. Shelving Assemblies
G. Cylinder and Dewar Restraint Assembly
H. Pipe Drop Enclosure
I. Drying Rack
J. Finish for Miscellaneous Wood Items
K. Metal Fabrications
L. Stainless Steel Fabrications
   1. Work Surfaces
   2. Laboratory Sinks
M. Slotted Channel Framing (Strut)
N. Sealant

1.2 RELATED SECTIONS

A. Division 09 – Flooring (wall base)
B. Section 115313 – Fume Hoods and Other Air Containment Units
C. Section 115343 – Laboratory Service Fittings and Fixtures
D. Division 22 – Plumbing
E. Division 23 – Heating, Ventilated, and Air-Conditioning
F. Division 26 – Electrical
G. Division 27 - Communications

1.3 REFERENCES


G. Scientific Equipment and Furniture Association: SEFA 8W-2010 Recommended Practices for Laboratory Grade Wood Casework.

H. Scientific Equipment and Furniture Association: SEFA 8M-2010 Recommended Practices for Laboratory Grade Metal Casework.

1.4 BID SUBMITTALS

A. Certification of Compliance: All bidders (including those listed in 2.01-A) must submit a compliance certification statement indicating that their bid includes products and installation which comply with every requirement of the project specifications and drawings (accounting for any RFI responses received during the bidding phase).

B. Certification of Qualifications: All bidders must submit a certification of compliance with the Qualifications requirements outlined below. List specific project experience as evidence of compliance.
C. Substitution Requests: All substitution requests for this scope of work in this section must be made during the bidding phase. No substitution requests will be considered post-bid.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 "Submittal Procedures" for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable items shall be deleted or struck.

5. Product data submittals provided in PDF format shall consist of fully collated PDF files allowing for collated printing from a single file.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for work in this section.

1. Product data shall not be duplicative or redundant with shop drawings. Do not include drawings in the product data submittal that are included in the shop drawings.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducible, PDF files, or photocopies, to scale, sheet size not to exceed 11 inches x 17 inches (A3). Shop drawing submittals provided in PDF format shall consist of fully collated files allowing for collated printing from a single file. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project
specification marked as "Comply" or "Not Comply." In any cases where "Not Comply" is indicated, an explanation of the relative advantages of the proposed design shall be provided.

F. Submit detailed anchorage and attachment drawings provided by a licensed Structural Engineer complying with applicable codes, regulations, and guidelines in the state of installation.

G. Samples: Accompanying Materials List, submit for Architect's approval two (2) samples of each type of specified finish and color range available for casework, laboratory work surfaces, painted steel fabrications, cabinet hardware, and shelving.

H. Certifications/Test Data: Submit certifications and test data as required elsewhere in this section, including evidence of AWI membership, SEFA structural performance test reports, and finish performance test reports.

I. Operations/Maintenance Manuals: At project close-out, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

J. Warranty: Submit manufacturer's warranty including any additional certifications as needed to meet the requirements specified.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 ENVIRONMENTAL CONDITIONS

A. It is the responsibility of the general contractor or construction manager to provide appropriate environmental conditions within the laboratory spaces throughout the period of installation of wood and composite wood casework products until substantial completion of the project and turnover to the owner. The relative humidity standards as delineated by the Architectural Woodwork Institute Quality Standards (8th Edition, Version 2.0) should be followed.
1. Humidity must be controlled between 25% and 55% in all areas where laboratory casework is stored and/or installed.

2. The range of relative humidity change should not exceed 30 percentage points.

B. It is the responsibility of the laboratory furniture subcontractor to assess building environmental conditions prior to the delivery and installation of laboratory casework. Wood laboratory casework shall not, under any circumstances, be installed in spaces which do not comply with the requirements outlined above.

1.8 QUALIFICATIONS

A. Work in this section shall be manufactured by and installed by a company/companies having a minimum of eight years documented experience providing and installing products similar to those specified in laboratory applications; an established organization; and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified work of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.9 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of five years following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the client’s academic/research schedule and may therefore require evening and/or weekend work.

PART 2 - PRODUCTS

2.1 WOOD LABORATORY CASEWORK AND TABLES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Advanced Lab Concepts, 15900 Bratton Lane, Austin, TX 78728 Tel: 800 711-LABS.
2. Cf Lab Casework Solutions, 56 Edilcan Drive, Ontario, Canada L4K 3S6 Tel: 905 738-5821.
3. Diversified Woodcrafts, Inc., 300 South Krueger Street, Suring, WI 54174 Tel: 920 842-2136.
4. Kewaunee Scientific Corporation, P.O. Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
5. Mott Manufacturing Limited., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
6. Thermo Fisher Scientific, 1316 18th Street, Two Rivers, WI 54241 Tel: 920 793-1121.
7. Approved substitution.

B. Quality Standards:

1. Wood casework shall comply with all requirements of AWS Custom Grade architectural cabinets, unless otherwise specified in this section.
2. Wood casework shall comply with all requirements of SEFA 8-W, unless otherwise specified in this section.

C. Design Requirements:

1. Door and drawer design: Square edged full flush overlay design with eased edges, 5/16 inch (8mm) top and bottom reveal and 5/32 inch (4mm) reveal horizontal and vertical and 1/16 inch (2mm) vertical reveal on ends of cabinets. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.
2. Pulls on doors shall be mounted vertically and on drawers horizontally.
3. Grain Pattern:
   a. Vertical Matched Grain Pattern: Grain pattern on all exposed surfaces shall be vertical. Entire front of each cabinet must be cut from a single panel.
   b. Book Matched Grain: Veneer shall be laid up with a book matched pattern, mirroring alternating veneer leaves across their common joint.
4. Toe Kicks/Toe Spaces:
   a. All tall storage cabinets to have toe space to match base units unless otherwise noted.
   b. Provide toe spaces at all fully-exposed sides of cabinets, including locations such as the end of island benches, the end of peninsula benches, and outside-corner cabinets. Toe spaces shall run continuously through all items such as front edge of knee opening side panels and end panels.
5. Full-Flush Construction and Installation: All finished panels and surfaces shall be in the same plane as the front of cabinet doors/drawers to provide a true flush overlay appearance.
   a. Filler panels: Provide filler panels as needed where casework units meet perpendicular walls to create a continuous appearance.
   b. Flush panels: Provide fixed fully-edgebanded flush panels at sink cabinets, knee opening drawer units, filler panels, and elsewhere, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance.
   c. At knee openings with a leg support at one or both sides, front of apron panel to be set back from face of leg.
   d. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.
   e. At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.
   f. At inside corners, mount filler panels flush with face of adjacent cabinet doors.
   g. At open cabinets (without doors), align face of cabinet with face of adjacent cabinet door. Adjust the depth of the cabinet and toe kick accordingly.
   h. Align other filler panels and applied panels with face of adjacent cabinet doors.
   i. Align face of end panels and knee-opening side panels with face of adjacent cabinet doors.
   j. Provide filler/trim panels at locations where undercounter dishwashers or glasswashers are shown and the units provided do not completely fill the opening indicated.

6. Extended Ends:
   a. At end-of-run base cabinets, provide extended end to cabinet to create closure to the wall without the use of filler panels. Extended end shall be edgebanded on front and bottom edges. Back edge shall be scribed to the wall with a tight hairline joint. Field-applied panels do not meet this requirement.
   b. At ends of island benches and peninsula benches, provide a paired set of base cabinets, each with an extended end, resulting in a single joint. These extended end panels shall be edgebanded on the front and bottom edges and shall meet at a hairline joint. Applied panels do not meet this requirement.

7. Flush interiors: Set cupboard bottom flush with front-end facers. Surface mounted bottoms and offsets caused by front face frames that interfere with ease of cleaning are not acceptable.
8. Non-exposed fasteners: Except where specifically shown or indicated, all fasteners used in the fabrication and installation of wood casework shall be hidden from view at all exposed and semi-exposed surfaces.

9. Widths of drawer bodies in knee opening rails shall not be less than 18 inches (457 mm). As noted above, applied panel shall be provided to complete the flush construction on either side of the drawer head.

D. Materials and Finishes:

1. Wood:

   a. Definition of cabinet components by surface visibility:

      1). Exposed Surfaces:

         a). Surfaces exposed when doors and drawers are closed.
         b). Surfaces visible when behind glass doors, including tops and bottoms of shelves.
         c). All exterior surfaces of suspended casework.
         d). Open units.
         e). Bottoms of cabinets if 42 inches (1070 mm) or more above finished floor.
         f). Tops of cabinets if less than 72 inches (1830 mm) above finished floor.
         g). Front rail of web frames.

      2). Semi-exposed surfaces:

         a). Surfaces that are visible when solid (opaque) doors are open or drawers are extended, including backs of doors.
         b). Tops of cabinets 72 inches (1830 mm) or more above finished floor when visible from an upper level.

      3). Unexposed surfaces:

         a). Surfaces not normally visible after installation with doors open and drawers extended.
         b). Bottoms of cabinets less than 30 inches (750 mm) above finished floor.
         c). Tops of cabinets over 78 inches (1980 mm) above finished floor and not visible from an upper level.

   b. Wood Species and Veneer Cut: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
c. Maple:

1). Lumber:
   
   a). Exposed and semi-exposed: Plain sawn Maple, NHLA Grade FAS.
   
   b). Unexposed: Select grade hardwood of a species suitable for the specified purpose.
   
   c). All lumber shall be clean and free of defects; kiln and air dried to uniform moisture content of 6 percent.

2). Veneer:

   a). Exposed: Plain sliced white select maple, grade A. Thickness: 1/50 inch (0.5 mm), minimum.

(1). Color and Matching:

   (a). 100% sapwood, no heartwood allowed.
   
   (b). Slight color streaks or marks.
   
   (c). Slight color variation.
   
   (d). No sharp contrast at veneer joints.

(2). Natural Characteristics:

   (a). Small conspicuous burls: combined average not to exceed 4 per 10 square feet (1 m²).
   
   (b). Conspicuous burl size: 3/8 inch (9.5 mm), maximum.
   
   (c). Conspicuous pin knots: combined average not to exceed 4 per 32 square feet (3 square meters). Maximum pin knot size – dark part: 1/8” (3.2mm). Maximum pin knot size – total: ¼” (6.4mm).
   
   (d). Scattered sound repair knots, bark pockets: not allowed.
   
   (e). Slight mineral streaks, worm tracks, cross bars and vine marks.

(3). Manufacturing Characteristics:

   (a). Rough cut or ruptured grain is not allowed.
   
   (b). Blended repaired tapering hairline Splits: two 1/16 inch (1.6 mm) x 6 inch (152 mm) on end panels only.
(4). Repairs: Small blending allowed.
(5). Flitch Width, Face Components: 5 inches minimum, except for outside components.

b). Semi-Exposed: Plain sliced white select maple Grade B sapwood – no heartwood allowed.
c). Unexposed: Plain sliced hardwood veneer.

2. Plywood

a. Typical, Unless Otherwise Noted: Hardwood Veneer Plywood

1). Product shall be provided with hardwood face veneers as specified above.
2). Plies:

a). ¾ inch (19 mm): minimum 7-ply, including face veneers.
b). 1 inch (25 mm): minimum 9-ply, including face veneer.

3). Physical Properties:

a). Screwholding: 355 lb at face.
b). Average modulus of rupture: 7346 psi (50.65 N/mm²).

b. Drawer and Door Fronts: ANSI A208.1 M3 Grade Industrial Particleboard Core Plywood.

1). Product shall be provided with hardwood face veneers as specified above.
2). Plies:

a). 3-ply, including face veneers.

3). Physical Properties:

a). Screwholding: 250 lbs at face, 225 pounds at edge.
b). Average modulus of rupture: 2,400 lb/in2.
c). Modulus of elasticity: 400,000 lb/in2.
d). Hardness: 500 lbs.

c. Drawer box back, front and sides: Finnish or Baltic Birch Plywood

3. Hardboard: Dry process S2S hardboard made from compressed exploded wood fibers.
4. Edgeband/Facer: 1/8" (3 mm) hardwood; species as described above.
5. Dowels: 8 mm, diameter, minimum, hardwood, laterally fluted with chamfered ends.
6. Glue: Type 2 or Type 3 water resistant glue with gluing done in clamps and jigs.
7. Finish for Wood Laboratory Components:
   a. Finish processes (stains and finishes) shall be by means of compression spray, providing high-transfer efficiency low waste generation. Solvent applied coatings are not acceptable and will not be considered. Manufacturer shall supply documentation that waste generated during the finishing process, is a non-hazardous material, eliminating liquid waste disposal in landfills.

   1). Chemically Resistance Finish: Finish for all wood products shall be environmentally friendly, highly chemically resistant, water-borne, laboratory-grade finish that satisfies the requirements specified herein for chemical and durability resistance. A letter from a third-party validator, verifying independent test results, shall be submitted.

   2). Operator Protection: The application shall be convenient and easily mastered, in a custom spray booth. The finish process shall be cleanly contained and shall have no solvent odor, and shall be applied in an air-conditioned room.

   3). VOC Emissions: Water-borne finishes shall be sprayed and cured with a near zero (2.0 lbs. per gallon for ‘clean finish’) VOC (Volatile Organic Compounds) emissions.

   4). Offgasing: After all wood products have cooled from the curing ovens, the coating shall be firm and stable. No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature.

   b. Manufacturer may uses either of the following finish systems:

   1). Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs.

   2). Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

   c. Stain Color:

   1). Stain color to match Architect’s sample.

d. Application:
1). Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

2). Preparation: Sand exposed and semi-exposed surfaces smooth, free from dirt and defects.

3). Stain application: Apply stain of color selected to all exposed and semi-exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

4). Finish application: Apply chemical resistant top finish to all stained surfaces. Apply to doors after any notching for hinges has been performed. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

8. Glass: Framed glass doors:

   a. 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.
   b. Without imperfections or marred surfaces.
   c. All glass should have etched safety information, readable from outside the cabinet.

E. Construction:

1. Base Cabinets:

   a. Assembly: Dowel and/or mortise-and-tenon joinery secured with countersunk screws and pressure-glued.
   b. Cabinet Top:

      1). L-shaped front rail of ¾" plywood: 1¼ inches (38 mm) x 2½ inches (57 mm); or horizontal front rail of 1 inch (25 mm) x 3 inches (76 mm) hardwood. Back rail: ¾" plywood or hardwood, 3-3/4" tall.
      2). At mobile cabinets (and other cabinets where tops are exposed): full ¾" plywood top with chemical-resistant plastic laminate, as specified below, set inside cabinet sides and back. Color to be selected by Architect.
   
   c. Cabinet Bottom: ¾ inch (19 mm) thick plywood. Set flush and join to cabinet end panels. Front edge shall be edgebanded.
   d. Cabinets Ends/Sides, and Backs Exposed to View from the Outside: ¾ inch (19 mm) thick plywood.

      1). Side panels and end panels: edgeband front edge.
e. Cabinet Backs, Exposed to View From the Inside at Open Units and Units with Glazed Doors: 1/4 inch (19 mm) thick veneer core plywood.

f. Cabinet Back, Semi-Exposed and Unexposed:

1. Removable hardboard, 1/4 inch (6 mm) thick.
2. Sink base back shall be half-height construction to allow for plumbing and sink waste connection.
3. Provide split back on drawer cabinets.

h. Shelves: 1 inch (25 mm) thick full depth, 9-ply hardwood plywood.

1. Front edge of shelves shall be edgebanded.
2. Front edge of open shelves:
3. Retainer Rail: Retainer rail as specified elsewhere this section and detailed on drawings.
4. Pull-Out Shelves: Construction shall be similar to drawer body mounted on a full-extension pull-out slide, with ½ inch (12mm) hardwood plywood bottom.
5. Shelf Adjustment: All shelves shall be adjustable on 32 mm centers.
6. Shelf Tolerance: Shelves shall fit into cabinets or into shelf supports with a tolerance of 1/16 inch per side maximum.

i. Drawer construction:

1. Drawer box back, front and sides shall be of ½ inch (13 mm), 9-ply Finnish or Baltic Birch veneer plywood, with eased top edge, finished with a 7-level polyester acrylic finish. Sides shall be full height with 1 inch (25 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.
2. Acceptable drawer joinery options:
   a. Dowel: Glued under pressure; 32mm, minimum, dowel spacing to 4 inches (102 mm) high, 64 mm dowel spacing above 4 inches (102 mm).
   b. Lock Shoulder: Glued and pin nailed.
   c. Multiple Dovetail: Tight fitting and glued.
3. Drawer bottom shall be Baltic Birch veneer plywood. Bottom shall be grooved into the 4 sided drawer box and sealed with hot melt glue process around entire drawer bottom perimeter.

4. Drawers up to 24 inches wide: 3/8 inch (6mm) thick 7-ply Baltic Birch veneer plywood.

5. Drawers greater than 24 inches wide: 1/2 inch (13 mm) thick 9-Ply Baltic Birch veneer plywood.

j. Door and Drawer Heads: shall be 3/4 inch (19 mm) thick plywood with edgebanding. Edges shall be of the same material as exposed hardwood. Drawer heads shall be screwed to drawer box.

k. Flush Panels: As described in the Design Requirements section of this specification.

l. Front Horizontal intermediate Rail: 3/4 inch (19 mm) x 1 1/2 inches (38 mm) exposed hardwood rail shall be provided between doors and drawers. For all drawer units at benches where service fitting connections are not accessible via an adjacent knee opening filler or cabinet filler panel, drawer units to be provided with Keku fasteners (Keku fasteners not required at other locations). The drawer unit intermediate horizontal and vertical box frames must be removable. These components shall be assembled with Keku suspension fittings as manufactured by Häfele America Co. or approved so these members are easily removable at any time with no special tools to gain access to concealed piped services behind.

m. Intermediate Back Rail: 1 1/2 inch (38 mm) x 3/4 inch (19 mm) hardwood lumber to accept hardboard security panel between drawers.

n. Security Panels: Provide hardboard security panels, 1/8 inch (3 mm) thick, in frames when keyed-different locks are specified, or where individual padlock hasps are indicated. Inset security panel into frame on all four sides.

2. Wall, upper and tall cases:

a. Shall be manufactured with materials and joinery methods as specified for base units, unless otherwise indicated.

b. Edgebanding:

1). Wall cabinet side and end panels: Edgeband front and bottom edges.

2). Edgeband front and top edges of upper cabinet side and end panels.

3). Edgeband front and top edges of tall cabinet side and end panels.
c. Cabinet Interior Backs: 1/4 inch thick veneer core plywood, typical for all exposed, and semi-exposed interior backs.
d. Hardwood plywood tops: 1 inch (25 mm) thick with front edge edgebanded.
e. Wall and upper case hardwood plywood bottoms: 1 inch (25 mm) thick. Tall case hardwood plywood bottoms 3/4 inch (19 mm) thick. Edgeband front edges.
f. Bottom hardwood kick rail on tall cases: 3/4 inches (95 mm) x 3/4 inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x 2-1/2 inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
g. Solid doors shall be the same construction as specified for base cabinets.
h. Framed-glass doors: Hardwood construction, 3/4 inch (19 mm) x 2-3/4 inch (70 mm) machined to accept glass. Ease all edges, interior and exterior, including those that frame the glazing. Provide extruded vinyl retaining molding on interior designed so glass can be replaced without tools.
i. Shelves: 1 inch (25 mm) thick full depth, 9-ply hardwood plywood.

1). Front edge of shelves shall be edgebanded.
2). Front edge of open shelves:
3). Retainer Rail: Retainer rail as specified elsewhere in this section and detailed on drawings.
4). Shelf adjustment:
5). Wall units: All shelves shall be adjustable on 32 mm centers.
6). General purpose tall units: One fixed shelf. All others shall be adjustable on 32 mm centers.

3. Wood Casework Construction Performance:

a. Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 lbs. (900 kg)), including working surface, without permanent distortion or interference with door and drawer operation.
b. Base cabinets shall be constructed so that when supported on both back corners and one front corner, with a counterweight load of 250 pounds placed on the rear corner behind the supported front corner; and with a load of 200 pounds placed on the unsupported corner – there shall be no permanent damage after 24 hours of loading. Maximum allowable deflection shall not exceed 1/8 inch.
c. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 12 inches (305 mm) measured
horizontally from hinge along the top edge of door through a swing of 160 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

d. Drawers shall be constructed so that they will support a 150 pound load hung on the drawer head centerline, with the drawer opened 13 inches (330mm), for five minutes. There shall be no interference with the normal operation of the drawer and the drawer head should remain tightly fastened to the drawer.

e. Drawers shall be constructed so that a drawer that is removed and supported on four corners will support a 10 pound sand or shot bag dropped from a height of 24 inches (610mm) without damage.

f. Drawers shall be constructed so that a drawer that is removed and supported at a 45 degree angle shall be capable of withstanding three impacts of a 2 inch (51mm) diameter, 12 inch (305mm) long steel rod (approximately 10 pounds in weight) released from 13 inches (330mm) from the front and back of the drawer. The drawer joinery shall remain intact and the drawer shall operate normally when placed back into the casework cabinet.

g. Drawers mechanical suspension systems shall be designed and attached to that a drawer uniformly loaded with 75 pounds of sand or shot bags shall operate freely without binding over its full range for 50,000 cycles at a rate not exceeding 10 cycles per minute. The force required to open and close the loaded drawer for the purposes of this test shall not exceed 8 pounds.

h. Shelves shall be designed and supported to that they can support a load of 40 pounds per square foot, up to a maximum of 200 pounds per shelf, for 24 hours with no more than 0.35 inches (9mm) of deflection maximum.

F. Hardware: As specified elsewhere in this Section.

G. Wood Finish Performance Requirements:

1. Chemical resistance: Contractor shall provide verification of wood finish performance. Testing to be performed by independent testing agency.

   a. Procedure: Finished panels shall be oriented horizontally and vertically during exposure to the test chemicals. Chemical concentrations shall be adjusted by the volume method. Ambient temperature and chemical temperature shall be 68°F to 72°F (20°C to 22°C). At the end of the test period, the surface shall be washed with detergent and warm water. Areas exposed to solvents shall be cleaned with a cloth dampened with the respective solvent. Prior to
the evaluation, 16 - 24 hours after the chemicals have been removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

1). Horizontal Test: Apply five (5) drops of the acid, base or salt substance to the correspondingly numbered areas of the surface to be tested. Position a 1 inch (25.4 mm) diameter watch glass in the liquid, convex side downward. Solvents shall be applied by saturating a 1 inch (25 mm) ball of cotton, then covering with an inverted 2 ounce (56.7 g) wide-mouth bottle. Test duration shall be one hour.

2). Vertical Test: The test surface shall be marked to indicate divisions; 12 inches (305 mm) high, ¾ inch (19 mm) wide, and numbered to identify the chemicals. Five (5) drops of each substance shall be applied to its respective numbered area in a vertical track pattern to prevent crossover. Test duration shall be two hours.

b. Evaluation ratings:

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<th>Description</th>
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<td>No effect (No detectable change in the material surface.)</td>
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<tr>
<td>1</td>
<td>Excellent (Slight detectable change in color or gloss but no change in function or life of the surface.)</td>
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<tr>
<td>2</td>
<td>Good (A clearly discernable change in color or gloss but no significant impairment of surface life or function.)</td>
</tr>
<tr>
<td>3</td>
<td>Fair (Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.)</td>
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<td>4</td>
<td>Failure (Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.)</td>
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c. Minimum acceptable results of chemical resistance test:

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<th>Reagent</th>
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LABORATORY CASEWORK AND OTHER FURNISHINGS
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2.2 METAL LABORATORY CASEWORK AND MOVABLE TABLES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer. Corrosive and flammable liquid/solvent storage cabinets may also be provided by the manufacturers listed with their descriptions.

1. Laboratory Casework:
   a. Advanced Lab Concepts, 15900 Bratton Lane, Austin, TX 78728 Tel: 800 711-LABS.
   b. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.
c. Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, NY 14701 Tel: 716 665-5313.
d. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
e. Mott Manufacturing Limited., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825
f. Thermo Fisher Scientific, 1316 18th Street, Two Rivers, WI 54241 Tel: 920 793-1121.
g. Approved substitution.

B. Metal Laboratory Casework

1. Quality Standards:
   a. Metal casework shall comply with all requirements of SEFA 8-M, unless otherwise specified in this section.

2. Door and Drawer Front Material and Design:
   a. Overlay metal construction with door and drawer fronts overlaying the case unit ends, top and bottom rails.
   b. Door and drawer design: Square edged full flush overlay design with 5/16 inch (8mm) top and bottom reveal and 5/32 inch (4mm) reveal horizontal and vertical and 1/16 inch (2mm) vertical reveal on ends of cabinets. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.
   c. Pulls on doors shall be mounted vertically and on drawers horizontally.
   d. Non-exposed fasteners: Except where specifically shown or indicated, all fasteners used in the fabrication and installation of metal casework shall be hidden from view at all exposed and semi-exposed surfaces.
   e. All tall cases shall be provided with toe space to match base units.
   f. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.
   g. Widths of drawers in knee opening rails shall not be less than 24 inches (600 mm) or the width of the rail whichever is the lesser.
   h. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.
   i. Full-Flush Construction and Installation: All finished panels shall be in the same plane to provide a true flush overlay appearance.
a). Provide metal filler panels at inside corners, end-of-run conditions, and other similar locations, aligned with the face of adjacent metal cabinet bodies.

2). Outside corners:

a). At outside corners, align the side panel of cabinet with the cabinet body of adjacent cabinet.

3. Materials:

a. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.

1). Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.

2). All gauges indicated are to be U.S. standard.

4. Base and Tall Cabinets:

a. General:

1). Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.

2). All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.

3). End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.

4). The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.

5). An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.

6). The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.

7). The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.

8). Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut.
in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:

1). Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.

2). Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable.

1). Restraint: At open shelf units, provide retainer rail as specified elsewhere in this section and detailed on drawings.

e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Door and Drawer Heads:

1). Metal, Flush Overlay: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan, an outer pan having a channel formation on all four sides welded and ground to eliminate exposure of sharp raw edges, and the interior space filled with sound deadening at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.
g. **Drawer Construction:**

1). Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.

2). **Drawer Suspension:** Refer to Drawer Slides under Hardware section.

3). **Drawer stops:** shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

h. **Top Horizontal Rail:** Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength, but shall be flush at face of unit. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

i. **Intermediate Rails:** Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

j. **Intermediate Vertical Uprights:** shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

k. **Knee Space Service Strip Cover Panels** where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

l. **Provide** filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom.

5. **Metal Casework Construction Performance:** Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000
lbs. (900 kg)), including working surface without objectionable distortion or interference with door and drawer operation.

a. Base cabinet corner gussets with leveling bolts shall support 500 lbs. (225 kg) per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.

b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 lbs. per square foot (200 kgf/m²) up to a maximum of 200 lbs. (90 kg), with nominal temporary deflection, but no permanent set.

c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.

d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

C. Metal Movable Tables

1. Materials: All components and assemblies shall be manufactured of heavy-duty furniture grade cold rolled steel, free of surface blemishes and must be stretcher leveled flat. All parts are to be accurately blanked and formed on precision presses and dies. Minimum tolerance gauges and fixtures shall be provided to assure uniformity of parts and assemblies from production run to production run.

2. Components: Provide all components necessary for assembly in the types and sizes indicated on the Laboratory Furnishing drawings.


4. Description: A modular system of table frames and worktops.

5. Table Frames

a. Frames and uprights shall be 16 gauge (1.6 mm thick) cold-rolled steel.

b. Table Frames: Modular, interchangeable work surface support structures in adjustable height configuration.

1). Adjustable height tables shall be capable of four-leg mechanical adjustable configurations.

2). Table frames shall be furnished with levelers.
c. System Requirements:

1). Structural components shall independently support work surfaces and under-counter cabinets.
2). Vertical height of table work surfaces shall be adjustable with simple, but positive mechanisms.

6. Work Surface Support:

a. Work surface frames shall be 11 gauge (3.2 mm thick) cold-rolled steel tubing.
b. Leg supports shall be 16 gauge (1.6 mm thick) cold-rolled steel.
c. Table feet shall be die-cast aluminum alloy.

7. Structural Performance Requirements:

a. Structural requirements:

1). Maximum individual component load ratings:

| Adjustable-height tables | 300 lbs (1.33 kN) |

2). Deflection limit: Spanning components shall not deflect more than 1/48 of the span under sustained maximum load.

D. Metal Casework and Movable Tables Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

E. Metal Casework and Movable Tables Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.

a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).
d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply 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 thicknesses:

   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 μm) film thickness with a minimum 1.2 mil (30 μm) film thickness and shall have smooth satin luster.

   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 μm) film thickness.

4. All drawer bodies to be finished in matching color.

5. Concealed interior parts shall receive corrosion-resistant treatment.

6. Finish must be UV stable.

F. Chemical Spot Test Performance Requirements:

1. Chemical resistance: Contractor shall provide verification of metal finish performance. Testing to be performed by independent testing agency.

2. Test procedure: A clean, dry, test panel shall be laid flat and level on a horizontal surface. Ambient temperature of 70°F to 76°F (20°C to 22°C) and relative humidity of 45% to 55% shall be maintained for 48 hours. After a test period of one hour, chemicals shall be flushed away with cold water and the surface washed with warm water, detergent, and naphtha and rinse with deionized water. Dry with towel and evaluate after 24 hours, maintaining ambient conditions. Test using one of the following methods:
a. Place a reagent-saturated cotton ball in the mouth of a one ounce (30 cc) bottle and inverting the bottle on the surface of the panel.
b. Chemical spot tests shall be made by applying 5 drops (approximately 0.5 mL) of reagent to the surface to be tested, covered with a 24 mm watchglass, convex side down.

3. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Slight detectable change in color or gloss but no change in function or life of the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Slight surface etching or severe staining.</td>
</tr>
<tr>
<td>3</td>
<td>Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
</tr>
<tr>
<td>4</td>
<td>Failure</td>
</tr>
</tbody>
</table>

4. Minimum acceptable results of chemical resistance test:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by wt.</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>98%</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Acid dichromate</td>
<td>5%</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
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<td>0</td>
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<td>Chromic acid</td>
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<td>Cresol</td>
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<td>Dichlor acetic acid</td>
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<td>0</td>
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<tr>
<td>Dimethylformamide</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
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<tr>
<td>Formic acid</td>
<td>90%</td>
<td>0</td>
</tr>
<tr>
<td>Furfural</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>37%</td>
<td>0</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>48%</td>
<td>1</td>
</tr>
</tbody>
</table>
G. Hot Water Test

1. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.

2. Acceptance Level: After cooling and wiping dry, the finish shall show no visible effect from the hot water.

H. Paint Adhesion on Steel Test

1. Test Procedure: Test shall be based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating.” Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.

2. Acceptance Level: Ninety or more of the squares shall show finish intact.
I. Impact Test

1. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer's standard manufacturing method.

2. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

J. Paint Hardness on Steel Test

1. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.


2.3 CABINET HARDWARE

A. General: Special cabinets, such as corrosives storage and flammable liquid and solvent storage may be provided with the manufacturer's standard hardware.

1. All door and drawer pulls shall match, regardless of type of casework, except for:

a. Flammable liquid/ solvent storage cabinets, which should use manufacturer's standard latch handles as required to satisfy requirements of regulatory approvals.

2. All hardware shall be compliant with the ADA Standards for Accessible Design (28 CFR Part 36).

B. Drawer and Hinger Door Pulls:

1. Drawer and door pulls shall attach to door or drawer with machine screws. Two (2) pulls shall be furnished on drawers wider than 28 inches (711 mm). Plastic pulls or other types subject to breakage are not acceptable.

2. Type: Pulls shall be round "wire."

a. Material and Finish:

1). Stainless steel with finish as follows:

b. Size:
1). Length: 4 inches (100 mm) center to center of screw holes.
2). Diameter: ¼ inch (6 mm).

C. Hinges:

1. General: Hinges shall be attached to both door and case with three screws through each leaf. Provide two hinges for doors up to 48 inches (1219 mm) high; three hinges for doors over 48 inches (1219 mm) high.
2. Type: Institutional with a five-knuckle bullet-type barrel. Characteristics:
   a. Height: 2½ inches (63 mm), nominal.
   b. Material:
      1). Stainless steel with stainless steel screws.
         a). Finish:
            (1). BHMA 630 Satin (Previously US32D).
         b). Manufacturers:
            (1). Rockford Process Control, Inc. 202 Seventh St., Rockford, IL 61104 Tel: 815 966-2000.
            (2). Approved substitution.

D. Shelf Hardware:

1. Shelf Supports:
   a. Adjustable shelf supports: Adjustable plastic shelf support with lockdown clips for slotted standard.

2. Manufacturers:
   a. Bainbridge Manufacturing, Inc., P. O. Box 487, 237 W 3rd, Waterville, WA 98888 Tel: 800 255-4702.
   b. The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
   c. Knape & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI 49505 Tel: 616 459-7620.
   d. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
   e. Approved substitution.

E. Catches:

1. Roller Catches:
a. Materials: Roller catches shall be chrome-plated or zinc-plated steel with adjustable tension ball catch. Plastic type catches are not acceptable.

b. Application: Provide roller catches at top of all non-locked cabinet doors.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
2). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
3). Approved substitution.

2. Elbow catches: Heavy-duty, adjustable, spring-type elbow catch and strike plate.

a. Material: Brass or steel with bright chromium plated finish.

b. Application: Elbow catches shall be used on left hand doors of locked double door cabinets, including tall cabinets.

1). At tall cabinets, elbow catch shall latch to fixed center shelf. Latching devices using chains or strings are not acceptable.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
2). Approved substitution.

F. Drawer slides:

1. Typical: Ball bearing slides:

a. Material:

1). Clear, zinc-coated steel.

b. Full extension, 100 lb/pr. (45 kg/pr.) capacity: Accuride 3832, or equal.

c. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) capacity: Accuride 4034, or equal.

d. Pull-out shelf suspension: 100 lb/pr. (45 kg/pr.) capacity pull-out shelf slide: Accuride 322, or equal.

G. Drawer Stops: All regular drawers shall be equipped with integral stops to prevent drawer head impact with cabinet body.
H. Door Stops: Provide door stops for any cabinet door, which will strike an obstruction when opened between 90° and 135°.

1. Stop to be either:
   a. Sash chain, #30 zinc-plated steel.
      1). Terminations: Zinc chromate wire screw eyes. Open eye as required to attach stop with screws. Through-bolting not allowed.
   b. Coated cable.
      1). Seven-strand, 7-wire-per-strand, stainless steel cable with clear nylon coating.
      2). Wire diameter: 0.047 inches.
      3). Composite diameter with coating: 0.063 inches.
      4). Terminations: Number 10 stake eye on both ends. Attach to door/cabinet with screws. Through-bolting not allowed.
      5). McMaster Carr part number 30345T3 or equivalent.

2. Engineer stop to length to allow door to open 1 ½ inch (40 mm) from obstruction.

I. Hanging File Suspension System: Hangers shall be fastened and secured to drawer construction and shall not be freestanding units set inside the drawer. Provide in all file drawers.

1. Basis of Design: Blum Metafile Hanging File Frame Kit.
2. Manufacturers:
   a. Julius Blum, Inc. 7733 Old Plank Rd., Stanley, NC 28164 Tel: 800 438-6788.
   b. Hettich America L. P., 6225 Shiloh Rd., Alparetta, GA 30005 Tel: 800 438-8424.
   c. Approved substitution.

J. Locks:

1. General: Provide locks on all file cabinet drawers. Provide locks at other locations as indicated on the drawings. Provide chain bolts 3 inches (75 mm) long, with an 18 inch (450 mm) pull and an angle strike to secure inactive door on cabinets over 72 inches (1829 mm) in height. Five (5) or eight (8) tumbler locks are acceptable. Locks shall have satin nickel or satin chrome finish.

2. Keying:
a. Keyed alike by room and master keyed.

3. Key engraving:
   a. Keys to be engraved with an identification number corresponding to the layout of unique keys on the project. All identical keys shall be engraved with the same number.

4. Manufacturers:
   a. Swinging Doors and Drawers:
      1). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864-297-6655.
      2). Illinois Lock Company, 301 West Hintz Rd., Wheeling, IL 60090 Tel: 847 537-1800.
      3). Approved substitution.

K. Glides: Non-marring material, 1 inch (25 mm) diameter, minimum, with at least 5/8 (16 mm) vertical adjustment. Provide on movable tables, unless otherwise indicated.

L. Leveling devices: Provide each fixed table leg with 3/8 inch (10 mm) minimum diameter leveling bolt and floor clip.

M. Leg shoes: Leg shoes shall be provided on all legs to conceal leveling devices, except for adjustable height tables or tables with casters. Shoes shall be 2 1/2 (63 mm) inch high and of black rubber or pliable black vinyl material. Use of a leg shoe which does not conceal leveling device is not acceptable.

N. Floor clips: Provide leg assemblies and fixed table legs with floor clips securely fastened to the floor after shimming.

O. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 1/2 inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core.

1. Material: Caster shall be heavy gauge cold rolled steel with bright zinc plating.

P. Support Struts and Service Ledging: Refer to specifications for slotted channel framing in this Section.

Q. Cord Management Hook: At movable electronics benches, as shown on drawings, provide two cord management hooks at each table. McMaster Carr
type 304 stainless-steel hook, part number 19075A12, or equivalent, with matching mounting screws.

2.4 LABORATORY WORK SURFACES

A. Applicable Standards:

1. Laboratory Work Surfaces shall comply with all applicable requirements of SEFA 3, unless otherwise specified in this section.

B. Epoxy Resin:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

   a. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512-595-8000.
   b. Epoxyn Products, 500 E. 16th Street, Mountain Home, AR 72653 Tel: 870 425-4321.
   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
   d. Prime Industries, Inc., 2600 Warrenville Road, Suite 205, Downers Grove, IL 60515 Tel 630-725-9200
   e. Approved substitution.

2. Thickness:

   a. Typical work surface: 1 inch (25 mm).
   b. Fume hood work surfaces: Tops shall be 1¼ (32 mm) inches thick at outer edge, indented ¼ inch (6 mm) to provide a raised rim around all exposed edges 1 inch (25 mm) wide, minimum, or as to allow for the fume hood sash. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3 mm) radius. The juncture between the raised rim and the top surface shall be coved or chamfered to a ¼ inch (6 mm) radius.
   c. Curbs and Splashes: ¾ inch (19 mm).

3. Color:

   a. Black.
   b. Color sample to be approved by Architect before work is put in hand.

4. Description:
a. Monolithic filled epoxy resin work surface consisting of a polymerized cast resin material oven-cured in molds.

b. Drip Grooves: Provide under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be ½ inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and ¼ inch (6 mm) from the edge where the edge overhangs ½ inch (13 mm).

c. Edge profile: For all exposed upper edges and corners:

1). Bevel eased: 1/8 inch (3 mm) machined bevel with blended radius corners.

d. Marine edges: Where indicated on the Laboratory Furnishing Drawings, shall be 1 inch (25 mm) wide and ¼ inch (6 mm) high with chamfered or radiused transition to and be an integral part of the work surface.

e. Sink Mounting:

1). Drop-in Sink: Cutouts shall be profiled to provide support for the sink, and to ensure that the rim of the installed sink is 1/8 inch (3 mm) below the surrounding work surface level or bottom of drain grooves, if present. The top edge of the cutout shall have 1/8 inch (3 mm) bevel. Ensure that there shall be no gaps between the installed sink rim and work surface. Cement sinks in place with epoxy rein.

f. Curbs and Splashes:

1). Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
2). Bonded to the surface of the top to form a square joint.

g. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Polish exposed edges to match finish of worksurface.

5. Physical Properties:

a. Chemical resistance:

1). Organic solvents: A cotton ball, saturated with the test chemical, is placed in a one ounce bottle with a reservoir of liquid above the ball. The container is inverted on the test
material surface for a period of 24 hours. Test temperature: 23°C ±2°C.

2). Other test chemicals: Five drops (1/4 cc) of the test chemical are placed on the test material surface. The chemical is covered with a 1 inch diameter watch glass for a period of 24 hours. Test temperature: 23°C ±2°C.

3). Evaluation: After 24 hours exposure, exposed areas are washed with water, then a detergent solution, finally with naphtha, then rinsed with distilled water, dried with a cloth, and rated as follows:

<table>
<thead>
<tr>
<th></th>
<th>No effect</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No detectable change in the material surface.</td>
<td>Slight detectable change in color or gloss but no change in function or life of the surface.</td>
<td>A clearly discernable change in color or gloss but no significant impairment of surface life or function.</td>
<td>Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
<td>Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

4). Test results:

<table>
<thead>
<tr>
<th>Test chemical</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
</tr>
<tr>
<td>Chromic acid</td>
<td>40%</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>10%</td>
</tr>
<tr>
<td>Hydrochloric acid (conc.)</td>
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<tr>
<td>Sulfuric acid</td>
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<tr>
<td>Sulfuric acid (conc.)</td>
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</tr>
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<td>Test chemical</td>
<td>Concentration</td>
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<tr>
<td>-------------------------------</td>
<td>---------------</td>
</tr>
<tr>
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<td>Oleic acid</td>
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</tr>
<tr>
<td>Phenol solution</td>
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</tr>
<tr>
<td>Ammonium hydroxide</td>
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</tr>
<tr>
<td>Sodium carbonate sol.</td>
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</tr>
<tr>
<td>Sodium hydroxide sol.</td>
<td>60%</td>
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<td>Sodium hypochlorite sol.</td>
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<tr>
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</tr>
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<td>Transformer oil</td>
<td></td>
</tr>
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<td>Turpentine</td>
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</tr>
</tbody>
</table>

b. Heat resistance:

1). High temperature test: A porcelain crucible is heated to a dull red color, placed on the test material, and allowed to cool to ambient temperature. Result: No observable surface deformation.

2). Flame test: A 3/8 inch (10 mm) Bunsen burner is adjusted to a quiet flame with a 1½ inch (38 mm) inner cone, overturned on
the test material, and allowed to stay for 5 minutes. Result: no observable surface deformation.

c. Physical properties:

<table>
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<tr>
<th>Property</th>
<th>Standard</th>
<th>Value</th>
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<tbody>
<tr>
<td>Compressive strength</td>
<td>ASTM D695</td>
<td>31,400 psi (216 MPa)</td>
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<tr>
<td>Tensile strength</td>
<td>ASTM D638</td>
<td>8,000 psi (55 MPa)</td>
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<tr>
<td>Flexural strength</td>
<td>ASTM D790</td>
<td>11,700 psi (81 MPa)</td>
</tr>
<tr>
<td>Rockwell hardness &quot;M&quot;</td>
<td>ASTM D785</td>
<td>105-110</td>
</tr>
<tr>
<td>Specific density</td>
<td>ASTM D792</td>
<td>122.4 lb/ft³ (1960 kg/m³)</td>
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<tr>
<td>Water absorption</td>
<td>ASTM D570</td>
<td>0.01%</td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>ASTM D635</td>
<td>ATB (sec)=0</td>
</tr>
<tr>
<td>Heat deflection @ 264 psi</td>
<td>ASTM D648</td>
<td>342°F (172°C)</td>
</tr>
<tr>
<td>(1.82 MPa)</td>
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<td></td>
</tr>
</tbody>
</table>

C. Static Dissipative High-Pressure Plastic Laminate Tops:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   a. Nevamar Decorative Surfaces, 8339 Telegraph Road, Odenton MD 21113 Tel: 410 551-5000.
   b. Pionite Decorative Surfaces, One Pionite Road, Auburn, ME 04211 Tel: 800 746-6483.
   c. Approved substitution.

2. Type: Static dissipative laminate work.
3. Substrate Thickness:
   a. Typical work surface: 1 inch (25 mm).

4. Color: To be selected by Architect.
5. Description:
   a. High-pressure decorative laminate consisting of a resin formulation applied over the decorative surface paper. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Horizontal post-
forming grade static dissipative plastic laminate sheet to NEMA LD 3-1995.

b. Finish: Fine beaded "crystal" texture to minimize smudges and finger marks, and to provide optimum scratch resistance.

c. Core material: Shop Sanded Exterior Grade Veneer Plywood with Hardwood Plywood Veneer Association K+ face veneers.

1). Thickness/Plies:
2). 1 inch (25 mm): minimum 9-ply.
3). Physical Properties:
4). Average modulus of rupture: 7346 psi (50.65 N/mm2).
5). Face Screw Holding Strength: 355 lbf (1579 N).

d. Backing sheets: High-pressure phenolic meeting or exceeding NEMA Standard LD3-2000 Grade BKL.

e. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18°C) at a pressure no less than 15 pounds per square inch (103 kPa). Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.


g. Electrical performance:

1). Point to point resistance (per EOS/ESD–S4.1):
2). 60% to 40% RH: $10^6$ to $10^7$ ohms.
3). 40% to 20% RH: $10^7$ to $10^8$ ohms.
4). 20% to 10% RH: $10^8$ to $10^9$ ohms.
5). Point to ground resistance (per EOS/ESD–S4.1):
6). 60% to 40% RH: $10^6$ to $10^7$ ohms.
7). 40% to 20% RH: $10^7$ to $10^8$ ohms.
8). 20% to 10% RH: $10^8$ to $10^9$ ohms.

9). Volume resistance (measured face to back at 72°F (22.2°C), 100V with a LCD Megohmmeter, item No. 19770, NFPA Electrodes (2.5 inch (63 mm) diameter, 5 lb. (2.27 kg)): 
10). 60% to 30% RH: $10^6$ to $10^8$ ohms.
11). 30% to 10% RH: $10^8$ to $10^9$ ohms.

12). Static Decay (FTMS 101C, Method 4046 test):
13). 50% RH: 0.01 sec.
14). 10% RH: 0.02 sec.

h. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings.
Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges.

i. Physical Properties:

2. Minimum Thickness: 0.036 inches ± 0.005 inches (0.9 mm ± 0.08 mm).
3. Cleanability: 5 cycles (NEMA LD3 test method 3.4).
6. Ball Impact Resistance: 35 inches (889 mm) (NEMA LD3 test method 3.8).
8. Dimensional change:
9. Machine direction: 0.40% (NEMA LD3 test method 3.11).
10. Cross direction: 0.80% (NEMA LD3 test method 3.11).
12. Appearance: No ABC defects.
15. Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect: No detectable change in the material surface.</td>
</tr>
<tr>
<td>1</td>
<td>Excellent: All stain reagents removed with no impairment to surface appearance. Any change in gloss due to the cleaning procedure is permitted.</td>
</tr>
<tr>
<td>2</td>
<td>Good: Moderate effect: A difficult to perceive stain visible from all angles and directions. Any change in gloss due to the cleaning procedure is permitted.</td>
</tr>
<tr>
<td>3</td>
<td>Fair: Severe effect: Any easy to perceive stain or disturbed surface visible from all angles and directions.</td>
</tr>
</tbody>
</table>
4. Failure: Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

<table>
<thead>
<tr>
<th>Stain</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
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<td>Distilled water</td>
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<tr>
<td>50%/50% Ethyl alcohol</td>
<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>1</td>
</tr>
<tr>
<td>Household ammonia</td>
<td>1</td>
</tr>
<tr>
<td>10% Citric acid</td>
<td>1</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>1</td>
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<tr>
<td>Fresh coffee</td>
<td>1</td>
</tr>
<tr>
<td>Fresh tea</td>
<td>1</td>
</tr>
<tr>
<td>Catsup</td>
<td>1</td>
</tr>
<tr>
<td>Yellow mustard</td>
<td>1</td>
</tr>
<tr>
<td>10% Povidone iodine</td>
<td>1</td>
</tr>
<tr>
<td>Black permanent marker</td>
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<tr>
<td>#2 pencil</td>
<td>1</td>
</tr>
<tr>
<td>Wax crayon</td>
<td>1</td>
</tr>
<tr>
<td>Black paste shoe polish</td>
<td>1</td>
</tr>
</tbody>
</table>

D. Stainless Steel: Refer to Stainless Steel Fabrications section of this specification.

2.5 ELECTRONICS BENCH

A. Manufacturers: Products complying with this specification and as shown on drawings may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Gilmore-Kramer Co. – telephone 800-544-3137
   a. Electric Assembly Work Station & Instrument Shelf w/electric outlets at the shelf riser supports and outlet strip w/ surge protection mounted under shelf.

   a. Standard Electronic Work Bench & Instrument Shelf w/ riser electrical panels channel mounted under the shelf.

3. C&H Distributors – telephone 888-316-2223
   a. Edsal Electronic Tech w/electrified riser and shelf
2.6 SHELVING ASSEMBLIES

A. Metal Shelving: Provide 18 gauge steel shelves with hat-section stiffener. Provide 16 gauge bookend brackets. Rear of bracket shall be profiled to fit into slots of shelf support. Provide ¼ inch (6 mm) stainless steel retainer rods. Refer to detail on Laboratory Furnishings Drawings.

B. High-Pressure Decorative (Plastic) Laminate Shelving:

1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.
   
a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.
   b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Auburn, ME 04211 Tel: 800 746-6483.
   c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.
   d. Approved substitution (no known equal).

2. Approved Products:
   
   b. Pionite ChemGuard.
   c. Wilsonart ChemSurf

3. Color: To be selected by Architect.

4. Description:

   a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.

   b. Laminate shall be applied to top and bottom surfaces.

   c. Finish: Fine pebble-grained “crystal” texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.

      1). Gloss: 15-16 +/- 3 gloss units.

   d. Physical Properties:
2). Minimum Thickness: 0.038 inches ± 0.005 inches (0.97 mm ± 0.13 mm).
3). Cleanability: 10 cycles (NEMA LD3 test method 3.4).
4). Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).
7). Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).
9). Dimensional change:
10). Machine direction: 0.50% (NEMA LD3 test method 3.11).
11). Cross direction: 0.80% (NEMA LD3 test method 3.11).
12). Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).
14). Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
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<tr>
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<td>Good</td>
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<td>Failure</td>
</tr>
<tr>
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</tr>
<tr>
<td>Acids</td>
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<tr>
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<td>Aqua regia</td>
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<tr>
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<tr>
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<table>
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<td>General Reagents</td>
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<td>Monsel’s solution (Ferric subsulfate)</td>
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<td>Petroleum jelly</td>
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<td>General Reagents</td>
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<td>Sucrose 50%</td>
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<td>Tincture of Merthiolate</td>
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<td>Trisodium phosphate 30%</td>
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<td>Zephiran chloride</td>
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<td></td>
</tr>
<tr>
<td>Zinc chloride</td>
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<td></td>
</tr>
<tr>
<td>Zinc oxide ointment</td>
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<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Stains and Indicators</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag Eosin Bluish 5% in Alcohol</td>
<td>0</td>
</tr>
<tr>
<td>Bromothymol Blue</td>
<td>0</td>
</tr>
<tr>
<td>Cresol Red</td>
<td>0</td>
</tr>
<tr>
<td>Crystal Violet</td>
<td>0</td>
</tr>
<tr>
<td>Gentian Violet 1%</td>
<td>0</td>
</tr>
<tr>
<td>Gram Stains</td>
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</tr>
<tr>
<td>Malachite Green</td>
<td>0</td>
</tr>
<tr>
<td>Methyl Orange</td>
<td>0</td>
</tr>
<tr>
<td>Methyl Red</td>
<td>0</td>
</tr>
<tr>
<td>Methylene Blue</td>
<td>0</td>
</tr>
<tr>
<td>Nigrosine</td>
<td>0</td>
</tr>
<tr>
<td>Safranin O</td>
<td>0</td>
</tr>
<tr>
<td>Sudan III</td>
<td>0</td>
</tr>
<tr>
<td>Thymol Blue</td>
<td>0</td>
</tr>
<tr>
<td>Wright's Blood Stain</td>
<td>0</td>
</tr>
</tbody>
</table>

5. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18.3°C) at a pressure no less than 15 pounds per square inch. Laminate core is not to exceed 10% moisture content.
and is to be laminated and cured in a controlled environment between 45% and 60% RH.

6. Core material: Shop Sanded Exterior Grade Veneer Plywood with Hardwood Plywood Veneer Association K+ face veneers.

a. Thickness/Plies:
   1). 1 inch (25 mm): minimum 9-ply.

b. Physical Properties:
   1). Average modulus of rupture: 7346 psi (50.65 N/mm²).
   2). Face Screw Holding Strength: 355 lbf (1579 N).

7. Edging:

a. Unless otherwise indicated, all edges shall be edgebanded with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable. Color of edgebanding to be selected by the Architect.

b. Safety Edges:
   1). Types:
      a). Extended Height PVC Band: 2 inch high set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable.

   2). Refer to the description of each system below for locations of each type.

C. Reagent Shelves with Fixed Tubular Supports.

1. Shelving: High-Pressure Decorative Laminate shelving as specified above.

2. Shelf supports shall be Type 304 stainless steel tubing, ASTM A312, 1 inch (25 mm) outside diameter, 0.133 inch (3.4 mm) wall thickness, with ¼ inch (6 mm) thick welded steel threaded inserts as shown on drawings.

3. Fasteners shall be slotted, flat head, zinc screws with bolts as shown on drawings.
4. Electrical raceway supports shall be 1/4 inch (6 mm) diameter stainless steel "U" bolt, provide one at each shelf support as indicated on drawings.

5. Safety edging:
   a. Provide safety edging at all four edges of overall installation. Do not provide safety edging at intermediate butt joints.
   b. Extended height PVC band.

6. Load capacity: System shall support a minimum of 25 pounds per square foot. Maximum deflection shall be 0.35 inches (9mm) under load.

D. Reagent Shelves on adjustable shelf standards with a steel tube support system.

1. Shelving: Metal shelving as specified above.

2. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members with radiused edges. All members shall be welded together. Grind all welds smooth and polish to produce clean smooth appearance with no visual evidence of welds after paint is applied. All vertical members shall be one piece continuous from floor to underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide welded caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop, if indicated on the drawings, and to underside of structure above.

   a. Tube steel dimensions:
      1). 2 inches x 3 inches, 12 gauge (50 x 75 x 2.8 mm).

3. Shelf standards:
   a. Steel tubes shall be punched to receive adjustable shelf brackets. Pattern shall match Knape & Vogt 85 ANO series uprights, length in accordance with drawings.

4. Shelf Brackets: 16 gauge (1.6 mm thick) bookend type, as detailed on drawings.

5. Safety edging:
   a. Front Edge:
      1). Retainer rail.
   b. Rear edge:
1). Retainer rail.

6. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

7. Finish: Factory-finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color to be selected by the Architect.

E. Adjustable Wall Shelves:

1. Shelving: Metal shelving as specified above.

2. Double Slot Shelf Standards:
   a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

      1). Knape & Vogt Manufacturing Company, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 616 459-3311.
      2). Approved substitution.

   b. Basis of Design: Knape & Vogt 85 ANO series uprights, or equal. Length as indicated on the drawings.

3. Shelf Brackets: 16 gauge (1.6 mm) bookend type, as detailed on drawings.

4. Safety edging:
   a. Front Edge:
      1). Retainer rail.

5. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

6. Finish: Factory finish standards and brackets with epoxy powder coating. Color to be selected by the Architect.

F. Heavy Duty Wall Shelves:

1. Shelving: Metal shelving as specified above.

2. Heavy duty shelf standards: Slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

3. Heavy duty shelf brackets:
a. Shelf Brackets: Cold-formed steel, slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

4. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

5. Safety edging, provide at front edge of each shelf and at exposed ends:
   a. Retainer rail.

6. Load capacity: System shall support a minimum of 50 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

G. Stainless Steel Shelving System

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
   a. InterMetro Industries Corporation, 651 North Washington St., Wilkes-Barre, PA 18705 Tel: 800 992-1776. Manufacturer of Metro product range.
   b. Eagle Group, 100 Industrial Blvd., Clayton, DE 19938 Tel: 302 653-3000.
   d. Approved substitution.

2. Floor Mounted Stainless Steel Shelving Systems
   a. Basis of Design: Metro Super-Erecta stainless steel shelf system, floor mounted post supported, or equivalent.
   b. Posts: floor mounted stainless steel posts, grooved at 1 inch (25 mm) increments and numbered at 2 inch (50 mm) increments for shelf adjustment, length as shown on drawings, Metro PS series or equal.
   c. Shelves:
      1). Open Wire: stainless steel wire.
      2). Solid: 18 gauge, Type 304 flat stainless steel sheet with 1/8 inch raised edge and aluminum corner castings for post attachment.
   d. Provide diagonal bracing for lateral stability at freestanding applications.
e. Accessories:

1. Foot Plate: stainless steel with adjustable leveling bolt, Metro No. 9993S or equal.
2. Post Clamps: Zinc-plated, to join adjacent posts, Metro No. 9994Z or equal.
3. Shelf Ledges:
   a). 1 inch (25 mm) high stainless steel wire, Metro No. LxxN-1S or equal, sized to match shelf.
4. Casters: 5 Inch (127 mm) diameter, cart-washable, stainless steel swivel stem caster with brake and polyurethane wheel, Metro No. 5MPBGSA or equal.

H. Open Industrial Metal Shelf Units:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
   a. Lyon Metal Products, P. O. Box 671, Aurora, IL 60507 Tel: 800 323-0096.
   b. Penco Products, Inc., P. O. Box 378, 99 Brower Ave., Oaks, PA 19456 Tel: 800 562-1000.
   c. Hallowell, Division of List Industries Inc., 5711 Distribution Dr., Memphis, TN 38141 Tel: 901 375-0022.
   d. Approved substitution.

2. Type: Premium grade 18 gauge (1.0 mm thick) steel shelf units comprised of 5 shelves adjustable on 1 1/2 inch (38 mm), maximum, increments, and 85 inches (2159 mm) high 14 gauge (2.0 mm thick) angle post supports. Size in accordance with Laboratory Furnishings plans.
3. Provide side and rear cross bracing for lateral stability at freestanding applications.
4. Provide closed end panels where indicated.

2.7 CYLINDER AND DEWAR RESTRAINT ASSEMBLY

A. Cylinder and Dewar Chain Assembly:

1. Framing channel, Fittings, Swivel Hangers, and End Caps: Slotted channel framing as specified elsewhere on this Section. Provide two swivel hangers per cylinder or dewar per wall bracket.
2. Chain: Provide restrainers of 5/16 inch diameter, Type 304 stainless steel welded chain fitted with stainless steel snap shackle with swivel clevis and split ring for each bracket; McMaster-Carr Supply Company, Suncor Marine & Industrial, Inc., or approved substitution.

3. Cylinder racks and restraint components shall be factory-finished. Color to be selected by the Architect.

2.8 DRYING RACK

A. Epoxy Drying Rack:

1. Comply with requirements for molded epoxy resin specified under Laboratory Tops in this Section and as described herein.

2. Drying rack bodies shall be of one inch (25 mm) thick black epoxy with a 3/16 inch to ¼ inch (5 to 6 mm) radius on all edges and corners. Each rack shall be of the size and with the peg arrangement shown on the Laboratory Furnishing drawings.

3. Pegs shall be of injection molded white polypropylene. Pegs shall not be bonded into the body, but shall be held in position by mechanical design.

4. Provide a drip trough of Type 304 stainless steel with a 16 gauge (1.6 mm thick), Type 304 stainless steel screen of 14 x 14 (1.8 x 1.8 mm) mesh, .02 (0.05 mm) wire.

5. Provide stainless steel fixing screws of appropriate type for attachment to support structure.

6. Provide clear, tight-fitting hose to drain from drip tray into sink.

2.9 FINISH FOR MISCELLANEOUS WOOD ITEMS

A. Applicability: This section applies to wood fabrications, including, but not limited to, wood laboratory tables, wood-framed balance tables, wood-framed pegboards, and wood filler panels.

B. Finish:

1. Manufacturer may uses either of the following finish systems:

   a. Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs. Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

2. Stain Color:

   a. Stain color to match Architect’s sample.

LABORATORY CASEWORK AND OTHER FURNISHINGS 115310 - 51
3. Application:

a. Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

b. Preparation: Sand exposed surfaces smooth, free from dirt and defects.

c. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

d. Finish application: Apply top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

e. Stain Color:

1) Stain color to match Architect’s sample.

C. Finish Performance Requirements:

1. Chemical resistance: Contractor shall provide verification of wood finish performance. Testing to be performed by independent testing agency.

a. Procedure: Finished panels shall be oriented horizontally and vertically during exposure to the test chemicals. Chemical concentrations shall be adjusted by the volume method. Ambient temperature and chemical temperature shall be 68°F to 72°F (20°C to 22°C). At the end of the test period, the surface shall be washed with detergent and warm water. Areas exposed to solvents shall be cleaned with a cloth dampened with the respective solvent. Prior to the evaluation, 16 - 24 hours after the chemicals have been removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

1) Horizontal Test: Apply five (5) drops of the acid, base or salt substance to the correspondingly numbered areas of the surface to be tested. Position a 1 inch (25.4 mm) diameter watch glass in the liquid, convex side downward. Solvents shall be applied by saturating a 1 inch (25 mm) ball of cotton, then covering with an inverted 2 ounce (56.7 g) wide-mouth bottle. Test duration shall be one hour.

2) Vertical Test: The test surface shall be marked to indicate divisions; 12 inches (305 mm) high, ¼ inch (19 mm) wide, and numbered to identify the chemicals. Five (5) drops of each substance shall be applied to its respective numbered area in a vertical track pattern to prevent crossover. Test duration shall be two hours.
b. Evaluation ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect. No detectable change in the material surface.</td>
</tr>
<tr>
<td>1</td>
<td>Excellent. Slight detectable change in color or gloss but no change in function or life of the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Good. A clearly discernible change in color or gloss but no significant impairment of surface life or function.</td>
</tr>
<tr>
<td>3</td>
<td>Fair. Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
</tr>
<tr>
<td>4</td>
<td>Failure. Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

c. Minimum acceptable results of chemical resistance test:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Horizontal Test Rating</th>
<th>Vertical Test Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>75%</td>
<td>2</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>20%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>37%</td>
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</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>25%</td>
<td>2</td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>75%</td>
<td>1</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>50%</td>
<td>2</td>
</tr>
<tr>
<td>Glycerin</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Potassium Hydroxide</td>
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</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>35%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>40%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>Saturated</td>
<td>1</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>Saturated</td>
<td>1</td>
</tr>
<tr>
<td>Sodium</td>
<td>5.25%</td>
<td>1</td>
</tr>
<tr>
<td>Reagent</td>
<td>Horizontal Test Rating</td>
<td>Vertical Test Rating</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------</td>
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</tr>
<tr>
<td>Hypochlorite</td>
<td>Saturated</td>
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</tr>
<tr>
<td>Zinc Chloride</td>
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<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>50%</td>
<td>2</td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Kerosene</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Methyl Alcohol</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Methyl Ethyl Ketone</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Toluene</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Xylene</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

2.10 METAL FABRICATIONS

A. Applicability: This section applies to metal fabrications, including, but not limited to, pipe drop enclosures, shelves, shelving support systems, metal movable laboratory tables, cylinder racks, and other miscellaneous brake-formed and shop fabricated components and trim.

B. Materials:

1. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
   a. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
   b. All gauges indicated are to be U.S. standard.

C. Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.
   a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
   b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).

d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply 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 thicknesses:

   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 μm) film thickness with a minimum 1.2 mil (30 μm) film thickness and shall have smooth satin luster.

   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 μm) film thickness.

4. All drawer bodies to be finished in matching color.
5. Concealed interior parts shall receive corrosion-resistant treatment.
6. Finish must be UV stable.
7. Color: As selected by the Architect.

D. Chemical Spot Test Performance Requirements:

1. Chemical resistance: Contractor shall provide verification of metal finish performance. Testing to be performed by independent testing agency.

2. Test procedure: A clean, dry, test panel shall be laid flat and level on a horizontal surface. Ambient temperature of 70°F to 76°F (20°C to 22°C) and relative humidity of 45% to 55% shall be maintained for 48 hours. After a test period of one hour, chemicals shall be flushed away with cold water and the surface washed with warm water, detergent, and naphtha
and rinse with deionized water. Dry with towel and evaluate after 24 hours, maintaining ambient conditions. Test using one of the following methods:

a. Place a reagent-saturated cotton ball in the mouth of a one ounce (30 cc) bottle and inverting the bottle on the surface of the panel.
b. Chemical spot tests shall be made by applying 5 drops (approximately 0.5 mL) of reagent to the surface to be tested, covered with a 24 mm watchglass, convex side down.

3. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect, no detectable change in the material surface.</td>
</tr>
<tr>
<td>1</td>
<td>Excellent, slight detectable change in color or gloss but no change in function or life of the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Good, slight surface etching or severe staining.</td>
</tr>
<tr>
<td>3</td>
<td>Fair, objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
</tr>
<tr>
<td>4</td>
<td>Failure, pitting, cratering, swelling or erosion of the surface. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

4. Minimum acceptable results of chemical resistance test:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by wt.</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>98%</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Acid dichromate</td>
<td>5%</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Chromic acid</td>
<td>60%</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dichlor acetic acid</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
<td>0</td>
</tr>
<tr>
<td>Formic acid</td>
<td>90%</td>
<td>0</td>
</tr>
</tbody>
</table>
Furfural 0
Gasoline 0
Hydrochloric acid 37% 0
Hydrochloric acid 48% 1
Hydrogen peroxide 3% 0
Methyl alcohol 0
Methyl ethyl ketone 0
Methylene chloride 0
Mono chlorobenzene 0
Naphthalene 0
Nitric acid 20% 0
Nitric acid 30% 0
Nitric acid 70% 1
Phenol 90% 0
Phosphoric acid 85% 0
Silver nitrate, saturated 0
Sodium hydroxide 10% 0
Sodium hydroxide 20% 0
Sodium hydroxide 40% 0
Sodium hydroxide, flake 0
Sodium hydroxide, saturated 0
Sulfuric acid 33% 0
Sulfuric acid 77% 0
Sulfuric acid/Nitric acid, equal parts 77%/70% 1
Tincture of iodine 2
Toluene 0
Trichloroethylene 0
Xylene 0
Zinc chloride, saturated 0

E. Hot Water Test

1. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.

2. Acceptance Level: After cooling and wiping dry, the finish shall show no visible effect from the hot water.

F. Paint Adhesion on Steel Test

1. Test Procedure: Test shall be based on ASTM D2197-86 "Standard Method of Test for Adhesion of Organic Coating." Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into
the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.

2. Acceptance Level: Ninety or more of the squares shall show finish intact.

G. Impact Test

1. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.

2. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

H. Paint Hardness on Steel Test

1. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.


2.11 STAINLESS STEEL FABRICATIONS

A. Applicability: This section applies to stainless steel fabrications, including, but not limited to, work surfaces, stainless steel pipe drop enclosures, and other miscellaneous brake-formed and shop fabricated stainless steel components and trim as shown on the drawings.

B. Material: Unless otherwise noted stainless steel shall be Type 304 and shall be of gauge indicated on Laboratory Furnishing drawings or this specification.

C. Finish: All fabrications shall have exposed surfaces ground and polished to a Number 4 satin finish.

D. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a Number 4 finish.

E. All stainless steel welding material shall be of type similar to the sheet material or a richer quality. All welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with a Number 4 satin finish. All joints in stainless steel tops and work surfaces shall be welded.

F. Work Surfaces:

1. Thickness: 16 gauge (1.6 mm).

2. Fabrication:
a. Edges: Flanged down the same dimension as the adjacent non-stainless top, with 1 inch (25 mm) being a minimum and returned over a perimeter metal frame to simplify securing top material to cabinet or structural frame.

b. Reinforcement: Under-surface shall be reinforced with full length 16 gauge (1.6 mm) structural metal channels as required to insure rigidity and prevent buckling, warping, or oil canning. Where bench-mounted fittings are indicated on the drawings, provide top reinforcement to allow for rigid, secure mounting of fittings.

c. Undercoating: Underside of top shall have a heavy mastic agent coating providing sound deadening.

d. Stainless steel sides and back-splashes, where indicated, shall be integrally welded to top and finish as indicated above. The back side of exposed backsplashes shall be finished to match front and sides.

e. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges with no burrs.

3. Tops with Sinks: Tops and sinks shall be integral, fabricated with a marine edge and shall be pitched to sink bowl for proper drainage. Marine edges shall be seamless die-formed.

4. Flat Stainless Steel Work Surfaces: (Without marine edge or sink) shall have an integrally coved back splash and bull-nose at front of work surface.

G. Laboratory Sink: Integral one piece construction with stainless steel work surface.

1. Thickness: 18 gauge (1.3 mm thick), unless otherwise noted.
2. Construction: Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). Bottoms shall be pitched to the drain indent. No soldering will be permitted in connection with sink construction. Sink bowl dimensions given are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.

2.12 SLOTTED CHANNEL FRAMING

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
1. Unistrut, 35660 Clinton Street, Wayne, MI 48184 Tel: 800 521-7730.
3. Kumar Industries (Nu-Strut), 4881 Chino Ave., Chino, CA 91710 Tel: (909) 591-0722.
4. Cooper B-Line Inc. (B-Line), 509 West Monroe St., Highland, IL 62249 Tel: (618) 654-2184.
5. Approved substitution.

B. Materials: Channel and framing members shall be fabricated from steel conforming to the following requirements:

1. Framing Members:
   b. Exposed Framing Members and Fittings: ASTM A446 GR A with zinc coating conforming to ASTM A525.
   c. Stainless Steel Framing Members and Fittings: ASTM A240 (Type 304), where indicated.

2. Fittings:
   a. Concealed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307.
   b. Exposed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307. Exposed fittings shall receive zinc coating conforming to ASTM A525.
   c. Stainless Steel Fittings and Hardware: Sintered Nuts shall be of ASTM B783 (Type 316N2-33) stainless steel and fittings shall be of ASTM A240 (Type 304) stainless steel. Stainless steel fittings and hardware shall be used with stainless steel framing members, or where indicated.

3. Thickness: 12 gauge, unless noted otherwise.
4. Size: 1 5/8 inch x 1 5/8 inch cross-section, unless noted otherwise.

C. Components:

1. The following components shall be provided, unless otherwise noted:
b. Suspended Framing Channel, 3 ¼ inch x 1 5/8 inch x 12 gauge: Unistrut P5000, Powerstrut PS 100, Kumar Industries N-150, B-Line Systems, Inc. B11, or equal.
c. 90° Angle Fitting: 4 1/8 inch x 3 1/2 inch x 1/4 inch with two holes, each leg: Unistrut P1325, Powerstrut PS 607, Kumar Industries N-1123, B-Line Systems, Inc. B104, or equal.
d. 135° Angle Fitting: 3 inch x 2 5/16 inch x 1/4 inch with one hole, each leg: Unistrut P1546, Powerstrut PS 633-45°, Kumar Industries N-1425, B-Line Systems, Inc. B154, or equal.
e. T-Shaped Flat Plate Fitting: 5 3/8 inch x 3 1/2 inch x 1/4 inch plate, T-shaped, with four holes: Unistrut P1031, Powerstrut PS 714, Kumar Industries N-1022, B-Line Systems, Inc. B133, or equal.
f. Wing Shape Fitting, 9 5/32 inch x 3 7/8 inch ten holes, two holes in each wing section and two holes in each of three channel section sides: Unistrut P2347, Powerstrut PS 913, B-Line Systems, Inc. B273.
g. Vertical Posts: 3 1/4 inch x 1 5/8 inch x 12 gauge, double channel section: Unistrut P1001, Powerstrut PS 200 2T3, Kumar Industries N-200-A, B-Line Systems, Inc. B22A, or equal.
i. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S.
j. Slotted Framing Channel for installation in Chemical Fume Hoods, 1 5/8 inch x 13/16 inch x 16 gauge Type 316 stainless steel framing channel: Unistrut P4000 SS, Powerstrut PS 560 SS, Kumar Industries, B-Line Systems, Inc.

1). Attach channel to side of fume hood with 2 5/8 inch x 1 7/8 inch x 1/8 inch, 4 hole, stainless steel 90° fitting: Unistrut P6325 SS, Powerstrut, Kumar Industries, B-Line Systems, Inc.
l. Closure Strip: 0.04 inches thick snap-in cover for framing channel: Unistrut P3184, Powerstrut PS 6152, Kumar Industries N-1920, B-

m. End Caps: 0.06 inches thick for framing channel: Unistrut P1280, Powerstrut PS 707, Kumar Industries N-2500, B-Line Systems, Inc. B205, or equal. Provide end caps for all exposed horizontal framing channels.

n. Ceiling Scutcheon: Provide 18 gauge steel, finished to match framing members, as indicated on the Laboratory Furnishing drawings, at ceiling penetrations.

o. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

2. Service Struts and Ledging:

a. 16 gauge, 13/16 inch x 1 5/8 inch cold-formed framing uprights: Unistrut P4000, Powerstrut PS 560, Kumar Industries N-400, B-Line Systems, Inc. B56, or equal. Uprights shall be provided at 48 inches, maximum, and fastened top and bottom by two adjustable U-shaped spreaders.

b. U-shaped spreaders: 12 gauge by 1 1/2 inch (45 mm) wide by length required, galvanized steel.

c. Locations:

1). Provide to support tops at pipe service chase space, support drain troughs, under fume hood superstructures, and other abnormal loads.

2). Support struts with U-shaped spreaders shall be provided at 48 inches (1220 mm) on center below island and peninsula benches, as indicated on drawings. Support struts shall be provided along wall 48 inches (1220 mm) on center below island and peninsula benches. Struts will be used to support piped and electrical services installed under Divisions 15 and 16/Divisions 22, 26, and 27. Provide all bolts, expansion sleeves, and fastening devices for a complete assembly. Pipe and conduit hangers shall be provided by Division 15 and 16/Division 22, 26, and 27 installers.

3. Heavy Duty Wall Shelving:

a. Shelf Standards: Framing channel, spaced equally, 36 inches on center, maximum. Secure to wall. Provide all bolts and fastening devices for a complete assembly.

b. Brackets: Cold-formed framing channel brackets, as required for maximum cover of shelf depth:


4. Cylinder and Dewar Restraint:

a. Swivel Hanger: 1 ¾ inch long by 3/8 inch diameter link welded to threaded stud; provide two per cylinder: Unistrut M2350, Powerstrut PS205, Kumar N-2911, B-Line 446B.

5. Finish:

a. Provide finish coating for all cold-formed framing components, except for stainless steel components.

b. Concealed Framing Members and Fittings: Rust inhibiting acrylic enamel paint applied by electrostatic deposition, after cleaning and phosphating, and thoroughly baked. Finish shall withstand a minimum of 400 hours salt spray when tested in accordance with ASTM B117. Color: Green.

c. Exposed Framing Members and Fittings: Factory applied epoxy powder coat. Color: To be selected by the Architect.

2.13 SEALANT

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

1. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686 Tel: 989 496-7881.
2. General Electric Company, 260 Hudson River Rd., Waterford, NY 12188
   Tel: 800 255-8886.
3. Approved substitution.

B. Basis of Design Products:
   1. Dow Corning 786 Silicone Sealant
   2. GE Sanitary SCS1700 Silicone Sealant

C. Characteristics:
   1. Type: One-part acetoxy cure silicone rubber.
   2. Resistance: Mildew resistant.
   3. Curing: Cures at room temperature on exposure to water vapor in the air.
   4. Regulatory Compliance:
         Type S, Grade NS, Class 25.

   5. Properties:
      a. Tooling Time: 5-11 minutes.
      b. Tack Free Time: 45 minutes maximum per ASTM C679.
      c. Durometer Hardness: Meet one of the following per ASTM D2240:
         2). 30 by Type A Indentor test.
      d. Tensile Strength: 292 pounds per square inch minimum per ASTM
         D412.
      e. Peel Strength: 20-31 pli per ASTM C794.
      f. VOC Content: 33 grams per liter maximum.
      g. Color: Clear/translucent.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection:
   1. Prior to installation of the work of this Section, carefully inspect the
      installed work specified in other Sections and verify that all such work is
      complete to the point where this installation may properly commence.
   2. Verify that all work may be installed in complete accordance with the
      original design, reviewed submittals, and the manufacturer's
      recommendations.
B. Discrepancy: In the event of discrepancy, immediately notify the Architect.

3.2 INSTALLATION

A. Coordinate work with any Owner furnished and/or installed components indicated on drawings.

B. Installation shall comply with all applicable requirements of SEFA 2, unless otherwise specified in this section.

C. Shim cabinets as required using concealed shims for a plumb, level, true and straight installation.
   1. Shimming shall be minimized as much as possible, yet be sufficient to achieve a level and plumb condition.
   2. Shimming shall maintain the required height of countertops. ADA-height countertops shall not vary more than 1/4" from the heights off the finish floor as indicated.
   3. Where floor conditions require shimming of more than 3/4" at any point, do not install casework in those locations. Notify the contractor and design team that remedial measures will be required to bring the floors closer to a level situation.

D. Installation materials:
   1. Installation of wood casework may involve the use of shims, spacers, cleats, straps and other such items of either metal or wood composition.
   2. Installation of metal casework shall use shims, spacers, cleats, and straps of galvanized steel, epoxy-coated steel, or stainless steel. No wood materials of any sort shall be part of the permanent installation of metal casework.
   3. Installation of stainless-steel casework, counters, and scullery sinks shall use shims, spacers, cleats, and straps of stainless steel of the type specified for the casework construction. No wood materials of any sort shall be part of the permanent installation of stainless steel casework.

E. Scribe tops as necessary for close and accurate fit.

F. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining units to a tolerance of 1/16 inch (1.5 mm).

G. Wall Units: Securely fasten to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets. Verify that all required backing and reinforcement necessary to support wall-mounted units is in place, secure, and accurately located.
H. Laboratory Tops:

1. Field Joints: Factory-prepared and identical to factory joints, locate only where indicated on approved Shop Drawings. Field processing of top and edge surfaces is not acceptable, except as described by manufacturer in approved Submittal Data. Provide full length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

2. Abut top and edge surface in one true plane, with internal supports placed to prevent any deflection. Joints in top units shall be flush and the narrowest for the respective materials of construction. Cement joint in accordance with the manufacturers’ specifications.

I. Sealant:

1. Do not install sealant until painting of adjacent and surrounding surfaces is complete.

2. Follow manufacturer’s installation instructions and standards. Thoroughly clean all surfaces prior to application. Prime any surfaces as applicable as recommended or required by manufacturer’s installation instructions.

3. At all laboratory spaces, unless indicated otherwise, caulk edges of fixed tops, backsplashes and side splashes to adjacent fixed surfaces with silicone sealant.

4. Sealant to remain unpainted.

3.3 DESTRUCTIVE TESTING

A. The Owner, Architect, and/or Contractor may, at their own cost, elect to perform destructive testing on casework cabinet components (such as fronts, sides, etc.) to confirm compliance with the requirements of this specification. The casework manufacturer/installer should account for the de-installation, repair, and reinstallation, or replacement of one cabinet that may be selected for destructive testing.

3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect at no additional cost to the Owner.

B. Clean finished units, touch up as required, and remove and refinish damaged or soiled areas.

C. Cover tops with kraft paper or polyethylene sheeting after installation for protection against scratching, soiling, and deterioration during remainder of construction period. Remove protection prior to final cleaning.
D. Clean counter tops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

END OF SECTION 115310
SECTION 115313 – FUME HOODS AND OTHER AIR CONTAINMENT UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Chemical Fume Hoods, bench mounted

A. Fume Extractor Arms (Snorkels)

1.2 RELATED SECTIONS

A. Section 115310: Laboratory Casework and Other Furnishings

B. Section 115343: Laboratory Service Fittings and Fixtures

C. Division 22: Plumbing

D. Division 23: HVAC

E. Division 26: Electrical

1.3 REFERENCES

A. Chemical fume hoods:

2. Conform to the recommended practices for laboratory fume hoods published by the Scientific Equipment and Furniture Association (SEFA) 1-2002.

1.4 DESCRIPTION

A. Provide equipment complete with accessories as described herein and shown on Laboratory Furnishings drawings.

B. Chemical fume hoods:

1. Fume hoods with accessories shall be pre-piped and pre-wired. Pre-pipe service fittings to single point connection at 6 inches (150 mm) above top of hood or as otherwise shown.

   a. Refer to Section 11 53 43 and details on Laboratory Furnishings drawings for service fittings.
   b. P-trap, waste piping and tailpiece extensions for cupsinks shall be furnished and installed by Division 22. Comply with Division 22
requirements for piping and installation requirements for respective pre-piped services, except that, in any case, piping for natural gas shall be standard weight wrought black iron.

c. Pre-wire all electrical devices to junction box at top of hood. Comply with Division 26 requirements for electrical work.

1.5 SUBMITTALS

A. Refer to the General Conditions and Division 1 "Submittal Procedures" for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable options, items and components shall be deleted or struck.

C. Materials List/Product Data: Submit complete materials list, including catalog data of all materials, equipment, and products for Work specified in this Section. Include chemical resistance finish performance test results for any products specified in this section.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches x 17 inches (A3) in size. Blueline prints are not acceptable.

E. Submit detailed anchorage and attachment detail drawings for seismic restraint.

F. Samples: Submit two (2) samples of each type of specified finish and color range available.

G. Test Reports: Submit the following performance test reports.
1. "As Manufactured" (AM) Fume Hood Testing in Manufacturing Facility: Provide certification that each type and size of fume hood has achieved an AM performance rating equal or better than 0.05 ppm with 4.0 Lpm tracer gas release rate when tested in accordance with ASHRAE 110-1995.

2. Fume Hood Certification: Submit "As Installed" (AI) test report as described elsewhere in this section.

3. Fume Hood Sound Level Certification: Provide certification of fume hood compliance with design criteria for maximum allowable noise within laboratories.
   a. For fume hoods operating with a face velocity of 100 fpm, test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Measurements shall be taken 36 inches (915 mm) in front of open sash at 100 fpm (0.51 m/s) face velocity.

H. Operations/Maintenance Manuals: Submit under provisions of Division 1. Submit for Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, component parts list, and closest factory representative for components and service.

1.6 QUALIFICATIONS

A. Work in this Section shall be performed by a firm having a minimum eight years documented experience, and an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment required with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.7 COORDINATION

A. Work of this Section requires close coordination with Work of Divisions 22, 23 and 26 as well as installation of Owner furnished components and Work specified in other Sections. Sequence all Work to ensure an orderly progress in the project without removal of previously installed Work and so as to prevent damage to finishes and products.

B. Coordinate, furnish, and install chemical fume hoods designed for variable air volume (VAV) or constant air volume (CAV) operation as indicated in the mechanical drawings. The designed exhaust airflow control method (VAV or
CAV) shall be confirmed and coordinated prior to submission and shall be clearly indicated in the submittal product documentation.

1.8 SUBSTITUTIONS

A. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as "Comply" or "Not Comply." In any cases where "Not Comply" is indicated, an explanation of the relative advantages of the proposed design shall be provided.

B. Substitution shall not affect dimensions shown on Drawings.

C. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.

D. Substitutions shall have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

E. Maintenance and service parts shall be locally available for the proposed substitution.

1.9 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved.

PART 2 - PRODUCTS

2.1 ACCESSIBILITY FOR PERSONS WITH DISABILITIES

A. Where indicated on Laboratory Furnishings drawings, fume hoods shall be furnished and installed in a manner to make them accessible to persons with disabilities in accordance with the Americans with Disabilities Act and any state or local building code or regulation having jurisdiction. The height of the highest point of access to the work surface above finished floor shall not exceed 34 inches. Fittings for piped services and electrical receptacles shall be of a design and in a location in order to be considered accessible.
2.2 CHEMICAL FUME HOODS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

1. Advanced Lab Concepts, 15900 Bratton Lane, Austin, TX 78728 Tel: 800 711-5227.
2. Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, NY 14701 Tel: 716 665-5313.
4. Labconco Corporation, 8811 Prospect Avenue, Kansas City, MO 64132 Tel: 800 821-5525.
5. Mott Manufacturing Limited, 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
6. Thermo Fisher Scientific, 1316 18th Street, Two Rivers, WI 54241 Tel: 920 793-1121.
7. Approved substitution.

B. Underwriters Laboratory Listing: Fume hoods shall be UL subject 1805 classified. Label shall be attached to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods.

C. Materials: The following materials shall be provided, unless superseded by the requirements listed below for specific fume hood types.

1. Steel:
   a. ASTM A366 mild steel, furniture stock, cold-rolled, pickled, double annealed, and free from rust, scale, scratches, buckles, ragged edges, and other defects.
   b. Minimum Thickness: 18 gauge (1.2 mm).

2. Stainless Steel:
   a. Type 304, ASTM 240, with exposed surfaces ground and polished to a No. 4 finish.
   b. Minimum Thickness: 16 gauge (1.6 mm).
   c. Welding: All stainless steel welding material shall be of similar type to sheet material. Welds shall be made without discoloration, ground, polished, and passivated to blend with a No. 4 finish.

3. Liner and Baffle:
a. Typical: Glass-reinforced polyester panel, flame-retardant and self-extinguishing with smooth finish and white color. Flexural strength: 14,000 psi. Flame spread: 15 or less per U.L. 723 and ASTM E84-80. Baffle shall be same material as liner. Liner thickness: 3/16 inch (4.76 mm); baffle thickness: ¼ inch (6.35 mm), minimum. Liner performance characteristics shall be as specified below.

4. Glass: 7/32 inch (5.56 mm) laminated safety glass. Glass shall not be etched with manufacturer’s name, logo, or any other permanent markings, other than to identify the glass as safety glass. Light fixture lens may be tempered safety glass.

5. Sash guides: Extruded PVC.


7. Pulley assembly for sash chain: Finish bored steel drive sprockets and keyed drive, 1/2-inch (12.7 mm) diameter front connector shaft. Rear idler sprockets; double sealed ball bearings type, lubricated. All sprockets steel with zinc dichromate finish.

8. Sash belt: Two 1/2 inch wide stainless steel-reinforced polyurethane notched belts. Minimum tension cord strength of 840 N.

9. Pulley assembly for sash belt: Cast aluminum sprocket mated to a steel shaft.

10. Sash pull: Full width of sash.

   a. Material: Steel with chemical resistant powder coating.

11. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

12. Fasteners:

   a. Exterior structural member attachments: Sheet metal screws, zinc plated.

   b. Interior fastening devices shall be concealed; exposed screws are not acceptable. (Screw head "caps" not acceptable).

   c. Exterior fastening devices shall be exposed corrosion-resistant, non-metallic material; exposed screws are not acceptable.

D. Construction:

1. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4 7/8 inch (124 mm) thick. Wall shall consist of a sheet steel outer shell and a corrosion resistant inner liner, and shall house and conceal steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels shall be attached to a full frame construction, minimum 14 gauge (2.0 mm)
galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.

2. Access Panel: Access to fixture valves and piping concealed in wall shall be through flush access panels on the inside liner walls, or through removable front posts. Panels shall be secured with PVC extruded gasket or tamperproof, epoxy coated, countersunk, flat head screws providing a tight fit. Hook and loop type attachments and panels held by gravity are not acceptable.

3. Downdraft bypass: Low resistant type, 18 gauge (1.27 mm) steel chamber; directional louvers are not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

4. Baffles: Baffles shall be fixed and non-adjustable.

5. Ceiling Closure Panels: Panel shall include simple-to-operate means of access to the hood lighting fixture. Finish shall match superstructure exterior. Closure panel shall conceal view of the sash when the sash is in the open position. Provide sash pocket if required to allow correct operation of the bypass.

   a. Acoustical Ceiling Tile Conditions: Provide 18 gauge steel paneled enclosure from top of hood to 2 inches above the ceiling.

6. Bypass Grill: Low-resistant type 18 gauge steel with upward directional louvers.

7. Trim and Side Panels: Provide matching steel trim and side panels, as required, to finish any openings around and between hoods. Finish shall match superstructure exterior.

8. Finished Back: Provide for any fume hood where back of hood is exposed to view. 18 gauge steel sheet. Finish shall match superstructure exterior.


   a. Each back-to-back fume hood shall be provided with separate exhaust connections and collars.

10. Exhaust Duct Transition Piece: Furnished by the fume hood manufacturer for installation by the mechanical contractor. Provide contoured (minimum 20 gauge) Type 316 stainless steel exhaust collar, including transition piece, to connect to the fume hood exhaust duct system as shown on the Mechanical Drawings.

   a. For Multiple exhaust collar fume hood design, manufacturer shall provide exhaust duct manifold transition piece to combine fume
hood exhaust outlets into a single connection to the fume hood exhaust duct system as shown on the mechanical drawing.

11. Cup Sink:
   a. Oval with raised rim, material and color to match work surface, sizes in accordance with drawings. Comply with Section 115343 /11604 requirements.
   b. Raised Rim Height: ¼ inch (6.35 mm).

12. Piping shall be as specified in Division 22 for respective system.

13. Service Fittings: As shown on Laboratory Furnishings Drawings and specified in Section 11 53 43, factory-installed and complete with all gaskets, grommets and sleeves. No additional holes in fume hood side posts shall be provided for services beyond those required by the construction documents.

14. (TO BE CONFIRMED) Alarm (for VFD hoods): Coordinate cut out for fume hood alarm to be provided under Division 23. All cut outs for alarm shall be made in the factory; field cutting is not acceptable.

15. (TO BE CONFIRMED) Alarm (for CAV hoods): Continuously operating, field calibratable and programmable, airflow monitoring device mounted at front of fume hood shall provide audible and visual alarm and FPM readout with digital display. Provide for remote alarm connections. TEL model AFA1000, or equal. Provide receptacle for alarm.

16. Electrical:
   a. Pre-Wiring: All fume hood electrical devices shall be factory-installed and wired to a junction box located on top of the hood. Comply with Division 26 requirements for electrical work.
      1). Fume hood receptacles shall be wired such that no more than two duplex outlets and the hood lighting are wired through a single circuit.
   b. Receptacles: Flush mounted, 125V / 20A / 60Hz duplex type, single gang, NEMA 5-20R, 3-wire, grounding type receptacle, one or two per side, or as indicated on the Laboratory Furnishings Drawings, with brushed stainless steel cover plate. Each side of the fume hood shall have a GFCI receptacle with feed-through protection of any downstream receptacles.

17. Interior Hood Lighting:
   a. Lighting within hood shall be provided by a protected vapor-proof fluorescent lighting fixture with two lamps (32W T8, electronic ballast, rapid start) operated by an exterior switch with stainless
steel cover plate. Lamp size shall not exceed 48 inches; provide multiple fixtures as required.

b. Provide safety glass panel cemented and sealed to the hood roof.

c. Light level: Average light level on the work surface shall be 80 footcandles (860 lux), minimum.

18. Safety label: Provide self-adhesive polyester label, as described on the drawings. Labels shall indicate safe operating conditions with respect to fume hood sash position. Labels solely indicating 100 fps face velocity sash position are not acceptable. Manufacturer: Lab Safety Supply Inc., P. O. Box 1368, Janesville, WI 53547 Tel: 800 356-0783, or approved substitution.

19. Hood Finish: As specified elsewhere in this Section.

20. Exterior Color: As selected by Architect from manufacturer’s full color line and complying with finish requirements.

21. Pass-through: Provide 3 inch I.D. pass-through in fume hood sidewall where indicated on the Laboratory Furnishing drawings. Pass-through shall be flanged and sealed on the interior of the fume hood, with a threaded end and cap on the exterior.

E. Bench Mounted Chemical Fume Hoods:

1. Style: General purpose.

   a. Subject to compliance with the requirements listed below, acceptable models include:

      1). G3 Fume Hood by Advanced Lab Concepts.
      2). Isolator Bench Fume Hood by Jamestown Metal Products, Inc.
      4). Protector XL Benchtop Laboratory Hood by Labconco Corporation.
      5). Pro Restricted Bypass Bench Fume Hood by Mott Manufacturing Limited.

2. Exterior Depth: 31 ¼ inches (794 mm), nominal. Interior depth: Minimum 23 ½ inches (597 mm) clearance.

3. Design:

   a. Restricted bypass fume hoods for variable air volume or constant volume exhaust systems with airfoil. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved
through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth downflow effect.
b. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.

1). Fume hoods shall be designed to operate safely at face velocities of 100 feet per minute (0.51 m/s) to 125 feet per minute (0.64 m/s).

4. Work Surface: 1 ¼ inch (32 mm) dished epoxy resin, in compliance with Section 115310/11602 requirements. Color: Black.

5. Airfoil: The airfoil shall allow ample room for electrical hospital grade cords to fit beneath the airfoil. Sill must pivot forward to provide cord and trough access. Bottom horizontal foil shall provide nominal 1 inch (25.4 mm) bypass when sash is in the closed position. Bottom foil shall not be removable without use of special tools. Airfoil shall be steel with urethane or epoxy powder coating.

a. Sill shall consist of a half-round bullnose on front edge. Airfoil and sill to be flush with the height of the work surface; airfoil sills that are not flush with the top plane of the work surface dish are not acceptable. A secondary containment trough shall be located in front of the work surface and extend below the airfoil sill.

6. Fume hood sash (Combination horizontal/vertical): Provide vertical and horizontal sash access with a 35 inch (890 mm), nominal, high sight line. Sash shall be top hung on nylon tired stainless steel ball bearing wheels. Sash frame on bottom and sides must be no more than 1 ½ inch (38 mm) thick and radiused to minimize turbulence. Area above the 28 ½ inch (724 mm), nominal, vertical sash opening shall be glazed with a minimum of 3/8 inch (9.53 mm) thick laminated safety glass. All glass to have polished exposed edge treatment. Horizontal panels provided with finger pulls.

a. Counter balance system: Single weight, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Maximum 7 pounds (3 kg) pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure.

b. Sash shall have the capability to be raised to full 28 ½ inch (724 mm), nominal, vertical opening for loading or unloading of large apparatus.
c. Sash Stop: To allow manual override with automatic reset for an 18 inch (457 mm) sash opening. Either of the following devices are acceptable:
   1). Corrosion-resistant, spring-loaded lever handle integrated with sash track and fume hood side post.
   2). Stainless steel spring-loaded barrel-bolt integrated with sash pull and provided with angled stainless steel strike plate.

F. Finish Requirements

1. Preparation:
   a. After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality.
   b. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

2. Application: Electrostatically apply 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 thicknesses:
   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.
   c. Concealed interior parts shall receive corrosion-resistant treatment.
   d. Stainless steel parts and surfaces shall not be powder coated.

3. Chemical Resistance Finish Performance Requirements:
a. Test Procedure: Apply 10 drops (approximately 0.5 cubic centimeters) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68°F to 72°F (20°C to 22°C). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150°F (65.5°C) and with alcohol to remove surface stains. Examine surface under 100 foot-candles (1076 lx) of illumination.

b. Evaluation Ratings: Change in surface finish and function shall be described by the following ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect No detectable change in the material surface.</td>
</tr>
<tr>
<td>1</td>
<td>Excellent Slight detectable change in color or gloss but no change in function or life of the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Good A clearly discernable change in color or gloss but no significant impairment of surface life or function.</td>
</tr>
<tr>
<td>3</td>
<td>Fair Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
</tr>
<tr>
<td>4</td>
<td>Failure Pitting, cratering, or erosion of the surface. Damage to film and loss of adhesion and film protection. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

4. Performance requirements: Test results for powder coat finish shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by weight</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Acetic acid, glacial</td>
<td>98%</td>
<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>50%</td>
<td>2</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cresol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Dioxane</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reagent</td>
<td>% by weight</td>
<td>Rating</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Furfural</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Glycerin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>20%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>37%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>48%</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Kerosene</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Monochlorobenzene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Naphthalene (dissolved in Toluene)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Nitric acid</td>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Phenol</td>
<td>85%</td>
<td>2</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>75%</td>
<td>1</td>
</tr>
<tr>
<td>Potassium hydroxide</td>
<td>45%</td>
<td>1</td>
</tr>
<tr>
<td>Silver nitrate (10% aqueous solution)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sodium carbonate, saturated</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sodium chloride, saturated</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>40%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td>5.25%</td>
<td>1</td>
</tr>
<tr>
<td>Sodium sulfide, saturated</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>70%</td>
<td>1</td>
</tr>
<tr>
<td>Tincture of Iodine</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Xylene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Zinc chloride, saturated</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: Maximum concentration is to be understood unless a lower concentration is shown in the table.

a. Physical Tests:
1. Abrasion: Finish shall have high abrasion resistance with maximum weight loss of 5.5 mg per 100 cycles as tested on a Taber Abrasion Tester No. E40101 with 1000 gm wheel pressure and Calibrase No. CS10 wheel.

2. Hardness: Finish shall have surface hardness equivalent to 4H or 5H pencil lead.

3. Humidity: Finish shall withstand 1000 hours exposure in saturated atmosphere at 100°F (38°C).

4. Moisture: Finish shall withstand the following procedures with no visible effect:
   a. Boiling water flowing over 45° inclined surface for 5 minutes.
   b. 100 hours continuous contact with water-soaked cellulose sponge, maintained in a wet condition throughout test.

5. Adhesion: Finish shall withstand the following test procedure with at least 95 squares maintaining their finish. Using a razor blade, score the finish surface of the test panel through to the substrate with a pattern of 100 squares, each 1/16 inch x 1/16 inch. Brush away loose particles with a soft brush.


G. Fume Hood Liner Test: Polyresin

1. Test No. 1: Spills and Splashes:
   a. Suspend a 42 inches (1067 mm) x 12 inches (305 mm) panel (42 inch (1067 mm) dimension horizontal) in a position to expose the surface to be tested in a vertical plane. Divide the panel vertically into 3/4 inch (19 mm) spaces.
   b. Using an eyedropper, apply five drops of each reagent as listed.
   c. Liquid reagents shall be applied at the top of the panel and permitted to flow down full panel height. (CAUTION! Flush away any reagent drops.)

2. Test No. 2: Fumes and Gases:
   a. Prepare a panel 24 inches (610 mm) x 12 inches (305 mm) by dividing panel into 2 inch (51 mm) squares. Using 100 ml beakers, place 25 ml (approximately 1/2 inch (13 mm) of reagent) into each beaker. Place beakers in position so that test panel may be placed over beaker tops in the proper sequence. Place panel over
beakers. Note: Beaker pouring lip permits atmospheric oxygen to enter and participate in the reaction of the reagent fumes.

b. After a 24 hour time period has elapsed, remove panel, flush off with water, clean with naphtha and detergent, rinse and wipe dry. Evaluate.

3. Evaluating Ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Failure</td>
</tr>
</tbody>
</table>

No detectable change in the material surface.
Slight detectable change in color or gloss but no change in function or life of the surface.
A clearly discernable change in color or gloss but no significant impairment of surface life or function.
Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.
Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

4. Performance: Test results shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by wt.</th>
<th>Spills</th>
<th>Fumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid, glacial</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acid dichromate</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chromic acid, saturated</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dichloro acetic acid</td>
<td>93%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>88%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Furfural</td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reagent</td>
<td>% by wt.</td>
<td>Spills</td>
<td>Fumes</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>48%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>37%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Monochlorobenzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>20%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>30%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>70%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>85%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>85%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Silver Nitrate</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>20%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide Flake</td>
<td>40%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Sulfide, saturated</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>33%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>77%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>93%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid/Nitric acid, equal parts</td>
<td>77%/70%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Tincture of Iodine</td>
<td></td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Xylene</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Zinc Chloride</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Maximum concentration is to be understood unless a lower concentration is shown in the table.

2.3 FUME EXTRACTOR ARMS (SNORKELS)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.


2. Alsident System represented by Laboratory Enterprises, 3122 Brinkerhoff Road, Kansas City, KS 66115 Tel: 913 621-7337.


FUMA HOODS AND OTHER AIR CONTAINMENT UNITS 115313 - 16
4. Approved substitution.

B. Models: Subject to compliance with the requirements listed below, acceptable models include:

1. Terfu by Movex Inc.
2. System 75 by Alsident System.
3. FX Extractor Arms by Nederman Inc.

C. Type: Ceiling mounted, self-supporting fume extractor arm.

D. Characteristics:

1. Extractor Arm Diameter:
   a. 3 inch diameter tubes.

2. Extractor Arm Material:
   a. Anodized aluminum.

3. Arm Length: Arms shall be of sufficient length to cover an 18 inch radius area at 42 inches above the finished floor.
   a. Assembly shall be positioned so that no adjustable component is higher than 84 inches above the finished floor in operating position and, when fully retracted vertically no component is lower than 84 inches above finished floor.

4. Swivel Assembly: Hi-grade cast aluminum with 360 degree rotation.
   a. Provide external, corrosion-resistant adjustment knobs.

7. Ceiling mounted stanchion/bracket for attachment to structure above.
8. Escutcheon suitable to trim any ceiling penetrations.
9. Final connection to the fume exhaust duct system under Division 23. Provide airflow per Equipment Exhaust Schedule.
10. Dampers are not acceptable and shall not be provided.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Prior to installation of the Work of this Section, carefully inspect the installed Work specified in other sections and verify that all such Work is complete to the point where this installation may properly commence.

B. Verify that all Work has been installed in complete accordance with the original design, received submittals, and the manufacturer's recommendations.
C. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

A. Work in this Section requires close coordination with Work specified in Division 22, 23 and Division 26, as well as installation by Owner of Owner furnished components. Coordinate all Work to ensure an orderly process in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

B. Coordinate location and alignment of fume hoods and cabinets for proper connection of all piping and duct work.

C. Install all equipment in accordance with applicable codes and regulations, accepted Shop Drawings, and as necessary for a complete operating system.

3.3 FIELD TESTING

A. Chemical Fume Hoods:


2. Fume hood field tests shall be performed by a qualified independent testing company on each hood to determine face velocity and air flow patterns.

3. Fume hoods shall achieve an AI performance rating equal or better than 0.10 ppm with 4.0 Lpm tracer gas release rate when tested in accordance with ASHRAE 110-1995.

4. Balancing of the system is in the scope of work of Division 23.

3.4 CLEANING AND PROTECTION

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

B. Adjust all moving or operating part to function within their design parameters.

C. Clean equipment, touch up as required.

D. Protect all units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

END OF SECTION 115313

FUME HOODS AND OTHER AIR CONTAINMENT UNITS 115313 - 18
SECTION 115343 – LABORATORY SERVICE FITTINGS AND FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Laboratory service fittings, valves, and related components.
B. Laboratory emergency plumbing fixtures.
C. Laboratory sink units.

1.2 RELATED SECTIONS

A. Division 22: Plumbing
B. Division 23: Heating, Ventilated, and Air-Conditioning
C. Section 222000: Laboratory Plumbing
D. Division 26: Electrical

1.3 REFERENCES


1.4 DESCRIPTION

A. Work includes but is not necessarily limited to furnishing to the project site for installation by Division 22, all laboratory fixtures, fittings, and emergency plumbing fixtures described herein and shown on the Laboratory Furnishings Drawings.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.
2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for Work in this Section.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches x 17 inches (A3) in size. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

1. Substitution shall not affect dimensions shown on Drawings.

2. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.

3. Substitutions shall have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

4. Maintenance and service parts shall be locally available for the proposed substitution.

F. Samples: Submit two (2) samples of each type of specified finish and color specified.

G. Certifications: As a condition of acceptance, submit certification stating that equipment is complete and ready for intended function.

H. Operations/Maintenance Manuals: Accompanying certification, submit for Architect’s review and Owner’s use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and
replacement schedules, components parts list, and closest factory representative for components and service.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 QUALIFICATIONS

A. Work in this section shall be performed by a company having a minimum of eight years documented experience, and an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment required, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

B. Work in this Section requires close coordination with Work in electrical and mechanical Sections. Coordinate all Work to assure an orderly progress in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

C. Review conditions of installation, procedures and coordination with related Work.

D. Carefully inspect the installed Work specified in other Sections and verify that all such Work is complete and ready for the installation of this Work to properly commence.

E. Verify that all Work may be installed in complete accordance with the original design, reviewed submittals and manufacturer’s recommendations.

1.8 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any
parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the College’s academic schedule and may therefore require evening and/or weekend hours.

PART 2 - PRODUCTS

2.1 GENERAL

A. All service fittings and emergency plumbing fixtures shall be specifically designed for laboratory use.

B. Service fittings, emergency fixtures, sinks, etc. specified in this Section shall be furnished and delivered to point of use for installation as specified in Division 22.

C. All service fittings shall be factory pre-assembled including the assembly of valves to turrets, mounting shanks to turrets, etc., and individually factory tested.

D. All laboratory service fittings shall be the product of one service fitting manufacturer to assure ease of replacement and maintenance.

E. All service valves, fittings, and accessories shall be of cast brass with a minimum copper content of 85%, except for items which are to be brass forging or bar stock.

F. Provide fittings as shown in laboratory fitting details for all laboratory equipment at locations shown on the Laboratory Furnishings drawings. See Service Fitting Schedule.

G. Assembly components and operating parts such as valve stems, renewable units, packing nuts, outlet nozzles and straight serrated hose ends shall be made from solid brass stock.

H. Replaceable seats, needle cones, valve disc screws and other accessories shall be Monel or stainless steel alloys especially selected for use intended.

I. Fittings shall be factory tested and shall be supplied with nipples, lock nuts, shanks, etc.

J. Serrated tip fittings shall have 3/8 inch. ((9.525 mm)) IPS thread with the hose end being tapered. Diameter of orifice in serrated tip shall be 1/8 inch (3.2 mm), except where otherwise specified.

K. Turrets shall be brass drop forging of design indicated in details shown elsewhere in the Section and shall be one or two-way, as required, with 3/8
inch ((9.525 mm)) IPS female inlet thread for connections. Units shall be furnished with brass shanks, brass locknuts, and washers.

L. Fittings located on the same plane shall have their handles project the same distance from the plane of reference to present a uniform related appearance, regardless of valve type construction.

M. Flanges shall be brass forging of approved design with 3/8 inch ((9.525 mm)) IPS female inlet and outlet.

N. All goosenecks shall provide full thread for attachment of anti-splash outlet fittings, serrated tips (at cup sink locations only), and filter pumps.

O. Hot water/cold water gooseneck mixers and wall-mounted cold water goosenecks shall swivel. Swivel point shall be above valve body or at valve level if wall mounted. Swing joints shall have heavy Teflon type packings; "O" rings will not be permitted. Cold water goosenecks at cup sinks shall be rigid.

P. All fittings shall have plastic colored service index buttons as specified in this Section.

Q. Provide durable 1 inch x 3 inch (25 x 75 mm) sign "NONPOTABLE WATER, DO NOT DRINK" at each bench mounted industrial water fitting, see details on Laboratory Furnishings drawings.

R. Provide plug and socket (2-piece) quick connect service fittings for all compressed air (AIR60-100) fittings.

S. Fittings and fixtures designated to be accessible to persons with disabilities (ADA) with operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N), maximum.

2.2 LABORATORY SERVICE FITTINGS

A. Manufacturers:

1. Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

   a. Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: (312) 666-5500.

   b. T&S Brass and Bronze Works, Inc., 2 Saddleback Cove, P. O. Box 1088, Travelers Rest, SC 29690 Tel: (800) 476-4103.
c. Broen represented by Laboratory Enterprises, 3122 Brinkerhoff Rd. Kansas City, KS 66115 Tel: (913) 621-7337.

d. Approved substitution.

B. Pattern: All service fittings shall have cylindrical profiles.

C. Handles:

1. Faucets designated to be accessible to persons with disabilities (ADA): provide 4" "wrist-blade" handles with screw on index (identification) discs. Wrist-blade handles to be installed in the vertical position (off).

2. Laboratory gas, nitrogen, air and vacuum valves at workstations indicated to be accessible to persons with disabilities (ADA): Provide ball valves fitted with lever-type handles and screw on index (identification) discs.

3. Other fittings shall be fitted with color-coded hooded type handles and screw-on index discs.

a. For laboratory gas at non-accessible workstations provide push/turn gas valve assembly, powder coated metal hooded handle with pop-up indicator and screw-on index discs.

D. Finish: Polished chrome, with clear, acid-resistant coating.

E. Water Valves:

1. Water valves shall include a renewable unit containing all the working parts which are subject to wear, including stainless steel or monel seat, monel screw and heavy duty seat disk and Teflon packing.

2. Volume control at deck mounted water faucets:

a. Compression unit with integral adjustable volume control to regulate size of inlet port of valve.

3. Volume control at fume hood water outlets: Serrated hose end shall have a 0.5 GPM removable flow restrictor insert to allow a perfect flow out of the outlet and eliminate any splashing or wide pattern spray.

4. Unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing faucet body proper and shall also be capable of being readily converted from water construction to needle valve or steam valve construction having outside packing gland without disturbing faucet body.

5. Unit shall be sealed in valve body with special composition gasket. Metal-to-metal or ground joint type of sealing is not acceptable.

6. Water fixtures shall be fully assembled and factory tested at 80 psi (0.55 MPa) water pressure.
F. Needle Valves: Fully assembled and factory tested at 225 psi (1.55 MPa) air pressure. Gas, nitrogen, air, vacuum and steam needle valve fittings shall have stainless steel replaceable floating cone that is precision ground and self-centering which shall seat against a stainless steel or monel renewable valve seat. Action of valve shall be slow compression for fine control under pressure up to 150 psi (1.03 MPa) and shall have subject-to-wear parts easily replaceable. Provide pressure regulators designed for use with the appropriate service at locations indicated on the Laboratory Furnishing drawings. Needle valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97. Needle valves in fume hoods shall be mounted on the front panel of the fume hood, with all components subject to wear accessible from the exterior face of the hood.

G. Laboratory Ball Valves: Suitable for laboratory gas, nitrogen, air and vacuum and be supplied fully assembled and factory tested at 125 psi (0.86 MPa) air pressure. Ball valves shall be of quarter-turn (closed to fully open) design, be fitted with lever handle requiring less than 5 lbf (22 N) force to operate, and shall have subject-to-wear parts easily replaceable. Ball valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97.

H. High Purity Water Valves: Suitable for purified water and provided with polypropylene liner. Valve stem and bonnet shall be brass.

I. Service Fitting Color Index:

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Disc Color</th>
<th>Letters</th>
<th>Letter Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Air</td>
<td>Orange</td>
<td>AIR</td>
<td>Black</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Orange</td>
<td>AIR60,90,100</td>
<td>White</td>
</tr>
<tr>
<td>Gas</td>
<td>Dark Blue</td>
<td>GAS</td>
<td>White</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Yellow</td>
<td>VAC</td>
<td>Black</td>
</tr>
<tr>
<td>Industrial Cold Water</td>
<td>Dark Green</td>
<td>ICW</td>
<td>White</td>
</tr>
<tr>
<td>Industrial Hot Water</td>
<td>Red</td>
<td>IHW</td>
<td>White</td>
</tr>
<tr>
<td>High Purity Water</td>
<td>White</td>
<td>PW</td>
<td>Black</td>
</tr>
<tr>
<td>Deionized Water</td>
<td>White</td>
<td>DI</td>
<td>Black</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Brown</td>
<td>N2</td>
<td>White</td>
</tr>
</tbody>
</table>

2.3 LABORATORY EMERGENCY PLUMBING FIXTURES

A. Manufacturers:

1. Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following
manufacturers. All products specified in this section shall be the provided by a single manufacturer.

a. Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: 312 666-5500.
b. Guardian Equipment, 1104N North Branch St., Chicago, IL 60642 Tel: 312 447-8100.
c. Haws Corporation, 1455 Kleppe Lane, Sparks, NV 89431 Tel: 775 359-4712.
d. Approved substitution.


C. All emergency plumbing fixtures shall be accessible to persons with disabilities in compliance with the requirements of the federal Americans with Disabilities Act (ADA), ADA Accessibility Guidelines (ADAAG), and state accessibility regulations.

D. Barrier-free safety station with emergency shower actuation valve in stainless steel cabinet for recess mounting and wall-mounted eyewash with stainless steel skirt: Water Saver Model No. SSBF670-721, or equal, with the following characteristics or modifications.

1. Ceiling-mounted exposed showerhead. Nipple length shall be as required for a complete installation; verify finished ceiling height.
2. Exposed piping, showerhead, nipple, and escutcheon shall be chrome-plated brass with clear epoxy coating.
3. Safety shower actuating arm shall be stainless steel.
4. Showerhead shall have perforated stainless steel spreader.
5. Safety shower actuating arm shall be mounted in a flanged, recessed-mounted 18 gauge (1.3 mm) stainless steel cabinet with No. 4 finish.
6. Flag/paddle shall be epoxy-coated cast aluminum or stainless steel.
7. Eyewash heads shall be ABS plastic with float-off dust covers.
8. Stainless steel skirt shall have No. 4 finish.
10. Fixture shall be furnished with green plastic sign with graphic symbol for safety shower/eyewash.

2.4 FINISHES

A. Chrome finish with clear, acid-resistant coating:
1. Applicable to:
   a. All laboratory service fittings (except fittings inside fume hoods).
   b. All laboratory service fittings mounted on stainless steel work surfaces, scullery sinks, hand or service sinks, or any other stainless steel laboratory furnishing item or equipment.
   c. Laboratory emergency plumbing fixtures.

2. Chrome finish: All exposed surfaces shall be polished and buffed, then electroplated with one layer of nickel and one layer of chrome. Each layer of plating shall completely cover all visible areas. Total plating thickness shall be not less than 0.4 mil (10 μm). Finish:
   a. Polished.

3. Clear epoxy coating: Following plating, clear epoxy coating shall be applied to all exposed surfaces and then baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils (50 μm).

B. Colored coating:

1. Fume hood service fittings.
2. Preparation: Surfaces to be coated shall be polished or sandblasted to produce a uniform fine-grained surface and immersed in a phosphoric acid cleaning solution to remove thoroughly all oil, grease and other foreign substances.
3. Epoxy finish: Following cleaning, coating material shall be electrostatically applied to all exposed surfaces. After application, coating shall be fully baked to permit curing. Coating material shall be free-flowing epoxy powder with particle size of 1.4 to 2.8 mils (35 to 70 μm). Surfaces shall have a minimum finished coating thickness of 2 mils (50 μm).
4. Color:
   a. Fittings inside fume hoods shall have a colored finish color-coded to match the fitting service index color.

C. Performance requirements for coated finishes:

1. Chemical resistance:
   a. Fume Test: Suspend coated samples in a container of at least 6 cu. foot (170 L) capacity, approximately 12 inches (300 mm) above open beakers, each containing 100 mL of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After
exposure to these fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other effects.

b. Direct Application Test: Subject coated samples to the direct action of the following reagents and solvents at a temperature of 25°C dropping from a burette at the rate of 60 drops per minute for ten minutes. Finish on samples shall not rupture, though slight discoloration or temporary softening is permissible.

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>98%</td>
</tr>
<tr>
<td>Acetone</td>
<td></td>
</tr>
<tr>
<td>Ammonium Hydroxide</td>
<td>28%</td>
</tr>
<tr>
<td>Amyl Acetate</td>
<td></td>
</tr>
<tr>
<td>Amyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Calcium Hypochlorite</td>
<td></td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td></td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td></td>
</tr>
<tr>
<td>Chloroform</td>
<td></td>
</tr>
<tr>
<td>Chromic Trioxide Acid</td>
<td></td>
</tr>
<tr>
<td>Cresol</td>
<td></td>
</tr>
<tr>
<td>Crude Oil</td>
<td></td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
</tr>
<tr>
<td>Distilled Water</td>
<td></td>
</tr>
<tr>
<td>Ether</td>
<td></td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td></td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>90%</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
</tr>
<tr>
<td>Glacial Acetic Acid</td>
<td>99.5%</td>
</tr>
<tr>
<td>Glycerine</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>38%</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
<td>48%</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>5%</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Lactic Acid</td>
<td>10%</td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
</tr>
<tr>
<td>Methyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Methyl Ethyl Ketone</td>
<td></td>
</tr>
<tr>
<td>Methylene Chloride</td>
<td></td>
</tr>
<tr>
<td>Reagent</td>
<td>Concentration</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td></td>
</tr>
<tr>
<td>Monochlor Benzene</td>
<td></td>
</tr>
<tr>
<td>N-Hexane</td>
<td></td>
</tr>
<tr>
<td>Naphthalene</td>
<td></td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>70%</td>
</tr>
<tr>
<td>Perchloric Acid</td>
<td>70%</td>
</tr>
<tr>
<td>Phenol</td>
<td></td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>75%</td>
</tr>
<tr>
<td>Sea Water</td>
<td></td>
</tr>
<tr>
<td>Silver Nitrate</td>
<td>30%</td>
</tr>
<tr>
<td>Sodium Bichromate</td>
<td>Saturated</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>10%</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>20%</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>50%</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td></td>
</tr>
<tr>
<td>Sodium Sulfide</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>87%</td>
</tr>
<tr>
<td>Toluene</td>
<td></td>
</tr>
<tr>
<td>Trichlorethylene</td>
<td></td>
</tr>
<tr>
<td>Turpentine</td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>Saturated</td>
</tr>
<tr>
<td>Xylene</td>
<td></td>
</tr>
<tr>
<td>Zinc Chloride</td>
<td>Saturated</td>
</tr>
</tbody>
</table>

2. Mar and abrasion resistance: Coating material shall have a pencil hardness of 2H – 4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch-pounds (18 Nm). Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

3. Repairability: Scratches and other localized surface damage shall be field-repairable.

2.5 LABORATORY SINKS

A. Epoxy Resin:

1. Manufacturer: Manufacturer shall be the manufacturer of epoxy resin work surfaces specified in Section 11 53 10.

2. Laboratory Sinks:

   a. Drop-in Type: Drop-in installation by Division 11 in epoxy resin work surface. Color to match work surface.
   b. Comply with the requirements of Section 11 53 10 for epoxy resin.
   c. All exposed edges shall be radiused not less than 1/4 inch (6 mm).
d. Tops without drain grooves: Sink shall be set 1/8 inch (3 mm) below the level of the adjacent surface.

e. Provide epoxy resin sink outlet in color to match sink with strainer, stopper and open-end overflow, and install in sink with continuous bead of silicone sealant.

1). At black epoxy resin sinks, outlet shall be black polypropylene.

f. Provide tailpiece compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

B. Stainless steel:

1. Laboratory Sinks:

   a. Refer to Section 11 53 10, Stainless Steel Fabrications.
   
   b. Provide stainless steel strainer, outlet, standpipe overflow and stopper for all sinks unless otherwise specified.
   
   c. Provide tailpieces compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection:

   1. Prior to installation of fittings specified in Section 11 53 43, carefully inspect the installed Work specified in other Sections and verify that all such Work is complete to the point where this installation may properly commence.

   2. Verify that all Work has been installed in complete accordance with the original design, approved submittals, and the manufacturer's recommendations.

B. Discrepancy:

   1. In the event of discrepancy, immediately notify the Architect.

3.2 PACKING AND DELIVERY

A. Deliver all fittings and fixtures to job site in recommended packaging, with each fitting individually packaged, marked, and scheduled for point of use.
B. Inventory fittings, at job site, verify that type and quantity are correct, and re-package until installed.

C. Store in clean, dry location.

3.3 INSTALLATION

A. Set internal volume control on all cup sink water fittings so water does not splash out of sink.

B. All service index buttons to be installed plumbed with lettering oriented in the horizontal position when in the off position.

END OF SECTION 115343
SECTION 115350 – LABORATORY EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Laboratory Glassware Washer/Dryers: Base Cabinet Height

B. Laboratory Sterilizers (Autoclaves): Small

C. Products installed but not supplied under this section: Owner’s existing Market Forge Industries Inc. Sterilmatic Autoclave. Work includes but is not limited to, disconnection and relocation to new location as indicated, and complete installation according to manufacturer’s recommendations. Work must be coordinated with Owner’s schedule requirements.

1.2 RELATED SECTIONS

A. General and Supplementary Conditions and Division 1

B. Division 23: Mechanical

C. Division 22: Plumbing

D. Division 26: Electrical

1.3 REFERENCES

A. Comply with requirements of general and supplementary conditions and Division 1 as part of this specification.

1.4 DESCRIPTION

A. Furnish and install all laboratory equipment with necessary components and accessories required to ensure a complete installation and ready for intended use as specified herein and shown on the Laboratory Furnishings Drawings.

B. Provide side panels to cover all exposed sides of cabinet-type equipment designed for under-counter installation.

C. Work of this section requires close coordination with work of Division 23 and 26 as well as installation of Owner furnished components and work specified in other Sections. Sequence all work to assure an orderly progress in the project without removal of previously installed work and so as to prevent damage to finishes and products.
1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

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C. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches x 17 inches (A3) in size. Blueline prints are not acceptable.

D. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer to show compliance with the applicable Building Code seismic restraint requirements.

E. Samples: Submit for Architect’s approval two (2) samples of each type of specified finish and color range available.

F. Certifications: As a condition of acceptance, submit certification stating that equipment is complete and ready for intended function.

G. Operations/Maintenance Manuals: Accompanying certification, submit for Architect’s review and Owner’s use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

1.6 QUALIFICATIONS

A. Contractor for work in this section shall have an established organization and production facilities including all tools, equipment and special machinery
necessary for specializing in the fabrication and installation of the type of equipment specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.7 COORDINATION

A. Work of this Section requires close coordination with Work of Divisions 22, 23 and 26 and Work specified in other Sections. Sequence all Work to ensure an orderly progress in the project without removal of previously installed Work and so as to prevent damage to finishes and products.

1.8 SUBSTITUTIONS

A. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as "Comply" or "Not Comply." In any cases where "Not Comply" is indicated, an explanation of the relative advantages of the proposed design shall be provided.

B. Substitution shall not affect dimensions shown on Drawings.

C. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.

D. Substitutions shall have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

E. Maintenance and service parts shall be locally available for the proposed substitution.

F. Regulatory: Specified products, materials, or systems for Project may include engineering or on file standards required by the Regulatory Agency. Contractor’s substitution of products, materials or systems may require either additional engineering, testing, reviews, approvals, assurances, or other information for compliance with Regulatory Agency requirements or both. Contractor shall provide all Agency approvals or other additional information required and pay additional costs for required Architect’s services made necessary by the substitution at no increase in Contract Sum or schedule time, and as a part of substitution proposal.
1.9 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damage as a result of this contractors work will be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.10 WARRANTY

A. Refer to the General Conditions and Division 1 “Product Requirements” for warranty requirements. In addition to these requirements, all products will be warranted to be free from defects in materials and workmanship for a minimum period of one year following substantial completion. The manufacturer/ dealer/ subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved.

PART 2 - PRODUCTS

2.1 LABORATORY GLASSWARE WASHER/DRYERS: BASE CABINET HEIGHT

A. Manufacturers/Models: Products, as listed below, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers, listed in alphabetical order:

1. Labconco Corporation, 8811 Prospect, Kansas City, MO 64132
   Tel: (816) 333-8811.
   a. Model: Flaskscrubber

2. Lancer USA, Inc., 705 W. Highway 434, Longwood, FL 32750
   Tel: (800) 332-1855.
   a. Model: 815LX.

3. Miele Appliances, Inc., 9 Independence Way, Princeton, NJ 08540,
   Tel: (609) 419-9898.

4. Approved equal (no known equals)/ No Substitutions.

B. Listing:
1. Unit shall carry an ETL mark signifying certification to UL Standard 3101-1/61010-1 or CAN/CSA C22.2 No. 1010.1.

C. Requirements:

1. Microprocessor-controlled laboratory glassware washer/dryer with purified water rinsing and with at least 9 automatic wash programs, capable of accepting optional inserts such as open baskets and spindles/injectors for open or injection cleaning of laboratory glassware on two rack levels.

2. Size:
   a. Minimum Chamber Dimensions: 20⅛ inches wide x 18⅛ inches high x 20 inches deep.
   b. Minimum Chamber Volume: 4.5 cubic feet.
   c. Maximum Overall Dimensions: 24⅛ inches wide x 33⅛ inches high x 27⅛ inches deep.

3. Insulated, fully cabinet-enclosed unit to allow for freestanding or under-counter installation. See Laboratory Furnishing drawings for location.

4. Door: Bottom-hinged, fold-down door with safety interlock.

5. Construction:
   a. Chamber and door:
      1). Walls and ceiling, type 304 stainless steel
      2). Floor and door, type 304 or 316 stainless steel.
   b. Exterior: Type 304 stainless steel.

6. Operation/Performance:
   a. Control panel with LCD display to indicate cycle times, temperature, and error messages.
   b. Dual pump system with separate pumps for circulation and draining.
   c. Rotating upper and lower wash arms.
   d. Circulation pump: rated at a minimum of 90 gallons per minute.
   e. Minimum Heater rating: 2 kW.
   f. Wash water temperature: Unit shall be capable of attaining a wash temperature of 199°F (93°C).
   g. Final rinse temperature: Unit shall be capable of attaining a final purified water rinse temperature of 199°F (93°C).
   h. Easily-removable filter system to catch debris at bottom of the chamber.
i. Drying system: Unit can use any of the following drying systems:

1). Gravity-convected drying via an electrical heating element.
2). Drying via an electrical heating element with an internal chamber circulation fan.
3). Non-filtered fan-driven drying system.

j. Detergents: Unit shall be capable of operating with both detergent and neutralizer. Dispensing shall either be manual or automatic.

k. Noise Level: Unit shall operate at a noise level not exceeding 63dBA.

7. Utility Requirements:

a. Contractor to coordinate utility requirements with selected manufacturer's installation guide. The utility requirements below are intended to be able to accommodate any of the specified units.


c. Cold water: Input pressure 25 to 87 psig.

d. DI rinse water: Maximum incoming temperature 158°F (70°C) at 29 to 87 psig.

e. Electric: 208/230 V, 60 Hz, Single-Phase or 3-phase, 12A to 34A. Contractor to coordinate with submitted unit. Utilize 3-phase power if compatible with selected unit.

f. Drain: Connect to sink tailpiece, standpipe, or into adjacent floor sink. Refer to drawings for details. Maximum flow rates: 5.0 gallons per minute.

8. Accessories required:

a. Drain water cool-down kit.

b. Provide an initial set of detergent and neutralizer chemicals, sufficient for a minimum of 50 washes, per unit.

c. Glassware accessories:

1). Lower rack with a minimum of 19 spindles to provide for injection cleaning for narrow-neck glassware.

2). Utensil basket(s) of approximately 512 cubic inch capacity with lid/cover(s).
2.2 LABORATORY STERILIZER (AUTOCLAVE): SMALL

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

2. Consolidated Stills and Sterilizers, 76 Ashford Street, P.O. Box 297, Boston, MA. Tel: (617) 782-6072
3. Approved equal.

B. Basis of Design: Sterilmatic Sterilizer (Autoclave), Model STM-EL, as manufactured by Market Forge Industries, Inc.

C. Description: Small size sterilizer designed for use in Laboratory and industrial applications.

D. Chamber Size:

1. 16 inches in diameter x 26 inches (406 x 660 mm) nominal.

A. Door/Mounting Configuration:


B. Operation:

1. Sterilizing cycle will be fully automatic, time-controlled and have a built-in temperature control which provides 250°F (121°C). Model STM-EL has the additional feature of an adjustable temperature control that can be set anywhere from 230-250°F (110-121°C) range. All operating controls will be located at the top, front of the sterilizer. Pressure will be automatically and quickly exhausted and power supply shut off at termination of cycle. Slow exhaust may be selected for sterilizing liquids.

C. Steam Source:

1. Internal generation, supplied manually with industrial water.

D. Product Characteristics:

1. Construction:

   a. Cylinder: Sterilizing cylinder will be 3/16" (4.8mm) wall welded aluminum. Sterilizer exterior is made of polished stainless steel.
Interior dimensions of 16" (406mm) in diameter and 26" (660mm) long with a cubic content of 5,220 cubic inches (0.085 cubic meters) and will have a door opening of 13 1/2" (343mm) wide and 11" (279mm) high. Sterilizing compartment will have a capacity of:

1. (3) 12" x 20" x 2 1/2" (305mm x 508mm x 64mm) or,
2. (2) 12" x 20" x 4" (305mm x 508mm x 102mm) or,
3. (1) 12" x 20" x 6" (305mm x 508mm x 152mm).

a. The sterilizer door will be self-sealing type which cannot be opened until steam pressure is completely exhausted. Door will be 12 gauge stainless steel, removable for cleaning without tools. Door gasket will be one piece molded, replaceable without tools or cement.

b. Standard Features:

1. Automatic temperature control
2. Thermometer 180\(^\circ\) - 300\(^\circ\)F (82\(^\circ\) - 149\(^\circ\)C)
3. Safety valve
4. 0-30 lb. steam gauge
5. 0-60 minute timer
6. Low water cut-off
7. Thermostatic steam trap
8. Signal light
9. Flat perforated steam baffle
10. Removable pan supports

E. Utilities:

1. Drain: ½ inch (13 mm) FTP of 5/8 inch (16 mm) OD copper to adjacent floor sink. An air break must be provided.

2. Steam exhaust Connection: 3/8 inch (10 mm) IPS. Exhaust line must be vented to the outside to eliminate the exhaust steam and the accompanying noise from entering the room. Use 1/2" (13mm) copper tubing or suitable alternate. The overall height and length of the line should not rise more than 4' (1.2 meters) above the unit and exceed 15' (4.5 meters) with a minimum of bends. The line should slope downward after leaving the sterilizer in order to ensure condensate drainage.

3. Electrical Connection: 208 V, 60 Hz, 3-phase, 4 wire, 26A, 12 kW. Unit must be grounded. Main supply voltage fluctuations are not to exceed +/- 10% nominal supply voltage.

F. Standards: Units shall conform to the applicable requirements of the following:

1. Underwriters Laboratories (UL).
3. NEC.
4. ASME Code, Section VIII, Division 1 for unfired pressure vessels.
5. ASME Code, Section I, Part PMB for power boilers.

G. Options Required:
1. Tubular leg stainless steel stand with shelf.
2. Sterilmatic Trays (TO BE DETERMINED).
3. Seismic tie-down kit required to conform to local building codes.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection: Prior to installation of laboratory equipment, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.

B. Discrepancies: In the event of discrepancy, immediately notify the Architect.

3.2 EXAMINATION

A. Examine surfaces designated to receive work for conditions that would adversely affect the finished work. Repair or replace surfaces not meeting tolerances or quality requirements governing substrate construction prior to start of work.

B. Verify that surfaces, prepared openings, or support structures are ready to receive work.

C. Verify field measurements and opening dimensions are as instructed by manufacturer.

D. Inspect and verify that the required utilities are available, in proper locations, prior to equipment installation.

3.3 WORK REQUIRED OF OTHER SECTIONS PRIOR TO INSTALLATION

A. Install shutoff valves on service lines.

B. Install fused disconnect switches (with lockout in OFF position) in electric supply lines near the equipment.

C. Provide building service lines supplying specified pressures and flow rates.
D. Provide illumination of service area, with provision of convenience outlet for maintenance.

3.4 INSTALLATION

A. General:

1. Install all equipment per manufacturer's recommendations and reviewed submittals.
2. Properly align and position all equipment.

B. Connection to Building Systems: See Laboratory Plumbing and Electrical drawings and Divisions 23 and 26 for final connections.

3.5 START UP AND TESTING

A. Test, clean, and adjust equipment and apparatus installed to ensure performance meets specified requirements.

B. Operate each unit and test full range of cycles over a continuous period. Record test data.

C. Adjust and re-test any units not meeting requirements.

3.6 DEMONSTRATION AND INSTRUCTIONS

A. Engage services of factory-qualified instructor to instruct and train Owner's operating and maintenance personnel in operation, service, and maintenance of equipment.

B. Test equipment prior to demonstration. Ensure equipment, including specified accessories, is operational.

C. Provide demonstration of equipment operation and instruction of Owner's personnel.

D. Demonstrate operating capability of equipment and systems. Include control and safety features, and service and maintenance procedures.

3.7 CLEANING AND PROTECTION

A. All equipment shall be protected before, during and after installation. Damage to material due to improper protection shall be cause for rejection.

B. Packaging and debris and other waste resulting from installation of equipment will be removed.
C. Repair or remove and replace defective Work as directed by the Architect upon completion of installation.

D. Clean finished equipment, touch up as required and remove and refinish damaged or soiled areas.

E. Prior to final acceptance by the customer, equipment that has become damaged will be repaired or replaced according to the terms of the warranty and any external soiled surfaces will be cleaned.

END OF SECTION 115350
PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Hydraulic passenger elevator as shown and specified. Elevator work includes:
   1. Twinpost telescopic 3-stage pre-engineered hydraulic passenger elevator.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Jack(s).
   4. Operation and control systems.
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Section 033000 - Concrete: Installing inserts, sleeves and anchors in concrete.
   2. Section 051200 - Structural Steel and Section 055000 - Metal Fabrications:
      a. Providing hoist beams, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames
      c. Pit wall ladder.
   4. Division 9 Finishes: Providing elevator car finish flooring and field painting for unfinished and shop primed ferrous materials.
   5. Division 22 Plumbing:
      a. Sump pit with pump.
   6. Division 23: Heating, Ventilation and Air Conditioning
      a. Heating and ventilating for hoistways and machine rooms.
   7. Division 26 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches.
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in machine room, hoistway and pit.
C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for hydraulic elevators. State or local requirements must be used if more stringent.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. Machine room to be enclosed and protected.
10. Machine Room temperature must be maintained between 55° and 90° F.
11. Access to the machinery space and machine room must be in accordance with the governing authority or code.
12. Provide an 8" x 16" cutout through machine room wall, for oil line and wiring duct, coordinated with elevator contractor at the building site.
13. All wire and conduit should run remote from either the hoistway or the machine room.
14. When heat, smoke or combustion sensing devices are required, connect to elevator machine room terminals. Contacts on the sensors should be sized for 120 volt D.C.
15. Install and furnish finished flooring in elevator cab.
16. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
17. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment.
Drywall contractor to coordinate with elevator contractor.

18. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.

19. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor’s requirements.

20. General Contractor shall fill and grout around entrances, as required.

21. Elevator sill supports shall be provided at each opening.

22. All walls and sill supports must be plumb where openings occur.

23. Locate a light fixture and convenience outlet in pit with switch located adjacent to the access door.

24. A light switch and fused disconnect switch for each elevator should be located inside the machine room adjacent to the door, where practical, per the National Electrical Code (NFPA No. 70).

25. As indicated by elevator contractor, provide a light outlet in center of hoistway.

26. For signal systems and power operated door: provide ground and branch wiring circuits, including main line switch. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.

27. Wall thickness may increase when fixtures are mounted in drywall. These requirements must be coordinated between the general contractor and the elevator contractor.

28. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc.

29. Locate telephone and convenience outlet on control panel.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor will provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the machine room/control space, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.
C. Powder Coat Paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Operation and maintenance data. Include the following:
   2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. Must be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
   1. ASME/ANSI A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
   6. CAN/CSA C22.1 Canadian Electrical Code.
D. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
1. Arrange for inspections and make required tests.
2. Deliver to the Owner upon completion and acceptance of elevator work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturer will deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

B. Provide the hole for the jack unit based on excavation through normal soil or clay which can be removed by manual digging or by standard truck-mounted regular drilling unit. Provide a casing if required to retain the walls of the hole. General contractor shall remove excavation spoils deposited in the elevator pit.
1. If a physical obstruction or hindrance is encountered below the ground surface, including boulders, rock, gravel, wood, metal, pilings, sand, water, quick sand, caves, public utilities or any other foreign material, obtain written authorization to proceed with excavating using special excavation equipment.
2. Maintain a daily log of time and material costs involved.
3. Elevator contractor will be compensated on a time and material basis for additional costs incurred after encountering the physical obstruction or hindrance, including the cost of the special excavation equipment.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer’s standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.
1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for elevator from date of Substantial Completion during normal working hours, excluding callbacks. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.

1. Manufacturer shall have a service office and full time service personnel within a 150 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Schindler Haughton
B. Equal by: Thyssen Krupp

2.02 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect from manufacturer’s standard colors, patterns, and finish charts.

B. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.

C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.

D. Carpet: Installed by carpet supplier for remainder of project.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 3-stage. Two jacks piped together, mounted one on each side of the car with each having three telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. A follower guide shall be furnished for the top of the lower two plungers and be guided by rollers running inside a steel guide channel which is firmly attached to the guide rail system. This plunger guide system shall maintain a stabilized support for the plunger sections. Each Jack Assembly shall have check valves built into the assembly to allow for automatically re-syncing the three plunger sections by moving the jack to its fully contracted position.

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade oil as specified by the manufacturer of the power unit.

2.04 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
   1. Oil reservoir with tank cover.
2. An oil hydraulic pump.
3. An electric motor.
4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.

D. Control System: Shall be microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.

E. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.


2.05 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted/knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors,
hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.

2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish.

3. Typical door & frame finish: ASTM A 366 steel panels, factory applied powder coat enamel finish.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKLP, durable wood core finished on both sides with high pressure plastic laminate.
   2. Canopy: Cold-rolled steel with hinged exit.
   3. Ceiling: Suspended type, fluorescent lighting with translucent diffuser mounted in a metal frame.
   5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
      a. Door Finish: Provide panels faced with brushed stainless steel.
      b. Cab Sills: Extruded aluminum, mill finish.
   6. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls. Handrails shall have a stainless steel, No. 4 brushed finish.
   7. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.
B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.

2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.

3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.

4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.

5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.

6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
7. **Door Close Watchdog:** If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.

8. **Door Close Assist:** When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

**B. Door Protection Devices:** Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 **CAR OPERATING STATION**

**A. Car Operating Station, General:** The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

**B. Emergency Communications System:** Integral phone system provided.

**C. Auxiliary Operating Panel:** Not Required

**D. Column Mounted Car Riding Lantern:** A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
2.09 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

2.10 HALL STATIONS

A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type.

1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
2. Phase 1 firefighter’s service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at all typical landings.

D. Hall lanterns: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

C. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

D. Lubricate operating parts of system where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.
B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.
3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model:
      Equal-
      Thyssen Krupp AMEE 21 Twinpost Telescopic 3-Stage
      Schindler 330A Holeless Hydraulic Elevator, Dual Jack
   2. Rated Capacity: 3500 lbs. capacity
   3. Rated Speed: Minimum 120 ft./min.
   4. Travel: 34'-6" (field verify)
   5. Landings: 3 total
   6. Openings:
      a. Front: 3
   7. Clear Car Inside: 6' - 8" wide x 5' - 5" deep
   8. Cab Height: Nominal 8'
   9. Hoistway Entrance Size: 3' - 6" wide x 7'-0" high
   10. Door Type: Single Speed
   12. Seismic Requirements: Zone 1
   13. Fixture & Button Style: Vandal Resistant Signal Fixtures
   14. Special Operations: None

END OF SECTION