SECTION 12345 - LABORATORY CASEWORK AND FIXTURES

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing base cabinets, wall cabinets, storage cabinets, tables, cabinet understructures for fume hoods, shelf units, and other units as indicated and all appurtenant work, complete.

B. While providing sinks, accessories and piping and electrical service fixtures are included in the WORK of this Section, installation and testing such items shall be as specified in Division 15 and Division 16.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 06200 Finish Carpentry and Millwork
2. Section 15000 Piping Components
3. Section 15010 Mill Piping - Exposed and Buried
4. Section 16050 Basic Electrical Materials and Methods

1.3 CODES

A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. Uniform Building Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1.	ANSI A208.1	Particleboard, Mat-Formed Wood
2.	ANSI/AHA A135.4	Basic Hardboard
3.	ASTM A 167	Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip
4.	ASTM A 366	Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
5.	ASTM A 446	Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

6.	ASTM A 526	Sheet Steel, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
7.	ASTM D 570	Test Method for Water Absorption of Plastics
8.	ASTM D 635	Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
9.	ASTM D 695	Test Method for Compressive Properties of Rigid Plastics
10.	ASTM D 785	Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
11.	ASTM D 790	Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
12.	ASTM D 792	Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement
13.	NEMA LD-3	High Pressure Decorative Laminates

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Manufacturer's data and installation instructions shall be submitted for each type of laboratory casework and service fixture provided. Product data shall include independent laboratory certification that finishes comply with the indicated chemical and physical resistance requirements.

2. Shop drawings for all laboratory casework and fixtures, showing plans, elevations, ends, cross-sections, service run spaces, locations and types of service fixtures with all related lines and fittings. Shop drawings shall clearly define construction details, locations of anchorages and fitting to floors, walls, and base. Layouts of units shall be included which clearly define relationships to surrounding walls, doors, windows, and other building components.

3. Samples:

a. Finish: Six-inch square samples of each finish applied to its appropriate solid wood or plywood substrate. Countertop material samples shall also be submitted. Samples shall be reviewed by the CONSTRUCTION MANAGER for color, texture, and pattern only. Compliance with other specified requirements shall be exclusively the responsibility of the CONTRACTOR.

$# _____

NTS: Add or delete from full size sample requirements described below to suit project requirements and scope.

[b. CONTRACTOR shall submit one full-size sample of finish base cabinet unit complete with hardware, doors and drawers, without countertop.]

[c. CONTRACTOR shall submit one full-size sample of finished wall-mounted cabinet unit complete with hardware, doors, and adjustable shelves.]

[d. CONTRACTOR shall submit full-size samples of sink units and accessories if directed by the CONSTRUCTION MANAGER.]

[e. CONTRACTOR shall submit samples of piping and electrical service fixtures if directed by the CONSTRUCTION MANAGER, complete with fittings and accessories.]

[f. Acceptable sample units shall establish a minimum standard of quality and shall be used for comparison inspections through the course of the project. Unless otherwise directed, acceptable sample units may be incorporated in the WORK. CONSTRUCTION MANAGER shall be notified of their exact locations. If not incorporated in the WORK, acceptable sample units shall be retained in the CONTRACTOR'S storage at the site until completion of the WORK.]

1.6 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:

1. Manufacturer's maintenance and repair instructions shall be submitted for each type of laboratory casework and service fixture provided.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Delivery of Materials:** Products shall be delivered in original, unbroken, packages or containers bearing the manufacturer's label. Packages or containers shall be delivered to the site with seals unbroken.

B. **Storage:** All materials shall be carefully stored in an area that is protected from deleterious elements in a manner recommended by the product manufacturer. Storage shall be in a manner which prevents damage to the material or marring of its finish.

PART 2 -- PRODUCTS

2.1 GENERAL

A. **Single Source Responsibility**: Laboratory casework with all related tops, sinks, and associated service fixtures shall be manufactured or furnished by a single laboratory furniture company.

B. **Chemical and Physical Resistance of Finishes**: An independent testing laboratory report shall be submitted which certifies that the exterior finishes of indicated laboratory casework are capable of withstanding the following tests, with no change, or only slight change of gloss,

slight discoloration, or slight temporary softening of film, with no loss of adhesion and no loss of film protection.

1. Acids: Not less than 5 drops (0.25 cc) of each acid applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

   37% Hydrochloric Acid
   20% Hydrochloric Acid
   10% Hydrochloric Acid
   70% Sulfuric Acid
   25% Sulfuric Acid
   30% Nitric Acid
   10% Nitric Acid
   75% Phosphoric Acid
   25% Phosphoric Acid
   98% Acetic Acid
   50% Acetic Acid

2. Solvents: Not less than 5 drops (0.25 cc) of each solvent applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

   Ethyl Alcohol
   Butyl Alcohol
   Methyl Alcohol
   Ethyl Acetate
   Ethyl Ether
   Methyl Ethyl Ketone
   Toluene
   Acetone
   Benzene
   Carbon Tetrachloride
   37% Formaldehyde
   Gasoline
   Naphtha
   Kerosene
   Xylene
   Glycerin
   Furfural

3. Bases and Salts: Not less than 5 drops (0.25 cc) of each solution applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

   40% Sodium Hydroxide
   10% Sodium Hydroxide
   28% Ammonium Hydroxide
   40% Potassium Hydroxide
   10% Potassium Hydroxide
   Saturated Zinc Chloride
   Saturated Sodium Chloride
   Saturated Sodium Sulfide
   Saturated Sodium Carbonate

4. Moisture Resistance: Finish surface shall exhibit no visible effect when exposed to the following:

    a. Hot water at a temperature of 190 degrees F to 205 degrees F, trickled down the surface held at a 45 degree angle for 5 minutes.

    b. Constant moisture using a 2-inch by 3-inch by 1-inch cellulose sponge, soaked with water, in contact with the surface for 100 hours.

5. Cold Crack: Finish surface shall exhibit no visible effect when subjected to 10 cycles of temperature change from 20 degrees F for 60 minutes to 125 degrees for 60 minutes.

C. **Fabrication**:

1. Laboratory casework and fixtures shall be fabricated to dimensions, profiles, configurations and details shown on shop drawings.

2. Units shall be assembled in the shop in as large components as are practicable to minimize field jointing.

3. Hardware shall be installed uniformly and precisely after final finishing is complete. Hinges shall be set snug and flat in mortises unless otherwise indicated. Screws shall be turned to flat seat. Hardware shall be adjusted and aligned so that moving parts operate freely and contact points meet accurately. Final field adjustment shall be made after installation.

2.2 WOOD CASEWORK

A. **Definitions**: The following definitions shall apply to wood laboratory casework units:

1. Exposed portions of casework shall include all surfaces visible when doors and drawers are closed. Bottoms of cases more than 4 feet above the floor shall be considered as exposed. Visible members in open cases or behind glass doors shall also be considered as exposed portions.

2. Semi-exposed portions of casework shall include all surfaces behind opaque doors, such as shelves, divisions, interior faces of ends, case backs, drawer sides, backs and bottoms, and back faces of doors. Tops of cases 6 feet 6 inches or more above the floor shall be considered semi-exposed.

3. Concealed portions of casework shall include all sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

B. **Exposed Materials**: In clear finish materials, exposed faces of lighter-than-average color shall not be joined with exposed faces of darker-than-average color. Adjacent joined faces shall not contain surfaces which are noticeably dissimilar in grain, figure, and natural character markings.

1. Solid Lumber: Solid lumber material shall be clear, dry, and sound, selected for compatibility of grain and color, with no defects, and shall be of the following species:

Northern Hard Maple
White or Yellow Birch
Red or White Oak

a. Maple and birch may be combined in the same units if compatible in grain and color.

2. Plywood Face Veneer: Plywood face veneer shall be of the same species as exposed solid lumber, clear, selected for grain and color compatible with exposed solid lumber, with no defects. Solid crossbandings shall be provided without voids. Exposed edges shall be edgebanded with solid wood of the same species as the face veneer.

C. **Semi-Exposed Materials**:

1. Solid Lumber: Solid lumber shall be dry, sound, selected to eliminate appearance defects. Solid lumber may be any species of hardwood or softwood of similar color and grain to exposed portions.

2. Plywood: Plywood shall be hardwood, PS-51, "Good" Grade (1), or softwood PC-1/ANSI A 199.1, Group 1, A-A, INT, of species to match color and grain of exposed members.

D. **Concealed Members**:

1. Solid Lumber or Plywood: Solid lumber or plywood may be of any species, with no defects affecting strength or utility.

2. Particleboard: ANSI A 208.1, minimum 40 lb per cubic foot density, Grade 1-M-2, or better.

3. Hardboard: ANSI A 135.4, Class 1, tempered.

E. **Glass**: Glass shall be clear tempered float glass with the following minimum characteristics:

Grade B (fully tempered)
Style I (uncoated surfaces)
Type I (float)
Class I (transparent)
Quality q3 (glazing quality)

F. **Clear Wood Finish**:

1. General: Factory finish shall comply with the chemical and physical resistance requirements indicated above. After installation, touch up or refinish damaged portions to original factory finish.

2. Preparation: Exposed and semi-exposed components shall be sanded using machine and hand methods. Machine marks, cross sanding, tool marks or other surface blemishes will not be accepted.

3. Exposed Portions: Finishes shall be carefully sanded after each surface treatment. Finishes shall be applied as follows:

a. Sealer coat, if required.

b. Stain, to match color selected, if required.

c. Mineral filler, for open grain wood, if required.

d. Multiple coats, heat dried and sanded between each coat to produce a smooth, satin luster free of imperfections.

4. Semi-Exposed Portions: Sealer coat shall be applied, colored to match exposed portions, and followed with heavy application of clear, water-repellant finish coat to provide a smooth, washable surface.

5. Concealed Portions: Concealed portions shall receive one heavy coat of water repellant finish.

2.3 CASEWORK HARDWARE AND ACCESSORIES

A. Manufacturer's standard satin finish hardware units shall be provided unless otherwise indicated.

B. Hinges shall be institutional type, with five knuckles. One pair shall be provided for doors less than 4 feet tall and three pairs for doors over 4 feet tall.

C. Pulls shall be solid metal, for drawers and swing doors, mounted with two screws fastened from the back. Sliding doors shall be provided with recessed flush pulls. Two pulls shall be provided for drawers over 24 inches wide.

D. Door catches shall be nylon roller spring catch type or dual self-aligning permanent magnet type. Two catches shall be provided on doors over 4 feet tall.

E. Drawer stops shall be designed to permit easy removal and yet prevent inadvertent drawer removal. Stops shall be provided on all drawers, located on the inside.

F. Label holders shall be provided where indicated. Holders shall be sized to receive standard label cards, approximately 1 inch by 2 inches nominal size, finished to match other exposed hardware.

G. Drawer and cupboard locks shall be half-mortise type, with five-pin tumbler and dead bolt, round cylinder only, exposed of brass with plated finish.

H. Sliding door hardware sets shall be manufacturer's standard, to suit the type and size of sliding door units required.

I. Cabinet base molding shall be extruded vinyl or rubber, of color as selected by CONSTRUCTION MANAGER, 4 inches tall. Molding shall be provided on exposed sides and fronts of floor-mounted cabinets.

J. Leg shoes shall be extruded vinyl or rubber, black, open bottom type.

K. Adjustable shelf supports shall be BHMA B84072, wrought steel, mortise mounted.

2.4 TOPS, SINKS AND ACCESSORIES

A. **General**: Tops, box curbs, and splash rims shall be smooth and clean, with exposed tops and edges, in uniform plane, and free of defects. Exposed edges and corners shall be uniformly rounded.

1. Top Sizes: Tops shall be furnished in maximum practicable lengths.

$# _____

NTS: Select top thickness: 1-1/4-inch for stainless steel and plastic laminate; 1-inch for epoxy resin.

_____ #$

2. Top Thickness: Top thickness shall be maintained at [1-1/4-inch] [1-inch] with tolerance not exceeding plus or minus 1/32-inch. A front and end overhang of 1-inch shall be provided over base cabinets, formed with a continuous drip groove on the under surface, 1/2-inch from the edge.

[B. **Cast Epoxy Resin**: Tops shall be factory molded of a modified epoxy resin formulation, of uniform consistency and mixture throughout its full thickness. Color shall be black.

1. Physical Properties: Cast epoxy resin material shall have the following minimum physical properties:

   a. Flexural strength: 4,000 lbs per square inch
   b. Compressive strength: 14,000 lbs per square inch
   c. Hardness: Rockwell M-197
   d. Water absorption in 24 hours: 0.05 percent maximum
   e. Heat distortion point: 400 degrees F
   f. Thermal shock resistance: Highly resistant

2. Chemical Resistance: Top material shall be tested with the following reagents in standard laboratory concentrations in the following manner. Not less than 5 drops (0.25 cc) of each fluid applied to finish surface, covered with watch glass for 24 hours, then washed and dried. Surface shall be entirely unaffected or shall only sustain slight dulling of the finish.

glacial acetic acid	hydrochloric acid	nitric acid
phosphoric acid	sulfuric acid	chromium acid
ammonium hydroxide	calcium hypochlorite	sodium hydroxide
acetone	amyl acetate	aqua regia
benzene	butyl alcohol	ethyl acetate
ethyl alcohol	ethyl ether	formaldehyde
hydrogen peroxide	methyl alcohol	methyl ethyl ketone
kerosene	phenol	silver nitrate
trichloroethylene	xylene	zinc chloride

3. Workmanship: Surfaces shall be cast very smooth, with factory cut-outs for sinks and drip grooves. Plain butt type joints shall be assembled with epoxy adhesive and prefitted, concealed metal splines.]

[C. **Stainless steel**: Tops shall be 16 gauge stainless steel sheet, AISI Type 304, with No. 4 satin finish, unless otherwise indicated.

1. Shop joints shall be welded, ground smooth and polished so as to be practically invisible.

2. Butt jointed field joints shall be provided of hair-line quality, mechanically bolted through continuous channels welded to the underside at edges.

3. Field joints shall be kept to a minimum. Reinforcing channels shall be applied to the underside tops where necessary to ensure rigidity without deflection.

4. Tops shall be extended down to provide a 1-1/4-inch thickness and a 1/2-inch return flange shall be provided under the frame. The entire undersurface shall be sound-deadened with a heavy build mastic coating.

5. Backsplash shall be formed so as to be coved to and integral with the top surface.

6. A raised marine edge shall be provided around the perimeters of tops and counters containing sinks. Top surface shall be pitched two-ways toward the sink bowl to provide adequate drainage without supplementary channeling or grooving.]

[D. **Plastic Laminate**:

1. Tops shall be surfaced with plastic laminate sheet, black color through the entire thickness, satin finish, complying with chemical resistant properties in NEMA LD-3.

2. General purpose grade with a thickness of 0.050-inch shall be used for flat tops.

3. Post-forming grade with a thickness of 0.042-inch shall be used on formed tops.

4. Laminate shall be shop-bonded with fully waterproof bond glue to 3/4-inch thick sub-top, hardwood faced plywood, medium density overlaid plywood, or phenolic resin bonded particleboard.

5. Surfaces to which plastic laminate are to be bonded shall be sanded smooth.

6. Standard phenolic backing sheet shall be applied to backs of panels.

7. Exposed edges of tops shall be built up to 1-1/4-inch thickness. Exposed edges of top, splash, and openings shall be self-edged with the same plastic laminate used for tops.

8. Unless otherwise indicated, top and back splash shall be formed of one piece, with intersections coved. Intersections of end splash with top and back splash need not be coved.]

2.5 SINKS, CUP SINKS, TROUGHS

A. **General**:

1. Sizes: Sizes shall be as indicated or manufacturer's closest stock size of equal or greater volume.

2. Outlets: Outlets shall be 1-1/2-inch diameter, 6-inch minimum length, fabricated of silicon iron, cast epoxy resin, stainless steel, glass, or lead; of same material as sink wherever possible.

3. Overflows: Overflows shall be provided for sinks, except cup sinks, of standard beehive or open top type with separate strainer. Height shall be 2 inches less than the sink depth. Overflows shall be of same material as sink.

$# _____

NTS: Select sink type(s) required.

_____ #$

[B. **Cast Epoxy Resin Sinks**:

1. Sinks shall be cast epoxy resin, non-glare black, molded in one piece with surfaces smooth, corners coved and bottom sloped to outlet. Minimum physical properties and chemical resistance shall be as indicated for cast epoxy resin tops. Wall thickness shall be minimum 1/2-inch.]

[C. **Stainless Steel Sinks**:

1. Sinks shall be 18 gauge, stainless steel, Type 304, with No. 4 satin finish. Sinks shall be fabricated with horizontal and vertical corners rounded and coved to at least 5/8-inch radius. Sink bottoms shall be sloped to outlet. Double wall construction shall be provided for sink partitions with top edge rounded to at least 1/2-inch diameter. Weld joints shall be continuous butt type and fixture cutouts shall be prepared at the factory.]

$# _____

NTS: Delete below if not applicable.

_____ #$

[2. Where stainless steel sinks are provided as part of stainless steel tops, sink units shall be welded to tops and ground, polished and finished to produce an integral unit with invisible joint lines.]

$# _____

NTS: Retain below if stainless steel sinks are to be installed in other than stainless steel tops.

_____ #$

[3. Sink units shall be installed with integral rim or sink ring, set in chemical resistant mastic or sealant to form a positive seal with top. A heat-resistant underseal, approximately 1/8-inch thick, shall be applied to undersink surfaces for condensation prevention and sound-deadening.]

[D. **Chemical Porcelain Sinks**: Sinks shall have high temperature fired, completely vitrified, low-porosity chemical porcelain finish applied to cast iron one-piece sink with rounded corner and thickened top flange. Bottom shall be sloped to outlet and outlet hub shall be integral with sink.]

$# _____

NTS: Retain below from cup sink material options, or delete if not required.

_____ #$

[E. **Cup Sinks**:

1. Cup sinks shall be [cast epoxy resin] [spun chemical lead] [glass] [silicon iron] [stainless steel] in sizes and locations as indicated on the drawings. Sinks shall conform to chemical and physical resistance requirements specified for tops.]

$# _____

NTS: Delete below if not applicable.

_____ #$

[2. Where stainless steel cup sinks are provided as part of stainless steel tops, cup sink units shall be welded to tops and ground, polished and finished to produce an integral unit with invisible joint lines. Provide with tailpiece integral with cup sink unit.]

F. **Troughs**:

1. Troughs shall be fabricated from [cast epoxy resin] [stainless steel], as indicated. Trough construction shall conform to requirements for materials and construction as specified for tops or sinks. Pitch to drains shall not be less than 1/8-inch per foot.

[2. Cast Epoxy Resin Troughs: Troughs shall be cast epoxy resin, non-glare black, molded in one piece with surfaces smooth, corners coved and bottom sloped to outlet. Minimum physical properties and chemical resistance shall be as indicated for cast epoxy resin tops. Wall thickness shall be minimum 1/2-inch.]

[3. Stainless Steel Troughs: Troughs shall be 18 gauge, stainless steel, Type 304 with No. 4 satin finish. Troughs shall be fabricated with horizontal and vertical corners rounded and coved to at least 5/8-inch radius. Trough bottoms shall be sloped to outlet. Weld joints shall be continuous butt type.]

$# _____

NTS: Delete below if not applicable.

[4. Where stainless steel troughs are provided as part of stainless steel tops, trough units shall be welded to tops and ground, polished and finished to produce an integral unit with invisible joint lines.]

2.6 MECHANICAL SERVICE FIXTURES

A. **General**: Units shall be provided complete with washers, locknuts, unions, nipples, remote valves, wall and deck flanges, escutcheons, handle extension rods and remote valves, and other accessories necessary to a complete and functioning installation. All units shall be fabricated to withstand test pressures of 100 pounds per square inch, gauge.

B. **Material and Finish**: Service fixtures shall be fabricated from cast or forged red brass containing a minimum of 85 percent copper. Exposed surfaces, including fittings and escutcheons, shall have polished chrome plated finish.

C. **Service Outlet Identification**: Provide colored plastic index discs with embossed identification letters at each service fixture handle or knob. Secure discs to fixture handles to be virtually tamperproof. Color code discs as follows:

Service	Color	Code	Letter Color
Compressed Air	Orange	Air	Black
Natural Gas	Blue	Gas	White
Vacuum	Yellow	Vac	Black
Steam	Black	STM	White
Hot Water	Red	HW	White
Cold Water	Green	CW	White
Distilled (Deionized) Water	White	DW	Black

D. **Ground Key Type Hose Cocks**: Hose cocks shall have tapered core and handle of one piece forged brass, ground and lapped, held in place under constant spring pressure.

E. **Handles**: Four-arm forged brass handles shall be provided for valves, stops, faucets, remote controls, and cocks, except for ground key cocks, steam valves, and micro-adjustable needle cocks.

1. Steam valves shall be provided with heat resistant plastic handles.
2. Micro-adjustable needle cocks shall be provided with knurled brass safety handles.

F. **Needle Valves**: Units shall be provided with renewable self-centering floating cones and renewable seats of stainless steel or monel.

G. **Water Valves or Faucets**: Units shall be provided with renewable barrels locked in the valve bodies. Barrels shall contain all wearing parts, with renewable washers and seats.

H. **Hand of Fixtures**: Right-hand fixtures shall be provided except where "L" is indicated.

$#

NTS: Edit or delete "I" and "J" below as appropriate.

#$

I. **Self-Closing Cocks**: Self-closing valves shall be provided wherever indicated by "SC".

J. **Vacuum Breakers**: Vacuum breakers shall be provided on all water fixtures (hot or cold) equipped with serrated outlets.

$#

NTS: The following Service Fixture Schedule can be used to coordinate the drawings with this Section. The Schedule can be expanded to include more types of fixtures if needed.

#$

2.7 SERVICE FIXTURE SCHEDULE

A. **Ground Key Hose Cocks**: Air, gas, and vacuum service fixtures shall be provided as indicated.

Air-1, Gas-1, Vac-1:	Turret base, single serrated outlet
Air-2, Gas-2, Vac-2:	Turret base, two serrated outlets, 90 degrees
Air-3, Gas-3, Vac-3:	Turret base, two serrated outlets, 180 degrees
Air-4, Gas-4, Vac-4:	Turret base, three serrated outlets
Air-5, Gas-5, Vac-5:	Turret base, four serrated outlets
Air-6, Gas-6, Vac-6:	Single serrated outlet for line mounting
Air-7, Gas-7, Vac-7:	Single serrated outlet, flange for wall mounting
Air-8, Gas-8, Vac-8:	Two serrated outlets, wye flange for wall mounting

2.8 ELECTRICAL SERVICE FIXTURES

A. **General**: Units shall be provided complete with metal housing or box; necessary receptacles, terminals, switches, pilot lights, device plates, and fittings and gaskets required for mounting on casework. All fixtures shall be UL labeled.

B. **Pedestal Type Fixtures**: Pedestal type fixtures shall consist of cast aluminum housing complete with cover plates, neoprene gasket under base, and with receptacles or other devices as indicated. Units shall be fabricated with sloped single face or double face, as indicated, and concealed mounting holes in base for attachment to casework. Holes shall be provided, tapped for conduits.

C. **Line Type Fixtures**: Line type fixtures shall consist of cast metal box with threaded holes for mounting on rigid steel conduit, complete with cover plates, and with receptacles or other devices indicated.

D. **Recessed Type Fixtures**: Recessed type fixtures shall consist of galvanized steel outlet box, size as required, complete with cover plate and receptacles or other devices as indicated.

E. **Cover Plates**: Stainless steel cover plates shall be provided for AC outlets and devices, and laminated plastic plates for DC or combinations of AC and DC outlets and devices.

1. Stainless steel cover plates shall be type 302, satin finish, with formed beveled edges.

2. Laminated plastic cover plates shall be 1/8-inch thick, with white core and black outer laminations.

$# _____

NTS: Coordinate below with fixture schedule descriptions.

_____ #$

F. **Cover Plate Identification**:

1. Clear, permanent identification shall be provided on all cover plates at receptacles, switches, terminal posts and other locations as indicated. Provide 1/4-inch high letters unless otherwise indicated.

   a. All electrical receptacles shall be identified, except standard 125 volt, AC, duplex, grounding type. Indicate voltage and phase.

   b. All switches and thermal overload devices shall be identified. Indicate the specific equipment being controlled (e.g., "FUME HOOD FAN").

   c. All pilot lights shall be identified when located remote from the associated equipment or switch, or where the function is not obvious. The specific equipment or circuit being energized shall be indicated.

2. On laminated plastic cover plates, letters shall be etched through the outer lamination into the white core.

3. On stainless steel cover plates:

   a. Where etched directly on the cover plate, letters shall be filled with black enamel.

   b. Where laminated plastic identification plates are applied, letters shall be etched through the outer black lamination into the white core. Applied identification plates shall be permanently applied and non-removable.

G. **Finishes for Service Fixture Components**:

1. Housings or boxes for pedestal type and line type fixtures shall be provided with manufacturer's standard finish.

2. Painted surfaces shall employ baked-on chemical resistant enamel finish, in color as selected by CONSTRUCTION MANAGER from manufacturer's standards.

3. Ferrous fittings shall be provided with galvanized finish.

H. **Receptacles**: AC receptacles shall be provided for AC circuits. Unless otherwise indicated, receptacles and cover plates shall be [white] [ivory] [brown].

[I. **DC Receptacles**: DC receptacles, terminals and other special outlets shall be provided as indicated.]

J. **Switches**: Single pole, double pole, or 3-way switches shall be provided as required, rated [120] [277] volts AC, and in amperage capacities to suit units served. Provide in color to match receptacles.

1. Pilot lights shall be provided adjacent to toggle switches where indicated as "PL" adjacent to switch identification.

2. Thermal overload switches shall be single pole or double pole, as required, with maximum overcurrent trip setting to suit the particular motor controlled.

3. DC switches shall be single pole or double pole, as required, rated [125] [250] volts DC, and in amperage capacities to suit units served.

$# _____

NTS: The following fixture schedule can be used to coordinate the drawings with this Section. The schedule can be expanded.

_____ #$

K. **Electrical Fixture Schedule**:

1. Receptacles: The following receptacles shall be provided in locations and quantities indicated on the drawings:

AC-1 15 amp, 125 volt, duplex, 3-wire, grounding type
AC-2 20 amp, 125 volt, duplex, 3-wire, grounding type
AC-3 15 amp, 125 volt or 10 amp, 250 volt, duplex, 3-wire, grounding type
AC-4 15 amp, 250 volt, duplex, 3-wire, grounding type
AC-5 20 amp, 250 volt, duplex, 3-wire, grounding type

2.9 MANUFACTURERS

A. Products of the type indicated shall be manufactured by one of the following (or equal):

1. Hamilton Manufacturing Company
2. Kewaunee Scientific Equipment Corporation
3. Taylor Division of American Desk/Kidde, Inc.

PART 3 -- EXECUTION

3.1 CASEWORK INSTALLATION

A. Casework shall be installed plumb, level, true and straight, with no distortions. Shimming shall be accomplished as required, using concealed shims. Where laboratory casework abuts other finished WORK, CONTRACTOR shall scribe and apply filler strips for accurate fit with fasteners concealed where practicable.

B. **Base Cabinets**:

1. Base cabinets shall be set straight, plumb, and level.

2. Sub-tops shall be adjusted within 1/16-inch of a single phase.

3. Each individual base cabinet shall be fastened to the floor at the toe space, with fasteners spaced no more than 2 feet apart on center. Where individual cabinets do not adjoin other cabinets, they shall be secured with not less than two fasteners into the floor.

4. Continuous cabinets shall be bolted together. Where required, units shall be assembled into one integral unit with joints flush, tight, and uniform. Similar adjoining doors and drawers shall be aligned to a tolerance of 1/16-inch.

C. **Wall Cabinets**:

1. Wall cabinets shall be securely fastened to solid supporting material, not wallboard. Wall cabinets shall be anchored, adjusted, and aligned as indicated for base cabinets.

2. CONTRACTOR shall coordinate accurate location and sizing of reinforcement in substrate walls during their erection, as required to properly support wall-mounted cabinets.

D. Casework and hardware shall be adjusted so that doors and drawers operate smoothly without warp or bind. Operating hardware shall be lubricated as recommended by the manufacturer.

3.2 TOP INSTALLATION

A. **Field Jointing**: Where practicable, field jointing shall be accomplished in the same manner as factory jointing, using dowels, splines, adhesives, and fasteners as recommended by the manufacturer. Field joints shall be located as shown on shop drawings and shall be factory prepared so there is no job site processing of top and edge surfaces.

$# _____

NTS: Select from the following methods of fastening based on the top material selected for the project.

_____ #$

[B. **Fastenings**: Chemical resistant plastic laminate tops and stainless steel tops shall be fastened in the following manner:

1. Concealed clamping devices shall be used for field joints, located within 6 inches of fronts, at back edges and at intervals no more than 2 feet apart. Tighten in accordance with manufacturer's instructions, to exert a constant, uniform clamping pressure along the entire joint.

2. Tops shall be secured to cabinets with "Z"-type fasteners or equivalent, using two or more fasteners, front, end, and back.]

[B. **Fastenings**: Epoxy resin tops shall be secured to cabinets with epoxy cement applied at each corner and along the perimeter edges at intervals no more than 2 feet apart.]

C. **Workmanship**: Top and edge surfaces shall be abutted in one true plane, with internal supports placed to prevent any deflection. Provide flush, hairline joints in top units using clamping devices. [At epoxy resin joints, manufacturer's recommended adhesives and holding devices shall be used to provide joint width not more than 1/16-inch wide at any location. Joints shall be completely filled and flush with abutting edges.]

D. Penetration of tops for the purpose of fastening shall be done only with the full knowledge and permission of the CONSTRUCTION MANAGER. Such penetrations shall provide for fasteners to be countersunk approximately 1/8-inch and the hole plugged flush with a material equal in chemical resistance, color, hardness, and texture to the surrounding top surface.

E. After installation of tops, all top surfaces shall be thoroughly cleaned and polished and all surface scratches completely removed. Joints shall be carefully dressed smooth.

F. Holes and cutouts shall be provided as required for mechanical and electrical service fixtures.

G. Scribe moldings shall be provided for closures at junctures of tops, curbs and splashes with walls and other adjacent surfaces, as recommended by the manufacturer of the materials involved. Chemical resistant, permanently elastic sealing compounds shall be used as recommended by the manufacturer.

$# _____

NTS: Delete below if sinks are to be provided integral with the tops. Also select option at "A" for type of sink installation.

_____ #$

3.3 INSTALLATION OF SINKS

[A. **Underside Installation**: Manufacturer's recommended adjustable support system shall be used for table-type and cabinet-type installations.]

[A. **Semiflush Installation**: Stainless steel sink frame shall be used, complete with clamping lugs and pads. Prior to setting, a full coat of manufacturer's recommended sealant shall be applied under the rim lip and along the top.]

B. Top edges of sink units shall be set firmly pressed to the countertop, and shall be set in manufacturer's recommended chemical resistant sealing compound to produce a tight and fully leakproof joint. Sink shall be adjusted and securely supported to prevent movement.

3.4 INSTALLATION OF ACCESSORIES

A. Accessories shall be installed in a precise manner in accordance with the manufacturer's directions. Screws shall be turned to flat seat and not driven. Moving parts shall be adjusted to operate freely without excessive bind.

3.5 CLEANING AND PROTECTION

A. At the completion of the installation, defective WORK shall be repaired or removed and replaced as directed by the CONSTRUCTION MANAGER.

B. Shop-finished surfaces shall be cleaned and touched-up as required. Damaged or soiled areas shall be removed and replaced or refinished to the satisfaction of the CONSTRUCTION MANAGER.

C. **Protection**: CONTRACTOR shall take all procedures and precautions necessary to properly protect the completed installation from damage and soiling by subsequent construction, until final acceptance.

** END OF SECTION **