SECTION 00 01 07
SEALS PAGE

PART 1  GENERAL

ARCHITECTURAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Architect under the laws of the State of Michigan.

____________________________________________________________________________________
Date: ___________________   Registration No.: ___________________

MECHANICAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Architect under the laws of the State of Michigan.

____________________________________________________________________________________
Date: ___________________   Registration No.: ___________________

ELECTRICAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Architect under the laws of the State of Michigan.

____________________________________________________________________________________
Date: ___________________   Registration No.: ___________________

PART 2  PRODUCTS - Not Applicable To This Section

PART 3  EXECUTION - Not Applicable To This Section

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SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

A. Project Identification:  Wayne State University, Engineering Building, 5050 Anthony Wayne Drive, Detroit Michigan 48307

B. Project Summary:

The project is for the interior alteration of 4 rooms totaling approximately 3,891 SF on the second floor of the Engineering Building located on the campus of Wayne State University in Detroit Michigan. The project does not change the occupancy and use which shall remain the same. The work proposed will not alter fire separation boundaries, building structure, exterior envelope, core building elements, wall ratings and egress. The scope of renovation varies by area and is outlined below:

Research Lab 2319 – Partial interior renovation that includes new paint, new flooring, new wall base at casework, new laboratory casework, a new chemical fume hood and modification of all associated exhaust connections, services and utilities to support the new interior configuration. The existing wood casework to remain and shall be cleaned and refurbished. The existing ceiling is exposed and shall remain "as-is" and light fixtures shall remain. Light fixtures and sprinklers to be adjusted as necessary for the new configuration.

Research Lab 2327 - Minor interior renovation as the scope of work is limited to finishes only: new paint, new flooring and new wall base at existing casework. The existing wood casework to remain and shall be cleaned and refurbished. All other elements shall remain "as-is".

Research Lab 2335 - Minor interior renovation as the scope of work is limited to finishes such as new paint, new flooring and new wall base at existing casework. The two existing 8-foot chemical fume hoods shall be replaced with new and receive mechanical work as necessary to achieve certification for an air flow face velocity of 80-100 FPM. Existing damaged ductwork shall be replaced. All other elements shall remain "as-is". Note that Alternate No. 3 only replaces one existing hood with new.

Graduate Student Computer Room 2404 - The scope of work is limited to removal of walls, repair/replacement of lay-in ceiling as an alternate. Base bid is limited to new finishes only: new paint, new ceiling, new flooring and new wall base. All other elements shall remain "as-is". Note that Alternate No. 1 the existing ceiling system is to remain.
In summary, these changes are necessary to refresh the appearance of the spaces to match other recently renovated areas within the building. This project does not change the occupancy, function or means of egress of the spaces. The work proposed will not alter the fire separation boundaries or the building structure. The existing sprinkler system shall remain as is or shall receive some minor reconfiguration to accommodate the installation of new work.

C. Alternates:

- Alternate No. 1: Existing ACT Ceiling System to remain in Room 2404.
- Alternate No. 2: Existing emergency shower and eyewash to remain in Lab 2335.
- Alternate No. 3: (1) Existing fume hood to remain and (1) fume hood to be a standard hood with polypropylene liner in Lab 2335.
- Alternate No. 4: New Exhaust fans for (2) new fume hoods in Lab 2335.

END OF SUMMARY OF WORK
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Quality Monitoring: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Perform quality control procedures and inspections during installation.

B. Standards: Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable high quality Work. Do not permit tolerances to accumulate. Comply with manufacturers’ tolerances and installation requirements.

D. Reference Standards:


2. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

E. Manufacturer’s Field Services: When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.

1. Observe site conditions.
2. Conditions of surfaces, surface preparation and installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Test, adjust and balance of equipment.

F. Complete Installation: Provide all components, accessories and other materials as recommended by product manufacturers for preparation and installation and as necessary in the field for a complete installation.

G. Concealed Conditions and Wall Ratings: Patch and repair as needed.
wall partitions that extend to the underside of structure and existing
wall ratings by providing like construction and filling with appropriate
fillers, fire stopping and sealants.

PART 2  PRODUCTS - Not Applicable To This Section

PART 3  EXECUTION - Not Applicable To This Section

END OF SECTION
SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Security and Protection: Coordinate with the Owner to provide security and protection requirements including the following:
   1. Fire extinguishers.
   2. Site enclosure, barricades, warning signs, and lights.
   3. Environmental protection and dust control.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION
SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Manufactures: Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials and accessories as required by manufacturers of primary materials.

B. Product Selection: Provide products compliant with Wayne State University Construction Design Standards Approved Vendors List and as specified by Architect.

C. Substitutions: Request for substitution must be in writing and requires approval by Owner and Architect. Products submitted for substitution shall be submitted with complete documentation, and include construction costs of substitution including related work. Conditions for substitution include:
   1. Specified material cannot be coordinated with other work.
   2. Specified material is not acceptable to authorities having jurisdiction.
   3. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.

D. Substitution Requests: Substitutions shall be submitted prior to award of contract, unless otherwise acceptable. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless an item is clearly presented as a substitution at the time of submittal.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Substantial Completion: The following are prerequisites to substantial completion. Provide the following.
   1. Punch list completion report prepared by Contractor and subcontractors as applicable.
   2. Supporting documentation.
   3. Warranties.
   4. Certifications.
   5. Occupancy permit.
   6. Start-up and testing of building systems.
   7. Change over of locks.
   8. Commissioning documentation.

B. Final Acceptance: Provide the following prerequisites to final acceptance.
   1. Final payment request with supporting affidavits.
   2. Completed punch list.

C. As-Built Drawings: Provide a marked-up set of drawings including changes, which occurred during construction.

D. Project Closeout: Provide the following during project closeout.
   1. Submission of record documents.
   2. Submission of maintenance manuals.
   3. Training and turnover to Wayne State University’s personnel.
   4. Final cleaning and touch-up.
   5. Removal of temporary facilities.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Cutting and Patching: Provide cutting and patching work to properly complete the work of the project, complying with project requirements for:
   1. Mechanical/electrical systems.
   2. Visual requirements, including detailing and tolerances.
   3. Operational and safety limitations.
   4. Fire resistance ratings.
   5. Inspection, preparation, and performance.
   6. Cleaning.

B. Means and Methods: Do not cut and patch in a manner that would result in
a failure of the work to perform as intended, decrease energy performance, increase maintenance, decrease operational life, or decrease safety performance.

C. Inspection: Inspect conditions prior to work to identify scope and type of work required. Protect adjacent work. Notify Wayne State University of work requiring interruption to building services or Wayne State University’s operations.

D. Performance of Operations: Perform work with workmen skilled in the trades involved. Prepare sample area of each type of work for approval.

E. Cutting: Use cutting tools, not chopping tools. Make neat holes. Minimize damage to adjacent work. Inspect for concealed utilities and structure before cutting.

F. Patching: Make patches, seams, and joints durable and inconspicuous. Comply with tolerances for new work.

G. Cleaning: Clean work area and areas affected by cutting and patching operations.

3.2 GENERAL REQUIREMENTS THAT APPLY TO ALL SPECIFICATION SECTIONS FOR DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials in accordance with manufacturer’s instructions.

B. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer’s printed recommendations.

C. Protect adjacent surfaces during progress of the Work in this Section.

3.3 GENERAL REQUIREMENTS THAT APPLY TO ALL SPECIFICATION SECTIONS FOR PREPARATION, INSTALLATION AND PROTECTION

A. Execution: Examine substrate; report unsatisfactory conditions in writing. Do not begin installation until substrates are within manufacturer’s specified tolerances and have been prepared in accordance with manufacturer’s instructions. Beginning work means acceptance of substrates.

B. Installation:

1. Install materials and systems in accordance with manufacturer’s instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance.
2. Coordinate with work of other sections.

3. Adjust operation, clean and protect.

C. Protection:

1. Protect, inspect and repair work until final acceptance.

2. Touch-up, repair or replace damaged products before Substantial Completion.

3. Furnish complete touchup kit for each type and color of laboratory accessory provided. Include fillers, primers, paints, fabric patches, and other materials necessary to perform permanent repairs to damaged items.

END OF SECTION
SECTION 02 41 19.16
SELECTIVE INTERIOR DEMOLITION

PART 1 GENERAL

1.1 SUMMARY
A. Provide demolition activities. Demolition shall not impact the building structure, building enclosure, building core functions or building egress. Demolition shall be limited to select interior elements, utilities and finishes.

1.2 SUBMITTALS
A. Schedule: Submit for approval selective interior demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

1.3 QUALITY ASSURANCE
A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

1.4 PROJECT CONDITIONS
A. Occupancy: Immediate areas of work will not be occupied during selective interior demolition. Personnel and students may occupy adjacent areas.

B. Existing Conditions: No responsibility for buildings and structures to be demolished will be assumed by the Owner.

PART 2 PRODUCTS

2.1 DEMOLITION APPLICATIONS
A. Demolition:
   1. Application: Salvage of designated items identified in drawings.
   3. Application: Disconnection, capping, and removal of utilities.
   4. Application: Pollution control during building demolition, including noise control.
   5. Application: Removal and legal disposal of materials.
   7. Utilities: Interruption, capping or removal as applicable.
   8. Hazardous Materials: Not known to be present.

PART 3 EXECUTION
3.1 SELECTIVE DEMOLITION

A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed to a storage facility as identified by the Owner. Storage or sale of items at project site is prohibited.

B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.

C. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

D. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

E. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.

F. Restoration: Restore finishes of patched areas.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Provide cementitious underlayment and self-leveling underlayment compound to fill and level existing floor to prep for new flooring system.

B. Related Sections include the following:

1. Division 6, Section “Millwork”.
2. Division 9, Section “Gypsum Board Assemblies”.
3. Division 9, Section “Non-structural Metal Framing”.
4. Division 9, Section “Resilient Base and Accessories”.
5. Division 9, Section “Resilient Flooring”.
6. Division 9, Section “Carpeting”.
7. Division 9, Section “Ceramic Tile”.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cementitious Self-Leveling Underlayment:
2. Type: Low-alkali, cement-based, self-leveling underlayment.
3. Compressive Strength: 4200 psi or higher.
4. Pour Depth: Average 1/4 inch to 1-1/2 inches.
5. Primers: As recommended by manufacturer based on project conditions.
6. Moisture Vapor Control coating: As recommended by manufacturer based on project conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials in accordance with manufacturer’s instructions and approved submittals. Install materials in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install such that the underlayment plus the finished floor results in a finished floor height that is in the same plane and matched with existing flooring in adjacent main building corridor and existing adjacent laboratory. Coordinate with floor finish selection and manufacturer’s data for flooring system depth. The transition between the project area and the adjacent corridor and existing laboratory to be smooth, level and in-plane with no gaps.

C. The installation of the underlayment must be sound, smooth, flat, clean, and permanently dry. In order to ensure that the moisture condition of concrete substrates is within acceptable limits, it is critical that moisture testing be conducted on all concrete substrates, regardless of age or grade level, including those where resilient flooring has already been installed. Conduct three moisture tests: a Calcium Chloride (Moisture Vapor Emission) Test, a Relative Humidity Test, and a pH Test. Performing adhesive bond tests is also highly recommended. Bond testing will aid in identifying both the working characteristics of the adhesive (open time and working time) for the site conditions, and also any potential bonding problems.

D. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION
SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide firestopping at all penetrations through existing fire-rated wall construction as well as all floor penetrations both above and below the area to be renovated. This include all new work as well as filling in any missing firestopping at penetrations by existing to remain.

B. Related Sections include the following:
   1. Division 09, Section "Gypsum Board Assemblies" for wall reinforcing.
   2. Division 22 - Plumbing.
   3. Division 23 – Heating Ventilating and Air Conditioning.
   4. Division 26 – Electrical.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Submit for approval test reports.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.


PART 2 PRODUCTS

2.1 MATERIALS

A. Firestopping Systems:
   1. Manufacturers: 3M Fire Protection Products; e.z. barrier; Henkel Corporation; Specified Technologies Inc..
   2. Applications as Applicable to Assembly: Through-penetrations, fire-resistive joints, perimeter fire containment, smoke seals.
   3. Types as Applicable to Assembly: Endothermic and intumescent
sealants, pillows, putty and wrap strips.

PART 3 EXECUTION

3.1 INSTALLATION

A. Review extent of work with authorities having jurisdiction and obtain approval of installation thicknesses and methods.

B. Sequence work to avoid need for removal of firestopping by work of other trades.

C. Comply with manufacturers’ instructions and recommendations. Securely anchor insulation with safing clips. Install firestopping without gaps or voids.

D. Protect, inspect and repair work until final acceptance.

END OF SECTION
SECTION 07 90 00

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY
   A. Provide joint sealers and fillers.

1.2 SUBMITTALS
   A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
   B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
      1. Include manufacturers' full range of color and finish options if additional selection is required.

1.3 QUALITY ASSURANCE
   A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS
   A. Interior Joints, Limited Movement, Polyurethane:
   B. Interior Joints, Moisture and Mildew Resistant Silicone:
      1. Manufacturers: 3M, Dupont, Dow Corning, Lexan and GE.
   C. Provide sealants in colors as selected from manufacturer's standards.

PART 3 EXECUTION

3.1 GENERAL
   A. As per Specification Section 01 70 00.
   B. Clean and prime joints, and install bond breakers, backer rods and sealant as recommended by manufacturers.
C. Depth shall equal width up to 1/2 inch wide; depth shall equal 1/2 width for joints over 1/2 inch wide.

D. Cure and protect sealants as directed by manufacturers. Replace or restore damaged sealants. Clean adjacent surfaces to remove spillage.

END OF SECTION
SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1  GENERAL

1.1  SUMMARY

A. Provide resilient wall base and accessories: to be applied to the toe kick and perimeter of lab casework, new and existing, in rooms to receive new flooring.

B. Related Sections include the following:
   1. Division 09, Section “High Performance Coatings”.
   2. Division 12, Section “Painted Metal Lab Casework”.

1.2  SUBMITTALS

A. Product Data: Submit manufacturer’s product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

C. Submit extra stock equal to 2% of total used.

1.3  QUALITY ASSURANCE

A. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer’s instructions.

B. Performance: Fire performance meeting requirements of building code and local authorities.

PART 2  PRODUCTS

2.1  MATERIALS

A. (B-2) Resilient Wall Base:
   1. Manufacturers:
      a. Armstrong World Industries.
      b. Nora Rubber.
      c. Flexco.
      d. Roppe.
      e. Johnsonite.
      f. Mannington.
g. Commercial Resilient.
  h. Mercer Products.
  i. NAFCO.
  j. VPI Floor Products.
2. Color: See schedule on architectural plans.
4. Type: TS (rubber, vulcanized thermoset).
5. Style: Straight.
6. Thickness: 0.125 inch
7. Height: 4 inches.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions and recommendations. Install in proper relation to adjacent work.

B. Install base and accessories to minimize joints. Install base with joints as far from corners as practical.

C. Clean, polish, and protect.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Provide non-skid resinous flooring system as shown on the drawings and in schedules. The work shall consist of preparation of the substrate, the furnishing and application of a pigmented epoxy based floor coating system with urethane topcoat. The system shall have the color and texture as specified by the Wayne State University with a nominal thickness of 23 mils. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

1.2 RELATED SECTIONS

A. Division 9, Section “Resilient Base and Accessories”.

1.3 SUBMITTALS

A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
B. Manufacturer’s Material Safety Data Sheet (MSDS) for each product being used.
C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.4 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
E. Comply with NFPA 101.
F. A pre-installation conference shall be held between Applicator, General Contractor and the Wayne State University to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

A. Site Requirements

1. The Applicator shall ensure that adequate ventilation is available for the work area.
2. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

A. Manufacturer shall warrant that material is substantially free from material defects and will perform substantially as per specification and published literature if installed in accordance with the manufacturer's recommended procedures.

PART 2 – PRODUCTS

2.1 FLOORING AND EPOXY COVE BASE


1. System Materials:
   d. Cove Base: Dur-a-Glaze #4 Cove-Rez
   c. Cove Base: Plastic Adhesive Cove strip

1. Patch Materials
2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide system from one of the following:
   b. Sherwin Williams.
   c. Stonhard.

B. Manufacturer of Approved System shall be single source and made in the USA.

2.3 PRODUCT REQUIREMENTS

A. Primer

   Dur-A-Glaze #4 WB

   1. Percent Solids 56 %
   2. VOC 2 g/L
   3. Bond Strength to Concrete ASTM D 4541 550 psi, substrates fails
   4. Hardness, ASTM D 3363 3H
   5. Elongation, ASTM D 2370 9 %
   6. Flexibility (1/4: Cylindrical mandrel), ASTM D 1737 Pass
   7. Impact Resistance, MIL D-2794 >160
   8. Abrasion Resistance ASTM D 4060, CS 17 wheel, 1,000 g Load 30 mg loss

B. Broadcast Coat

   Dur-A-Gard OPF

   1. Percent Solids 100 %
   2. VOC 59 g/L
   3. Compressive Strength, ASTM D 695 16,000 psi
   4. Tensile Strength, ASTM D 638 3,800 psi
   5. Flexural Strength, ASTM D 790 4,000 psi
   6. Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles 35 mg loss
   7. Flame Spread/NFPA-101, ASTM E 84 Class A
   8. Impact Resistance MIL D-3134 0.025 inch Max
   9. Water Absorption, MIL D-3134 Pass
   10. Potlife @ 70 F 20-25 minutes

C. Broadcast Coat and Grout Coat

   Dur-A-Glaze #4 Water Clear

   1. Percent Solids 100 %
   2. VOC 3.8 g/L
   3. Compressive Strength, ASTM D 695 11,200 psi
   4. Tensile Strength, ASTM D 638 2,100 psi
   5. Flexural Strength, ASTM D 790 5,100 psi
   6. Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles 29 mg loss
   7. Flame Spread/NFPA-101, ASTM E 84 Class A
8. Impact Resistance MIL D-24613
   delamination
9. Water Absorption. MIL D-24613
10. Potlife @ 70 F

D. Topcoat
   Armor Top
   1. Percent Solids
   2. VOC
   3. Tensile Strength, ASTM D 2370
   4. Adhesion, ASTM 4541
   5. Hardness, ASTM D 3363
   6. 60° Gloss ASTM D 523
   7. Abrasion Resistance, ASTM D4060
       CS 17 wheel (1,000 g load) 1,000 cycles
   8. Pot Life, 70 F, 50% RH
   9. Full Chemical Resistance

PART 3 – EXECUTION

3.1 GENERAL
   A. As per Specification Section 01 70 00.

3.2 EXAMINATION
   A. Examine substrates, areas and conditions, with Applicator present, for compliance with
      requirements for maximum moisture content, installation tolerances and other conditions
      affecting flooring performance.
      1. Verify that substrates and conditions are satisfactory for flooring installation and
         comply with requirements specified.

3.2 PREPARATION
   A. General
      1. Existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles,
         moss, algae growth, laittance, friable matter, dirt, and bituminous products.
      2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
         a. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with
            installation only after substrates have a maximum 75% relative humidity level
            measurement.
         b. If the relative humidity exceeds 75% then Dur-A-Flex, Inc Dur-A-Glaze MVP Primer
            moisture mitigation system must be installed prior to resinous flooring installation. Slab-
            on grade substrates without a vapor barrier may also require the moisture mitigation
            system.
3. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.

4. Mechanical surface preparation
   a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-4 as described by the International Concrete Repair Institute.
   b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
   c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/8 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
   d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
   e. Expansion Joints (at column lines): Prior to coating application, thoroughly clean joint & remove existing joint material. Protect joint during coating applications to ensure joint remain free of coating product. Install new expansion joint material (sealant on backer rod) after finish coat application process.

5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General

1. The system shall be applied in six distinct steps as listed below:
   a. Substrate preparation
   b. Priming
   c. First broadcast coat application with first chip broadcast
   d. Second broadcast coat with second chip broadcast
   e. Grout coat application,
   f. Topcoat application

2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.

3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.

4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.

5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer
1. The primer shall be Dur-A-Glaze #4 WB Primer that is mixed at the ratio of 1 part resin to 4 parts hardener per the manufacturer’s instructions.
2. The primer shall be applied by 1/8 inch notched squeegee and back rolled at the rate of 200 sf/gal to yield a dry film thickness of 4 mils.

C. Broadcast Coats

1. The broadcast coat shall be applied as a double broadcast system as specified by the Architect.
2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The first broadcast coat shall be applied over horizontal surfaces using the dip and roll, and back roll method at the rate of 300 sf/gal using the Dur-A-Gard OPF material.
5. Chips shall be broadcast to excess into the wet material, Macro chips at the rate of 0.1 lbs/sf, and Micro chips at the rate of 0.15 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
7. Scrape the floor with a trowel or floor scraper. Sweep and vacuum the floor again.
8. Apply a second broadcast coat of resin shall be applied by flat squeegee then back rolled with a coverage rate of 200 sf/gal with the Dur-A-Glaze #4 Water Clear material.
9. Chips shall be broadcast to excess, Macro chips at the rate of 0.1 lbs/sf, and Micro chips at the rate of 0.15 lbs/sf.
10. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.
11. Scrape the floor with a trowel or floor scraper. Sweep and vacuum the floor again.

D. Grout Coat

1. The grout coat shall be comprised of a Dur-A-Glaze # 4 Water Clear material that is mixed in the ratio of 1 part hardener to 2 parts resin and installed per the manufacturer’s recommendations.
2. The grout coat shall be squeegee applied and back rolled with a coverage rate of 150 sf/gal.

E. Topcoat

1. The topcoat of Armor Top shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin and hardener that is mixed at the ratio of 4 parts hardener to 1 part resin and bag of grit per the manufacturer’s instructions.
3. The finish floor will have a nominal thickness of 40 mils.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
   a. Temperature
1. Air, substrate temperatures and, if applicable, dew point.
   b. Coverage Rates
      1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

   A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

   B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SPECIFICATION
SECTION 09 91 00

PAINTS

PART 1 GENERAL

1.1 SUMMARY

A. Provide painting and surface preparation.

B. Related Sections include the following:
   1. Division 09, Section "Gypsum Board Assemblies" for wall reinforcing.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
   1. Include manufacturers full range of color and finish options if additional selection is required.

C. Extra Stock: Submit 1 unopened gallons of each paint and color used in the project.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: Compliance with VOC and environmental regulations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Painting – Walls and Ceiling: interior wall and ceiling surfaces.
   1. Manufacturers:
      a. Sherwin Williams.
      b. Pratt & Lambert.
      c. Benjamin Moore.
      d. ICI Paint Stores.
      e. PPG Architectural Finishes.
   2. Primary Coating Type: Low VOC Latex based paints.
4. Gypsum Board Walls Color and Finish: Semi-gloss finish, see schedule on architectural plans.
5. CMU Walls Color and Finish: Eggshell finish, see schedule on architectural plans.

B. Painting – Interior Steel Doors, Frames and Radiator Covers:
   1. Manufacturers:
      a. Sherwin Williams.
      b. Pratt & Lambert.
      c. Benjamin Moore.
      d. ICI Paint Stores.
      e. PPG Architectural Finishes.
   2. Primary Coating Type: Alkyd based enamel paints.
   3. Primary Paint Systems: Rust-inhibiting primer plus two finish coats, sprayed application.
   4. Color and Finish: Satin finish, for color see schedule on architectural plans.

C. Fire Rated Assemblies: New and Existing.
   1. Paint “ONE HOUR RATED in stencil form with letters not less than 1.5” in height and the color red on a white or existing light contrasting background 12” below ceiling/floor deck every 10 feet of continuous wall surface and not less than once in each room adjoining the wall.

PART 3 EXECUTION

3.1 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.

C. At existing areas to be repainted, remove blistered or peeling paint to sound substrates. Remove chalk deposits and mildew and wash all surfaces with mild detergent. Perform related minor preparation including caulk and glazing compounds. Spot prime bare areas before priming and painting as specified.

D. Re-coat or remove and replace work which does not match or shows loss of adhesion. Clean up, touch up and protect work.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers: provide one new extinguisher near each lab entry door, except in locations where an existing extinguisher is already present. Provide one new extinguisher near the new emergency shower in Lab 2319 as shown on sheet A103, an additional extinguisher near the door is not needed in Lab 2319.

1.02 REFERENCES

A. American Disability Act (ADA)

ADA Accessibility Guidelines (ADAAG)

B. American Society for Testing and Materials (ASTM)

A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

C. Federal Standard (FED-STD)

FED-STD-795 Uniform Federal Accessibility Standards (UFAS)

D. National Fire Protection Association (NFPA)

NFPA 10 Portable Fire Extinguishers

E. International Building Code (IBC)

F. International Fire Code (IFC)

1.03 SUBMITTALS

A. Submit brochure and product data.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10.
B. Fire Extinguishers: Listed and labeled by Underwriter’s Laboratory (UL) or Factory Mutual (FM) for type, rating, and classification.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 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. Ansul Inc.
2. Larsen’s Manufacturing Co.
3. Potter Romer
4. JL Industries

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A1008/A1008M, commercial quality, stretcher leveled, temper rolled.

2.03 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

1. Product: A 10-lb, multi-purpose, UL listed, dry chemical fire extinguisher with a minimum rating of 4-A:40-B:C..

B. Mounting Brackets: Manufacturer’s standard steel bracket, designed to secure extinguisher, of sizes required for types and capacities of fire extinguisher indicated, with plated or baked-enamel finish.

C. Fire extinguishers installed outside shall be located in approved weather-tight fire extinguisher cabinets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

3.02 INSTALLATION OF FIRE EXTINGUISHERS
A. Comply with manufacturer’s written instructions for installing fire extinguishers and mounting brackets.

B. Mounting Height: Install extinguishers at heights indicated below.

1. Install fire extinguishers mounted on hangers or brackets attached to a wall so that the top of the fire extinguisher is not more than 3½ ft. above the floor.

2. In no case shall the clearance between the bottom of the fire extinguisher and the floor be less than 4 inches.

C. Locations: Install extinguishers at locations indicated below.

1. Install fire extinguishers at locations specified on the drawings or as directed by the authority having jurisdiction.

2. Fire extinguishers shall be conspicuously located, along normal paths of travel, including exits from areas. Extinguishers shall not be obstructed or obscured from view.

D. Verify that the extinguisher operating instructions face outward.

3.03 SIGNAGE

A. Identify bracket-mounted extinguishers with the words “FIRE EXTINGUISHER” in red letter decals applied to wall surface.

END OF SECTION
SECTION 11 53 13
LABORATORY FUME HOODS

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. Work includes providing laboratory fume hoods complete with factory installed wired and
   piped service fixtures, installation of fume hood controls, as indicated on Drawings and
   coordinated with laboratory casework specified in Division 12.

B. **Base Bid:** Provide (1) standard chemical fume hood and (1) special polypropylene hood.

C. **Alternate No. 3:** Keep existing standard chemical fume hood and replace (1) special
   polypropylene hood with a standard chemical fume hood with special exceptions for a
   polypropylene liner and a polycarbonate panel for the sashes.

D. Related Sections:

   1. Division 11, Section "Laboratory Service Fixtures" for service fixtures indicated on the
      Drawings shall be factory supplied and installed as part of the work of this Section,
      including all internal piping, pipe insulation, pipe sizing, pipe types, and wiring to
      termination points approximately 2 inches above ceiling.

   2. Division 12, Section "Metal Laboratory Casework".

   3. Divisions Divisions 22, 23, 25, 26 and 27, Sections for connecting service utilities at indicated
      point and final connections to Building Services.

   4. Division 23, Section "HVAC" for furnishing fume hood controls.

   5. Division 25, 26 and 27, Sections for electrical connections of fume hoods.

   6. Drawings for "Finish Schedule" for color and material selections as listed in Laboratory
      Component.

1.3 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods with the following performance ratings at a face velocity
   of 100 fpm (0.51 m/s) and a tracer gas release rate of 4.0 L/min. when tested according to
   ASHRAE 110:
1. As-Manufactured Rating: AM 0.05 (0.05 ppm) (shade as default standard).
2. As-Installed Rating: A1 0.05 (0.05 ppm).

B. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:

1. Fume Hood Base Cabinets and Stands: refer to Division12, Section “Painted Metal Laboratory Casework” for structural performance requirements.

C. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure. Design fume hoods so that, when connected to exhaust system that provides proper exhaust volume under normal laboratory conditions, fume hoods will operate in a safe, efficient manner, within acceptable tolerances for face velocities specified. Dead air pockets and reverse air currents will not be permitted along surface of hood interiors.

D. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums with sash in full open safe operating position:

<table>
<thead>
<tr>
<th>Face Velocity</th>
<th>Measured S.P.L. (W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 F.P.M.</td>
<td>.30 inches</td>
</tr>
</tbody>
</table>

E. Constant volume fume hoods shall maintain essentially constant exhaust volume at any sash position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any sash position at the specified face velocity.

F. Average Illumination of Work Area: Minimum 80 foot-candles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches.

1.4 SUBMITTALS

A. Product Data: For each type of laboratory fume hood specified. Submit manufacturer’s data for each component. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.

B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate locations of blocking and other supports required for installing fume hoods.
2. Indicate locations and types of service fittings, together with associated service connections required.
3. Indicate plumbing connections, duct connections, electrical connections, and locations of access panels.
4. Include roughing-in information for mechanical, plumbing, and electrical connections.
5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
6. Coordinate shop drawings with other work involved.

C. Samples: Submit 3 x 6 inch samples of finish for fume hoods, work surfaces and for other pre-finished equipment and accessories.

D. Operation and Maintenance Manuals: Submit bound manual with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information.

E. Instructions to be inscribed on instruction plate to be attached to hood, as specified in Part 2 of this Section.

F. Professional quality video - minimum 15 minutes in length on proper hood usage.

G. Test Reports: Submit test reports on each size and type of hood verifying conformance to test performances specified. Test report must accompany each hood as part of installation and usage package. Submit independent test reports as required by specification.

1. Provide fume hood face areas and volume of exhaust air at indicated face velocity, at hood sash stop position, and maximum sash opening. Also, provide fume hood face area and volume at sash minimum (closed) position.

H. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 110 fpm face velocity.

1.5 QUALITY ASSURANCE

A. Manufacturer shall identify and designate a full time factory representative for on-site supervision and coordination during the installation of fume hoods and all components.

B. Except for products specified to be manufactured by specific manufacturers, all other fume hoods shall be from the same manufacturer.

C. Provide and install service fixtures in laboratory fume hoods, manufactured or furnished by laboratory fume hood company for single responsibility.

D. Fume hood construction and performance including all electrical and mechanical components shall be designed in accordance with all applicable IBC, OSHA, NFPA and NEC.

E. Fume Hood Standard: Provide fume hoods complying with the requirements of SEFA 1.1, "Laboratory Fume Hoods - Recommended Practices".

F. Installer's Qualifications: Factory certified by the manufacturer.
G. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR, part 1201 for Category II materials.
   1. Subject to compliance with requirements, permanently mark safety glass with certification label of SGCC or another certification agency acceptable to authorities having jurisdiction.
   2. Alternate No. 3: Provide polycarbonate in lieu of safety glass for fume hood sashes.

H. Fume Hood Liner: Provide liner material with a flame spread rating at 25 or better in accordance with ASTM-E84.

I. Manufacturer's Qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and fume hoods, and shall meet the following minimum requirements:
   1. Five years or more experience in manufacture of laboratory casework and fume hoods of type specified.
   2. Ten installations of equal or larger size and requirements.

J. Demonstrate fume hood performance before shipment by testing according to ASHRAE 110. Provide testing facility, instruments, equipment, and materials needed for tests.
   1. Submit test reports as specified under Submittals.

1.6 PRODUCT HANDLING

A. Coordinate delivery of fume hoods with delivery of other laboratory casework components.

B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.

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

1.7 COORDINATION

A. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

B. Do not deliver or install equipment until the following conditions have been met:
   1. Windows and doors are installed and the building is secure and weather tight.
   2. Ceiling, overhead ductwork and lighting are installed.
   3. All painting is completed and finished flooring located below casework is installed.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide fume hoods from one of the following:

1. Labconco Corporation.
3. BMC National Products.
5. Mott Manufacturing.

B. Subject to compliance with requirements, provide special fume hoods by specific manufacturers in locations and with services as indicated on drawings. The manufacturer and model number indicated on drawings is to be used as minimum product standard. Provide products of the following manufacturers:

1. Provide polypropylene bench-top fume hoods designed and constructed to withstand the use of corrosive acids. Provide hoods with benchtops that will rest on fume hood base cabinets, as indicated on lab equipment drawings.
   a. Nuaire, Inc., NU-162, all polypropylene conventional fume hoods. Note: Provide benchtop model with polypropylene construction including benchtop and cupsink, existing base cabinets to remain.

2. FUME HOOD MATERIALS

A. Fabricate laboratory fume hoods from materials specified herein and as indicated on drawings.

B. Fume Hood Materials:

1. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 1008/A (ASTM A1008M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

2. Stainless-Steel Sheet: ASTM A 666, Type 302 or Type 304, stretcher leveled, No. 4 finish.

3. Metal Finish: Manufacturers standard electrostatically applied urethane baked-on powder coating. Metal finish shall be acid and alkali resistant with a hard smooth satin furniture quality finish. Color selections shall be as listed in the Laboratory Component Finish Schedule on drawings.

4. Interior Liners: Provide fume hood interior liner panels as specified herein and as indicated on drawings.
   a. Glass-Fiber-Reinforced Polyester (Poly-Resin): Polyester laminate complying with ASTM D 4357, with a chemical-resistant gel coat on the exposed face, and have a flame-spread index of 25 or less when tested according to ASTM E 84. The finish shall be smooth and have a white color in appearance. Thickness not less than ¼ inch.
b. Alternate No. 3: Provide polypropylene interior liner, white in color.

5. Work Surfaces: Provide fume hood work surfaces as specified herein and as indicated on drawings.
   a. Unless otherwise indicated on drawing, work surfaces (tops) shall be epoxy resin as specified in Section 11622, "Laboratory Accessories".
   b. Alternate No. 3: Provide polypropylene benchtop and cupsink.

6. Laminated Safety Glass: ASTM C 1172, Kind LT; Kind FT; Condition A, Type 1, Class 1, Quality q3 lites with clear, polyvinyl butyryl interlayer. Thickness 7/32".
   a. Alternate no. 3: Provide polycarbonate in lieu of safety glass.


2. 3 FUME HOOD COMPONENTS

   A. Fabricate laboratory fume hoods from components specified herein and as indicated on drawings.

   B. Ceiling Closure panels: Minimum 18 gauge; finish to match hood exterior.

   C. Bypass Grilles: Low resistant type, 18 gauge steel, upward directional louvers.

   D. Sash Cables: Stainless steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)

   E. Sash Guides: Corrosion resistant poly-vinyl chloride.

   F. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tired-not acceptable).

   G. Sash Pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.

   H. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

   I. Instruction Plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings and use of sash.

   J. Piping: All fume hood piping and insulation materials, and construction methods are to conform to the Mechanical Specifications, Division 15.

   K. Filters and Housings: Where called for, a filter housing shall be provided as an accessible component within the exhaust duct. The housing shall form a ridged, self-supporting assembly and have a casketed front cover to allow the replacement of the filters without disturbing the
ductwork. The design and installation of the filter and housing is to conform to the Mechanical Specifications, Division 15.

L. Fume Hood Face Velocity Sensors and Safety Monitor Alarms: To be provided by Siemens.

1. Provide fume hood manufacturers standard safety monitor/alarm system which monitors face velocity and provides audible and visual alarm if face velocity drops below safe levels. The technology shall be based on thermally compensated thermistor based in the alarm module. As the internal fume hood pressure changes as the sash opening is closed and opened, the flow passing over the thermistor is calibrated to a face velocity which is displayed on the front of the monitor.

2. Safety Monitor: UL listed, tamper proof, with all alarm circuits, electric components, external tubing, and manifolds furnished complete and factory installed. The monitor shall have light emitting diode and digital LCD display which provides clear indication of airflow conditions.

3. Calibration shall not accrue until the hood is stationed and the hood exhaust and room supply systems are balanced. A secondary calibration has been factory set into the alarm’s memory only to determine that the alarm is functional and ready for shipment. The primary calibration must be completed in the field.

4. Airflow Sensor: Thermally compensated glass-beaded thermistor, factory connected to a side-wall port on the interior of the fume hood.

5. Alarm Signal: Audible signal and a visual digital LCD display.
   a. Mute pushbutton, which disables the audible alarm, shall be accessible on the front of the safety monitor.
   b. Provide alternate mode in which audible alarm is silenced indefinitely but visual alarm remains activated until the alarm condition is corrected.
   c. When alarm condition is corrected and face velocity and volume return to specified levels, then the Safety Monitor will automatically reset and begin routine monitoring.

6. Provide test circuit to verify proper Safety Monitor operation.

7. Electrical Rating: Maximum 12 VDC, and maximum current rating of 200MA.

M. Lights: Provide each hood with a two-tube, fluorescent light fixture of longest practicable length with lamps maximum 4'-0" and ballasts included. Shield light fixture from hood interior by 1/8" thick tempered glass panel, sealed air tight into hood body with chemical resistant rubber channels. Set units so that fluorescent tubes are easily replaceable from outside hood through access panel. Provide only fixtures with components which carry UL label.

1. Interior of Fixture: White, high reflecting plastic enamel.

2. Provide two 36" fixtures for hoods with eight foot superstructures.

3. Include lamps with fixtures.
4. Illumination: Per performance values, Part 1 of this Section.

5. Fluorescent Ballasts: Energy saving, 120 volt, high power factor, non-PCB, Class "P" approved. Individually fuse with Bussmann Type GMF fuses in HLR holders. Fuses shall be accessible from outside the fixture chassis. Use fuse rating as recommended by fixture manufacturer. Furnish fixtures with ballasts having a NEMA sound rating of "A" or better. All ballasts shall match the lamps specified.
   a. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
      1) Advance
      2) Valmont
      3) Fyrnetics
      4) Magnetek

6. Fluorescent Lamps: Type F32T8/SP35, 32 watt lamps with 2850 initial lumen output, T-8 rapid start, unless otherwise indicated or specified in the fixture specification.
   a. Provide fluorescent tubes with a color temperature of 3500 K and a minimum color rendering index of 85.
   b. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
      1) General Electric Trimline
      2) Sylvania - Octron

N. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes.

O. Service Fittings: Comply with requirements of Division 11 Section 11621, "Laboratory Service Fixtures and Safety Equipment".
   1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on coating.

2. 4 FUME HOOD CONSTRUCTION

   A. General: Design hoods to be highly fume resistant, for collection, retention and disposal of hazardous fumes with complete safety, minimum purging of air from room supply and minimum turbulence within hood chamber.

   B. General: Provide benchtop fume hoods utilizing moveable sash configurations as indicated on drawings. Hoods shall operate on a variable or constant volume of exhaust air and incorporate a by-pass above the sash and at the sill to avoid dead air pockets at min-flow.

   C. Framework: Heavy-gage steel members, reinforced, braced, assembled, and of sufficient size to insure strength and rigidity. Framework shall support exterior sheet metal cover, sash, hood liner, and all piping and wiring.
D. Body Construction: Fabricate exterior of minimum 18 ga. cold-rolled steel with component parts screwed together to allow removal of end panels, front end fascia pieces, top fascia and airfoil, and to allow access to plumbing lines, service fixtures and light fixtures (for relamping). Apply manufacturer's standard acid and alkali resistant baked-on finish to interior and exterior surfaces of component parts prior to final assembly. Color selections shall be as listed in the Laboratory Component Finish Schedule on drawings.

E. End: Double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even flow of air. Enclose area between double walls for housing sash counter-balance weights, utility lines, and remote control valves, access ports, as required. Nominal and panel thickness shall be 5”.

F. Interior Lining: Use polyresin for exposed interior surfaces unless otherwise specified. Use stainless steel for fasteners and other exposed metal. Furnish end panels, back panel, and top of not less than ¼” thick material, screwed together with cleats or steel angles to form a completely rigid assembly to which exterior cold-rolled steel panels are mounted.

1. Back-up joints with angles or cleats and coat joints with chemical resistant mastic before assembly to prevent open joints or spaces. Use stainless steel truss head screws or rivets (not countersunk) for assembly of panels and to provide maximum strength joints. Secure hood baffle to cleats at rear of hood with stainless steel screws.

2. Punch hood side panels to receive remote controls and service fixtures at side of hood, as indicated. Furnish removable plug buttons for holes not used for indicated fixtures.

G. Provide exterior top enclosure panels as detailed on drawings.

H. Provide access panels in face of hood to permit relamping of light fixtures.

I. Working Surface: Unless otherwise specified, provide a working surface (counter) of epoxy resin. All working surfaces shall be provided with a ¼” thick raised edge across front, sides, and rear of hood, to make a watertight retaining ledge.

J. Rear Baffle: Provide adjustable baffle at rear of hood with adjustments permitting settings for one (1) high thermal loading, (2) heavier than air gases or fumes generated near work surface, and (3) normal or average operation. Baffle shall provide adjusted flow of air through hood to compensate for type of gas, apparatus, or heat source used. Unless otherwise specified, fabricate unit to be easily removable for cleaning behind baffle. Baffles shall be fabricated at same material as interior liner.

1. Provide acid resistant label indicating proper baffle operation. Locate label on hood near baffle lever.

K. Fume Hood Opening: The top and sides of fume hood openings shall be provided with splayed or radius face to provide a smooth, aerodynamic flow of air into the fume hood. The bottom of the opening shall be provided with the manufacturer’s standard airfoil or flush sill incorporating by-pass air functions, as indicated on Drawings. The flush sill shall be mounted on the fume hood and shall extend under the sash line. Sills shall be designed to direct exhaust air flow across the work surface to prevent backflow and eddy currents. Sill shall be
provided with a nominal 1" linear opening to facilitate air flow and for passage of electrical chords from hood interior to electrical receptacles on side rails.

L. Exhaust Connection: The fume hood shall be provided with an integral exhaust plenum and a single connection for exhaust air. Provide 304SS transition piece from hood plenum to building exhaust ductwork, unless otherwise noted. Coordinate exhaust connections with mechanical trades.

1. Plenum Chamber: Adequate volume for hood dimensions, extending full width of hoods to equalize air flow, of corrosion resistant material.

M. Postless Sash: Provide manufacturers standard sash frame for sash type indicated on drawings. Glaze with safety glass set into chemical resistant rubber glazing channels, held in place by removable stops.

1. Fabricate horizontal sliding sash with adjustable nylon-tired, ball-bearing sheaves on stainless-steel track. Sash shall by-pass and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash.

2. Fabricate vertical sliding, independently operable, double-hung sashes with concealed counterbalance to hold sashes in place regardless of position. Counterbalance vertical sliding sash with weight and stainless-steel cable system. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit. Pull required to raise or lower sash shall be less than 7 pounds. Provide rubber bumpers at top and bottom of each sash unit. Vertical sash glides and guides shall be Accuride.

3. Fabricate combination sash configurations as specified for horizontal and vertical sliding sash, and as indicated on drawings.

N. Sash Stops: Provide fume hoods with sash stops integral with hood frame to limit hood opening as indicated on drawings. Sash stops can be manually released to open sash fully for cleaning hood and for placing large apparatus within hood.

O. Utility Preparation: Fume hoods shall be completely prepiped and prewired with all vacuum breakers, valves and outlet fittings factory mounted. Prewiring of the hood shall terminate in junction boxes mounted on the top of the fume hood. Prepiping of the hood shall include extension of piping from the top of each side of the fume hood to the service valve and then to the service outlet and also include waste vent piping for cup sinks fitted in hoods. NOTE: Low pressure steam connections to fume hoods shall be from service chase, not overhead.

P. Fume Hood Face Velocity Sensors and Safety Monitor Alarms:

1. Fume hoods shall be fitted with factory mounted alarm and face velocity sensors, whether supplied by the fume hood manufacturer or supplied by the Laboratory Controls Supplier. The hoods shall be fabricated and equipped with all wiring, conduits, and electrical boxes required. Provide wiring in accordance with control unit manufacturer’s instructions to a junction box at top of hood. The alarm units shall be flush mounted.
Q. Closure Strips: Wood or metal, as applicable, to match adjoining surfaces. Provide where required to close openings between fume hood base cabinet and superstructure and adjacent building wall or ceiling construction.

R. Holes: Provide holes as indicated and as required for passage of piping, ducts, and conduit, and for fixtures furnished under other Division-12 sections.

S. Fasteners: Provide stainless steel for fasteners wherever exposed to fumes in hood.

T. Cup Sink: Furnish for each hood having water supply, provide of same material as hood working surface, size and configuration as indicated.

U. Vacuum Breakers: All required vacuum breakers shall be visible and be mounted outside of the working space on the front of fume hood above the level of the sash opening.

V. Service Fittings: Provide in accordance with fitting schedule. No valve operator shall be located inside the fume hood working space. Valves shall align vertically and horizontally with outlets where possible.

1. The color of Service Fitting Outlets in the hood interior shall match the color of the valve handle on hood exterior.

W. Access Panels: Provide interior gasketed, access panels in fume hood side walls for access to concealed piping. Access panels area to be of same material as hood liner.

2. 5 FUME HOOD PHYSICAL STYLES

A. Fabricate and provide laboratory fume hoods in the physical styles as specified herein and as indicated on drawings. Fume hoods are located, identified, described, and detailed on the drawings. The physical style of each fume hood is indicated on drawings.

B. The following lists fume hood physical styles of fume hoods for this project:

1. Benchtop: Benchtop fume hoods shall be designed to accommodate laboratory activities at normal benchtop height.

2. 6 FUME HOOD OPERATING TYPES

A. Fabricate laboratory fume hoods that operate as specified herein and as indicated on drawings. Fume hoods are located, identified, described, and detailed on the drawings. The operating type of each fume hood is indicated on Drawings.

B. Constant Volume Fume Hoods: Provide fume hoods that operate on a constant volume of exhaust air regardless of sash position. Provide fume hoods with an automatic compensating bypass above sash, which opens as sash is closed. As sash is lowered to a closed position, bypass design shall limit the increase in face velocity.
3.1 INSTALLATION

A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install plumb, level, aligned, and securely anchored to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where hoods abut other finished work, apply filler strips and scribe for accurate fit with fasteners concealed where practical.

B. Comply with requirements of Divisions 11, 15 and 16 Sections for factory installation of water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods and casework, unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Field Test: Field test 10% of installed units as selected by Architect after completion of installation to verify proper operation of hoods in accordance with specified requirements. Perform tests in accordance with ASHRAE Standard 110 after balancing of building air handling system is completed. The maximum allowable leakage rate during the tracer gas test is 0.05 parts-per-million (ppm) at a release rate of 4.0 liters per minute (1 pm) at the breathing zone. If the fume hood leakage rate is less than or equal to 0.05 ppm at 4.0 1pm release rate, then its performance is acceptable.

1. Notify Owner’s Representative a minimum of one week prior to start of testing to make arrangements to have Owner’s Representative present during testing.

2. In addition to the basic 10% of units tested, test one hood selected by Architect, for each type of hood installed, according to ASHRAE 110 to verify performance. If any hood tested for performance fails to perform as specified, field test additional hoods as directed by Architect.

3. Field adjust fume hoods, in conjunction with a tuned building exhaust and HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.

4. After making corrections, retest fume hoods that failed to perform as specified.

3.3 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near-silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Repair or remove and replace defective work as directed on completion of installation.

C. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION
FumeGard NU-162

conventional fume hood

The FumeGard NU-162 is built primarily of stress-relieved polypropylene to which NuAire has added anti-oxidizing agents and UV stabilizers. This increases tensile strength and improves thermal characteristics. NU-162 has a single piece airfoil across the bottom of the work access opening. As the sash is lowered, the face velocity increases rapidly. Fumes, gases, vapors, aerosols, and particulate are drawn through vents by an exterior exhaust duct. “Double wall” construction forms the plumbing chase for routing and connecting all services. This compartment is under negative pressure to minimize fume build-up.

NU-162 FumeGard has been independently tested to meet and exceed the requirements of ASHRAE Standard 110-1995 and is SEFA 1-1992 certified.

Available in polypropylene, PVC, CPVC, Flame Retardant Polypropylene, PVDF, HDPE or Teflon® construction.
Includes fume hood base cabinet. The leg levelers, easy-to-clean handles, hinges and screws are all made of polypropylene. Each solid polypropylene door has adjustable ventilation air vents and is secured with an easy-to-open concealed magnetic latch.

** For electrical connections PVC junction box is provided.
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

   This Section includes laboratory safety equipment including emergency eyewashes, showers
   and other related products.

   A. Extent and types of safety equipment as indicated on Laboratory Equipment drawings.

   B. Provide safety equipment as specified herein and as indicated on Laboratory Equipment
      drawings.

   C. Related Sections include the following:

      1. Division 11, Section “Fume Hoods”.

      2. Division 11, Section 116622 “Laboratory Accessories”.

      3. Division 12, Section 12352, “Painted Metal Laboratory Casework”.

      4. Divisions 22 and 26 for plumbing and electrical requirements.

      5. Divisions 20, 22, 23, and 26 for final connections to building services and systems.

1.3 PERFORMANCE REQUIREMENTS

   A. General Performance and Chemical Resistance: Provide certification that fixtures and fittings
      have been tested in accordance to and meet the performance requirements as described in
      SEFA 7.

1.4 SUBMITTALS

   A. Product Data: Submit manufacturer’s data and installation instructions for each type of
      emergency fixture.

      1. Include independent laboratory certification that applied finish complies with specified
         chemical and physical resistance requirements.
1.5 EXTRA MATERIALS

A. Provide to Owner a complete touch-up kit for surface repair of emergency fixtures. Provide an air-drying aerosol or liquid coating specially formulated to match the coating color which can be applied in the field to repair coated surfaces.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: All laboratory safety equipment, including those provided as an integral part of other laboratory equipment such as fume hoods, shall be the product of one service fixture manufacturer, unless specified otherwise.

B. All fixtures shall be in accordance with IBC, NFPA and OSHA for the intended use.

C. All fixtures for water service shall meet the requirements of ANSI/ASME A112.18.1M-1989 and be certified by the Canadian Standards Association (CSA) under Standard CAN/CSA B.125.M89.

D. All emergency eye wash and shower equipment shall be certified to comply with ANSI Z358.1.

E. ADA fixtures shall comply with the requirements of Section 309.4 of ANSI/ICC A117.1, where a fixture is to be ADA compliant, the maximum force required to open or close a manually activated fitting shall not exceed 5 lbs.

2.1 APPROVED MANUFACTURERS

A. All mechanical laboratory service fixtures shall be the product of one of the following:

1. Water Saver Faucet Co.
2. Chicago Faucet
3. Far laboratory Faucets Ltd.

2.2 FABRICATION; GENERAL

A. All laboratory service fixtures shall have the construction and shall meet the performance requirements set forth in this specification. Fixture types shall be as indicated in the fixture schedule on the Laboratory Equipment drawings and fixture details as an attachment to this specification.

B. Emergency Fixtures: Provide all emergency fixtures factory assembled, including the assembly of all valves, flanges, and other mounting accessories. Individually factory test each fixture and provide all fixtures complete with washers, locknuts, unions, nipples and other accessories.

C. Material and Finish: Fabricate service fixtures from cast brass containing a minimum of 85% copper or forged brass containing a minimum of 60% copper.
1. Safety equipment as follows:
   a. Satin Chrome Finish with Clear Epoxy Coating: Emergency eyewash. All components shall be polished and electroplated with one layer of nickel. Exposed surfaces shall then be further polished to an AISI No. 6 brushed finish which is fine-grained and uniform. Components shall then be electroplated with one layer of chrome. Following chrome plating, surfaces to be coated shall be cleaned and degreased. Following plating and cleaning a clear epoxy coating shall be applied to all exposed surfaces and fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.

D. Safety Equipment:
   1. Signage: Provide signage identifying shower location.
   2. Dual Purpose Eye Wash/Drench Hose Units: Deck mounted eye wash/drench hose units shall be capable of use as a fixed eye wash with hands-free operation or as a drench hose. Units shall have two Gentle Spray outlet heads mounted parallel and angled forward, each with a self-regulating volume control, reticulated polyurethane filter and removable spray cover. Dust covers shall be hinged swing-away style and shall be permanently attached to the spray head with a stainless steel pin. Units shall be furnished with a deck flange with locator guide to hold the unit facing forward and an 8 ft. reinforced PVC hose.
   3. Emergency eyewash units shall have the following:
      a. Controlled, low velocity flow completely rinses eyes and face and is not injurious to user.
      b. Hands free stay open ball valve activating within one second or less.
      c. Eyewash unit must be capable of delivering at least 0.4 gpm for 15 minutes.
      d. The nozzles must be protected from airborne contaminants.
   4. Emergency eyewash and shower combination units shall have the following:
      a. Controlled, low velocity flow completely rinses eyes and face and is not injurious to user.
      b. Hands free 1" IPS brass stay open ball valve activating within one second or less.
      c. Eye/face wash unit must be capable of delivering 3.0 gpm for 15 minutes.
      d. The nozzles must be protected from airborne contaminants.
      e. The height from the floor to the nozzles must be between 33 inches and 45 inches.
      f. The distance from the wall (or an obstruction) to the nozzles must be a minimum of 6 inches.
   5. Accessories and Options: Provide a shower curtain and track as part of the shower fixture.

PART 3 - EXECUTION
3.1 INSTALLATION OF SERVICE FIXTURES

A. Install in a precise manner in accordance with manufacturer’s directions. Adjust moving parts to operate freely without excessive bind.

B. Follow the manufacturer’s recommended test and working pressures for fittings. Testing or using a fitting at pressure for which it is not designed can result in leakage or failure.

C. Provide all interconnecting conduit, wiring, and devices to junction box for final connection to building systems by Electrical Trades Contractor.

3.2 REPAIRING, CLEANING, AND PROTECTION

A. Repairing: Repair or remove and replace defective work as directed upon completion of installation.

B. Cleaning: Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Laboratory Architect.

C. Protection: Advise Contractor of procedures and precautions for protection of installed laboratory service fixtures from damage by work of other trades.

END OF SECTION 11 53 33
**APPLICATION:** Dual purpose eyewash/drench hose unit for deck mounting. Unit meets the provisions of ANSI Z358.1 - 2004 as both an eyewash and a drench hose. Unit may be left in the deck flange for use as a fixed eyewash, leaving user’s hands free. Alternatively, unit may be removed for use as a drench hose to rinse any part of user’s eyes, face or body.

**SPRAY HEAD ASSEMBLY:** Two GS-Plus™ spray heads mounted side-by-side. Each head has a “flip top” dust cover, internal flow control and filter to remove impurities from the water flow.

**VALVE:** 1/2” IPS brass stay-open ball valve. EW1028 has valve mounted above counter and activated by flag handle.

**HOSE:** 8’ reinforced PVC hose. 300 PSI maximum working pressure.

**MOUNTING:** Eyewash assembly has deck flange for countertop mounting. Flange has handle locator guide to position spray heads facing forward at all times.

**SUPPLY:** 1/2” NPT male inlet.

**SIGN:** ANSI-compliant identification sign.

**QUALITY ASSURANCE:** Unit is completely assembled and water tested prior to shipment.

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**Available Options**

- **DC** Stainless steel dust cover for each spray head.
- **FSH** 8 ft. flexible stainless steel hose in place of PVC hose.
- **HG** Undercounter hose guide bracket to prevent hose from tangling or binding.
- **BP** In-line dual check backflow preventer installed on inlet of hose. *Note: Check with code authority for compliance with local plumbing code.*
- **VB** Atmospheric vacuum breaker installed on outlet of ball valve (EW1028VB).
- **TMV** AP3600 thermostatic mixing valve precisely blends hot and cold water to deliver warm (tepid) water as provided by ANSI Z358.1 - 2004. Refer to “Tempering Units” section for complete technical and product selection information.
EW1028 Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle
EW1028VB Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle, Vacuum Breaker

**NOTES:**

1. **EACH GS-PLUS SPRAY HEAD HAS A “FLIP-TOP” DUST COVER, INTERNAL FLOW CONTROL AND FILTER TO REMOVE IMPURITIES FROM THE WATER FLOW.**
2. **HOSE SHOULD NOT BE USED IN APPLICATIONS WHERE WATER PRESSURE EXCEEDS 90 PSI. HOSE SHOULD BE INSPECTED PERIODICALLY FOR DETERIORATION.**
3. **UNIT FURNISHED FOR MOUNTING ON COUNTERTOPS FROM 1/8” UP TO 1-1/2” THICK.**

Due to continuing product improvement, the information contained in this document is subject to change without notice. All dimensions are ± 1/4” (6mm). rev. 0308
**AP3600 Tempering Valve, 6 Gallon Capacity**

**Application:** Tempering valve to blend hot and cold water to deliver tepid water. Valve has flow capacity of 0.5 to 6 gallons per minute (GPM). Valve can be used with eyewash, eye/face wash, dual purpose eyewash/drench hose and drench hose units.

**Temperature Control:** Valve has bimetallic thermostat that senses incoming water temperature and automatically blends water to 85°F (29°C). High temperature limit stop is set to 90°F (32°C). Valve has dial thermometer on outlet to monitor temperature of delivered water. Note: Valve may need to be adjusted when installed based on incoming water temperature. Refer to “Installation Instructions” for further information.

**Fail Safe:** In event of restriction or failure of hot water supply, internal bypass allows valve to deliver cold water to emergency unit. In bypass mode, valve will deliver 4 GPM of cold water at 30 PSI flow pressure. In event of loss of cold water supply, valve will close and not deliver water.

**Flow Capacity:** Refer to chart below for flow capacity of valve at specified pressure drops:

<table>
<thead>
<tr>
<th>System Pressure Drop (PSI)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
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<tbody>
<tr>
<td>Flow Rate (GPM)</td>
<td>2.5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>8.5</td>
<td>9.5</td>
</tr>
</tbody>
</table>

| System Pressure Drop (Bar) | 0.3 | 0.7 | 1.0 | 1.4 | 1.7 | 2.1 | 2.4 | 2.8 |
| Flow Rate (Liters per Minute) | 9.5 | 15  | 19  | 23  | 27  | 30  | 32  | 36  |

**Supply Temperature:** Minimum hot water supply temperature is 140°F (60°C).

**Supply Pressure:** 30 PSI minimum supply pressure is required for proper operation of valve. Maximum supply pressure is 125 PSI.

**Mounting:** Furnished with heavy duty mounting bracket for securing valve to panel or wall.

**Inlets:** 1/2” nominal sweat female hot and cold water inlets. Each inlet has check valve and supply stop.

**Outlet:** 1/2” NPT female outlet.

**Quality Assurance:** Valve is completely assembled and water tested prior to shipment. Valve is certified to ASSE 1071.

**Additional Models**

- **AP3602** Same as above except valve is installed in surface mounted stainless steel cabinet.
- **AP3607** Same as above except valve is installed in recess mounted stainless steel cabinet.

**IMPORTANT:** Pursuant to ANSI Z358.1-2009, the water delivered by emergency equipment should be “tepid”. Tepid is defined as moderately warm or lukewarm, and is generally considered to be between 60°F (15°C) and 90°F (32°C). However, in certain circumstances, a chemical reaction may be accelerated or otherwise affected by the water temperature. Please consult with a medical advisor to determine the optimum delivered water temperature prior to specifying, installing or using a tempering valve.

Tempering valves will not deliver the appropriate water temperature if the system has not been sized correctly. Please refer to the flow capacities and supply pressure requirements listed above when designing the tempered water system and selecting tempering valves.

Tempering valves, like all emergency eyewash and shower equipment, must be installed in accordance with the manufacturer’s instructions and maintained on a regular basis. Under ANSI Z358.1-2009, all emergency equipment should be activated weekly and inspected at least annually. Tempering valves should be treated the same and, in addition, must be regularly cleaned and cycled.
**AP3600 Tempering Valve, 6 Gallon Capacity**

1. As with all plumbing devices and emergency equipment, thoroughly flush supply lines prior to and after installation.

2. Install mounting bracket on panel or wall. Thread tempering valve securely onto mounting bracket. Valve must be installed in location where it is readily accessible for inspection, cleaning and maintenance.

3. Connect hot and cold water supply lines to valve. Connect outlet line to valve and then to inlet of emergency equipment.

4. Activate the water flow and check the temperature of the water delivered from the tempering valve and emergency equipment. Note that the temperature control knob on the tempering valve has been factory preset to deliver 85°F (29°C) tepid water and the high temperature limit stop has been factory preset at 90°F (32°C). These temperatures are based upon an incoming hot water supply at 140°F (60°C). If the incoming hot water temperature is higher than 140°F (60°C), the valve will deliver water that is warmer than 90°F (32°C). In this case, the high temperature limit stop must be reset by the installer.

5. To reset the high temperature limit stop:
   - While the water is running, turn the adjusting knob counterclockwise to the maximum hot water position.
   - Remove the knob and retaining ring, loosen the set screw and remove the limit stop.
   - Replace the handle on the valve stem and rotate the valve stem until the desired outlet water temperature is reached. Confirm the outlet water temperature on the outlet thermometer.
   - Replace the limit stop on the valve stem, positioned so that the limit stop is against the web on the LEFT side of the valve cover (i.e. the valve stem cannot be turned any further counterclockwise).
   - Replace the retaining ring, tighten set screw and replace knob.
SSBF994 All-Stainless Steel Handicapped Accessible Safety Station with WideArea™ Eye/Face Wash

**Application:** All-stainless steel handicapped accessible combination WideArea™ eye/face wash and shower safety station. Shower head and pull rod are extended for improved access. Bowl is lowered and extended to permit access by wheelchair user. Profile of unit is “flattened” to comply with maximum height and knee clearance requirements. Stainless steel construction is ideal for highly corrosive environments and clean room applications.

**ADA Compliance:** Unit complies with ADA requirements for accessibility by handicapped persons (maximum height and reach, minimum knee clearance and distance from obstructions).

**Shower Head:** 10” diameter stainless steel.

**Shower Valve:** 1” IPS Type 316 stainless steel stay-open ball valve. Valve has stainless steel ball and Teflon® seals. Furnished with stainless steel actuating arm and 47-1/2” stainless steel pull rod.

**Spray Head Assembly:** Four GS-Plus spray heads. Each head has a “flip top” dust cover, internal flow control and filter to remove impurities from the water flow.

**Eye/face Wash Bowl:** 11-1/2” stainless steel.

**Eye/face Wash Valve:** 1/2” IPS Type 316 stainless steel stay-open ball valve. Valve has stainless steel ball and Teflon® seals.

**Pipe and Fittings:** Schedule 40 brushed stainless steel.

**Supply:** 1-1/4” NPT female top or side inlet.

**Waste:** 1-1/4” NPT female outlet.

**Sign:** Furnished with ANSI-compliant identification sign.

**Quality Assurance:** Valve and spray head assemblies are factory assembled and water tested prior to shipment.

**Available Options**

- **BC** Stainless steel cover for eye/face wash bowl.
- **FC20** Regulates shower flow rate to 20 GPM.
- **HS** Auxiliary drench hose unit for rinsing eyes, face or body.
- **APBF250-015 Modesty Curtain**
  Modesty curtain for mounting on Handicapped Accessible safety station.
- **AP275-200 Electric Light and Alarm Horn**
  Flashing light and alarm horn for mounting on safety station.
- **TMV** AP3800 thermostatic mixing valve precisely blends hot and cold water to deliver warm (tepid) water as required by ANSI Z358.1-2009.
SSBF994 All-Stainless Steel Handicapped Accessible Safety Station with WideArea™ Eye/Face Wash

Due to continuing product improvement, the information contained in this document is subject to change without notice. All dimensions are ± 1/4" (6mm).
**Application:** Tempering valve to blend hot and cold water to deliver tepid water. Valve has flow capacity of 3.0 to 34 gallons per minute (GPM). Valve can be used with emergency shower, safety station or multiple installations of eyewash, eye/face wash, dual purpose eyewash/drench hose and drench hose units.

**Temperature Control:** Valve has bimetallic thermostat that senses incoming water temperature and automatically blends water to 85°F (29°C). High temperature limit stop is set to 90°F (32°C). Valve has dial thermometer on outlet to monitor temperature of delivered water. Note: Valve may need to be adjusted when installed based on incoming water temperature. Refer to "Installation Instructions" for further information.

**Fail Safe:** In event of restriction or failure of hot water supply, internal bypass allows valve to deliver cold water to emergency unit. In bypass mode, valve will deliver 20 GPM of cold water at 30 PSI flow pressure. In event of loss of cold water supply, valve will close and not deliver water.

**Flow Capacity:** Refer to chart below for flow capacity of valve at specified pressure drops:

<table>
<thead>
<tr>
<th>System Pressure Drop (PSI)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Rate (GPM)</td>
<td>18</td>
<td>23</td>
<td>29</td>
<td>34</td>
<td>40</td>
<td>45</td>
<td>51</td>
<td>56</td>
</tr>
</tbody>
</table>

| System Pressure Drop (Bar) | 0.3 | 0.7 | 1.0 | 1.4 | 1.7 | 2.1 | 2.4 | 2.8 |
| Flow Rate (Liters per Minute) | 68 | 87 | 110 | 129 | 151 | 170 | 193 | 212 |

**Supply Temperature:** Minimum hot water supply temperature is 140° F (60° C).

**Supply Pressure:** 30 PSI minimum supply pressure is required for proper operation of valve. Maximum supply pressure is 125 PSI.

**Mounting:** Furnished with heavy duty mounting bracket for securing valve to panel or wall.

**Inlets:** 3/4” NPT female hot and cold water inlets. Inlets can be rotated 360 degrees for top or bottom supply. Each inlet has integral water strainer, check valve and supply stop.

**Outlet:** 1” NPT female outlet.

**Quality Assurance:** Valve is completely assembled and water tested prior to shipment. Valve is certified to ASSE 1071.

**Additional Models**

- **AP3702** Same as above except valve is installed in surface mounted stainless steel cabinet.

- **AP3707** Same as above except valve is installed in recess mounted stainless steel cabinet.

**Important:** Pursuant to ANSI Z358.1-2009, the water delivered by emergency equipment should be "tepid". Tepid is defined as moderately warm or lukewarm, and is generally considered to be between 60°F (15°C) and 90°F (32°C). However, in certain circumstances, a chemical reaction may be accelerated or otherwise affected by the water temperature. Please consult with a medical advisor to determine the optimum delivered water temperature prior to specifying, installing or using a tempering valve.

Tempering valves will not deliver the appropriate water temperature if the system has not been sized correctly. Please refer to the flow capacities and supply pressure requirements listed above when designing the tempered water system and selecting tempering valves.

Tempering valves, like all emergency eyewash and shower equipment, must be installed in accordance with the manufacturer’s instructions and maintained on a regular basis. Under ANSI Z358.1-2009, all emergency equipment should be activated weekly and inspected at least annually. Tempering valves should be treated the same and, in addition, must be regularly cleaned and cycled.
1. As with all plumbing devices and emergency equipment, thoroughly flush supply lines prior to and after installation.

2. Install mounting bracket on panel or wall. Thread tempering valve securely onto mounting bracket. Valve must be installed in location where it is readily accessible for inspection, cleaning and maintenance.

3. Connect hot and cold water supply lines to valve. Connect outlet line to valve and then to inlet of emergency equipment.

4. Activate the water flow and check the temperature of the water delivered from the tempering valve and emergency equipment. Note that the temperature control knob on the tempering valve has been factory preset to deliver 85°F (29°C) tepid water and the high temperature limit stop has been factory preset at 90°F (32°C). These temperatures are based upon an incoming hot water supply at 140°F (60°C). If the incoming hot water temperature is higher than 140°F (60°C), the valve will deliver water that is warmer than 90°F (32°C). In this case, the high temperature limit stop must be reset by the installer.

5. To reset the high temperature limit stop:
   - While the water is running, turn the adjusting knob counterclockwise to the maximum hot water position.
   - Remove the knob and retaining ring, loosen the set screw and remove the limit stop.
   - Replace the handle on the valve stem and rotate the valve stem until the desired outlet water temperature is reached. Confirm the outlet water temperature on the outlet thermometer.
   - Replace the limit stop on the valve stem, positioned so that the limit stop is against the web on the LEFT side of the valve cover (i.e. the valve stem cannot be turned any further counterclockwise).
   - Replace the retaining ring, tighten set screw and replace knob.

Due to continuing product improvement, the information contained in this document is subject to change without notice. All dimensions are ± 1/4” (6mm). 

312 666 5500 TELEPHONE
312 666 5501 FACSIMILE
wsflab.com
AP250-015 Modesty Curtain for Horizontal Showers and Safety Stations

**Application:** In an emergency, it is imperative that contaminated clothing be removed as quickly as possible. However, employees may be reluctant to remove their clothing in the presence of co-workers. A modesty curtain will protect the privacy of the user and permit disrobing while the shower unit is in operation. The curtain has a pocket in which a smock can be stored.

**Installation:** Unit is designed for use with horizontally mounted emergency showers and free-standing combination safety stations. Furnished complete with stainless steel track assembly for mounting on vertical and horizontal piping. All necessary mounting brackets and clamps are included.

**Curtain:** White UV-resistant nylon curtain with ring hangers. Curtain has tie-back so it can be neatly stored when shower is not in use. Curtain has interior pocket for storing a smock to be used after contaminated clothing is removed.

**Additional Models**

- **APBF250-015** Same as above except for installation on barrier-free horizontal showers and safety stations.
AP250-015 Modesty Curtain for Horizontal Showers and Safety Stations

NOTE:
TIE-BACK IS INCLUDED FOR STORING CURTAIN WHEN NOT IN USE.

STAINLESS STEEL TOP SUPPORT BRACE

STAINLESS STEEL CURTAIN TRACK

Ø37“ (INSIDE) (940mm)

SEE DETAIL “B”

(2) U-BOLTS FOR VERTICAL 1 1/4” PIPE

(2) U-BOLTS FOR 1” HORIZONTAL PIPE (SEE DETAIL "A")

(2) NYLON CURTAINS (72”X 72") (1829mm x1829mm) WITH POCKET AND RING HANGERS

DETAIL "A"

DETAIL "B"

Due to continuing product improvement, the information contained in this document is subject to change without notice. All dimensions are ± 1/4" (6mm). rev. 1213
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 laboratory service fittings and fixtures, also known as valves, for water, vacuum and compressed gas.

B. Extent and types of laboratory service fixtures and safety equipment as indicated on Laboratory Equipment drawings.

C. Provide service fittings and fixtures as specified herein and as indicated on Laboratory Equipment drawings.

D. Related Sections include the following:
   1. Division 11, Section “Fume Hoods”.
   2. Division 11, Section 116622 "Laboratory Accessories".
   3. Division 12, Section 12352, “Painted Metal Laboratory Casework”.
   4. Divisions 22 and 26, Sections for plumbing and electrical requirements.
   5. Divisions 20, 22, 23, and 26 for final connections to building services and systems.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide certification that fixtures and fittings have been tested in accordance to and meet the performance requirements as described in SEFA 7.

B. Chemical Resistance: All coating materials shall meet the following tests for chemical resistance:

   1. Fume Test: Suspend coated samples in a container at least 6 cubic feet capacity, approximately 12” above open beakers, each containing 100 cc of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After exposure to these reagent fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other damage to the coating.
2. Direct Application Test: The test of coated samples shall consist of the direct action of the reagents listed below. This test is to be conducted in such a manner that the test surface is kept wet throughout the entire test period and at a controlled temperature of 77 degrees F +/- 3 degrees F. The test must be conducted for a period of not less than one hour. As a result of the test the coating on the samples shall not rupture or otherwise compromised exposing the base material through erosion, dissolution, cracking, splitting or other damage resulting from reagent exposure. Obvious and significant deterioration is not acceptable. However, slight discoloration or temporary softening of the coating is permissible.

<table>
<thead>
<tr>
<th>Acetic Acid, 98%</th>
<th>Lactic Acid, 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Methanol</td>
</tr>
<tr>
<td>Acid Dichromate, 5%</td>
<td>Methyl Alcohol</td>
</tr>
<tr>
<td>Ammonium Hydroxide, 28%</td>
<td>Methyl Ethyl Ketone</td>
</tr>
<tr>
<td>Amyl Acetate</td>
<td>Methylene Chloride</td>
</tr>
<tr>
<td>Amyl Alcohol</td>
<td>Mineral Oil</td>
</tr>
<tr>
<td>Benzene</td>
<td>Mono Chlorobenzene</td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td>N-Hexane</td>
</tr>
<tr>
<td>Calcium Hypochlorite</td>
<td>Nitrotahealene</td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td>Nitric Acid, 70%</td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td>Perchloric Acid, 70%</td>
</tr>
<tr>
<td>Chloroform</td>
<td>Phenol</td>
</tr>
<tr>
<td>Chronic Trioxide Acid</td>
<td>Phosphoric Acid, 85%</td>
</tr>
<tr>
<td>Cresol</td>
<td>Sea Water</td>
</tr>
<tr>
<td>Crude Oil</td>
<td>Silver Nitrate, Saturated</td>
</tr>
<tr>
<td>Dichlor Acetic Acid</td>
<td>Sodium Bichromate, Saturated</td>
</tr>
<tr>
<td>Dimethylformanide</td>
<td>Sodium Carbonate, 10%</td>
</tr>
<tr>
<td>Dioxane</td>
<td>Sodium Chloride, 20%</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>Sodium Hydroxide, 50%</td>
</tr>
<tr>
<td>Ether</td>
<td>Sodium Hydroxide, Flake</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>Sodium Hypochlorite</td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td>Sodium Sulfide, Saturated</td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td>Sulfuric Acid, 96%</td>
</tr>
<tr>
<td>Formaldehyde, 37%</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid 70%, eq. parts</td>
</tr>
<tr>
<td>Formic Acid, 90%</td>
<td>Toluene</td>
</tr>
<tr>
<td>Furfural</td>
<td>Trichloroethylene</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Turpentine</td>
</tr>
<tr>
<td>Glacial Acetic Acid, 99.5%</td>
<td>Urea, Saturated</td>
</tr>
<tr>
<td>Glycerin</td>
<td>Xylene</td>
</tr>
<tr>
<td>Hydrochloric Acid, 38%</td>
<td>Xylem</td>
</tr>
<tr>
<td>Hydrofluoric Acid, 48%</td>
<td>Zinc Chloride, Saturated</td>
</tr>
<tr>
<td>Hydrogen Peroxide, 5%</td>
<td></td>
</tr>
<tr>
<td>Iodine, Tincture of Isopropyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
</tr>
</tbody>
</table>


4. 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
Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

5. Reparability: Coating material shall be capable of surface repair in the event that a fixture is scratched or a surface rupture occurs. The service fixture manufacturer shall have available an air-drying aerosol coating, specially formulated to match the existing epoxy coating color, which may be applied in the field to repair coated surfaces.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data and installation instructions for each type of service fixture.
   1. Include independent laboratory certification that applied finish complies with specified chemical and physical resistance requirements.
   2. Submit samples of plumbing and electrical service fixtures when requested by Laboratory Architect, complete with fittings and accessories with specified finish.

B. Service Color Code: Submit samples of index disc with letter code in colors used to identify water, vacuum and compresses gas services listed.

1.5 EXTRA MATERIALS

A. Provide to Owner a complete touch-up kit for surface repair of service fittings and fixtures. Provide an air drying aerosol or liquid coating specially formulated to match the coating color which can be applied in the field to repair coated surfaces.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: All laboratory service fixtures and safety equipment, including those provided as an integral part of other laboratory equipment such as fume hoods, shall be the product of one service fixture manufacturer, unless specified otherwise.

B. All fixtures shall be in accordance with IBC, NFPA and OSHA for the intended use.

C. All fixtures for water service shall meet the requirements of ANSI/ASME A112.18.1M-1989 and be certified by the Canadian Standards Association (CSA) under Standard CAN/CSA B125.M89.

D. Atmospheric vacuum breakers shall be certified by the American Society of Sanitary Engineers (ASSE) under Standard 1001 and faucet fixture breakers shall be certified to comply with ANSI/ASSE Standard 1035.

E. ADA fittings shall comply with the requirements of Section 309.4 of ANSI/ICC A117.1, where a faucet or fitting will be used in an application that is intended to be ADA compliant, the maximum force required to open or close a manually activated fitting shall not exceed 5 lb. (22 N) at 80 PSI (550 kPa) static pressure.
F. Natural gas service, ball valves shall be certified by the American Gas Association (AGA) under ANSI Z21.15 and the Canadian Gas Association (CGA) 9.1 under CAN/CGA-3.16-M88 (CLIR 36).

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. All mechanical laboratory service fixtures shall be the product of one of the following:

1. Water Saver Faucet Co.
2. Chicago Faucet
3. Far laboratory Faucets Ltd.

2.2 FABRICATION; GENERAL

A. All laboratory service fixtures shall have the construction and shall meet the performance requirements set forth in this specification. Fixture types shall be as indicated in the fixture schedule on the Laboratory Equipment drawings and fixture details as an attachment to this specification.

B. Service Fixtures: Provide all service fixtures factory assembled, including the assembly of all valves and shanks to turrets, flanges, and other mounting accessories. Individually factory test each fixture and provide all fixtures complete with washers, locknuts, unions, nipples and other accessories.

C. Material and Finish: Fabricate service fixtures from cast brass containing a minimum of 85% copper or forged brass containing a minimum of 60% copper.

1. Finish service fixtures and safety equipment as follows:

   a. Satin Chrome Finish with Clear Epoxy Coating: All components shall be polished and electroplated with one layer of nickel. Exposed surfaces shall then be further polished to an AISI No. 6 brushed finish which is fine-grained and uniform. Components shall then be electroplated with one layer of chrome. Following chrome plating, surfaces to be coated shall be cleaned and degreased. Following plating and cleaning a clear epoxy coating shall be applied to all exposed surfaces and fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.

   b. Stainless Steel.

   c. Fittings Inside Fume Hoods: shall have an epoxy finish color-coded to match the fixture service index color. Following base preparation and cleaning, coating material shall be electrostatically applied to all exposed surfaces. After application, coating shall be fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.
D. Handles: Except as otherwise indicated, provide forged brass four-arm style handles on all fixtures with a color coded screw-on index disc.

1. Benchtop service fixtures at locations identified as accessible (ADA) and or for hand-washing (HW) and where otherwise indicated on lab equipment drawing shall be fitted with 4” wrist blade handles, color coded.

2. Provide foot pedals as indicated on lab equipment drawings.

3. Provide a combination fixture at locations indicating on lab equipment plan which indicates dual functions of both foot pedals and a mixing faucet with 4” wrist blade handles.

E. Water Fixtures and Valves:

1. All fixtures and valves for water service shall have a renewable unit containing all working components subject to wear, including a stainless steel replaceable seat and an integral adjustable volume control. The renewable unit shall be interchangeable among all faucets and valves for water service. The renewable unit shall be broached for position locking in the valve body. The unit shall have a high durometer thermoplastic valve disc and a molded TFE stem packing. The unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing the faucet body.

   a. Water Fixtures and valves shall be fully assembled and individually factory tested at 80 PSI water pressure.

2. Goosenecks shall have a separate outlet coupling with a 3/8” IPS female thread securely brazed to the gooseneck for attachment of serrated hose ends, aspirators and other outlet fittings. Rigid goosenecks shall have a 3/8” IPS male inlet thread and be threaded directly into the faucet body so as to be absolutely rigid. Swing goosenecks shall utilize a TFE packing with an externally adjustable packing nut.

   a. Gooseneck faucets at cup sinks (CS-#) and cold water gooseneck fixtures at lab sinks (LS-#) shall have a rigid gooseneck.

   b. Hot and cold water gooseneck fixtures at lab sinks (LS-#) shall have a convertible rigid/swing gooseneck.

3. Vacuum breakers, where required and indicated by the fixture number, shall be integral with the gooseneck. Vacuum breakers shall have a forged brass body, a renewable seat and an ultralight float cup with a silicone gasket for fine flow control. Vacuum breakers shall not spill over at low water volume.

F. Distilled, Deionized and Pure Water Fixtures:

1. Purified Water Fixtures and Valves: Fixtures and valves for distilled, deionized and pure water service shall be fabricated with a brass exterior and an interior lining. The interior lining and all components in contact with pure water shall be inert:

   1) Polypropylene with recirculating line.
2) Valves shall be manual or self-closing type as indicated in the fixture schedule, and shall have a round molded nylon handle, screw-on index disc and a removable serrated hose end. Valves shall have a brass valve body, brass bonnet and brass stem with a floating tip.

G. Stainless Steel Valves:

1. Provide stainless steel valves as indicated on drawings. Valve bodies and components shall be Type 316 stainless steel. Valve handles shall match those specified elsewhere in this section.

H. Valves for Gas, Air, Vacuum and Inert Gas Service:

1. Needle Valves:

   a. Needle valves shall have a forged brass valve body with a 3/8" IPS female outlet for attachment of serrated hose ends, quick connects or other outlet fittings. Valves shall have a self-centering replaceable stainless steel floating cone and a replaceable stainless steel valve seat. The lateral movement of the cone shall not exceed .015". The valve shall have a molded TFE stem packing with an externally adjustable packing nut. The valve shall go from closed to fully open in two full revolutions of the handle.

   b. Needle valves shall be fully assembled and individually tested at 190 PSI air pressure under water. Maximum working pressure shall be 125 PSI air pressure.

2. Fine Control Needle Valves for Flammable, Toxic and Oxidizing Gases

   a. Fine control needle valves shall have a forged brass valve body with a 3/8" IPS female outlet for attachment of serrated hose ends, quick connects or other outlet fittings. Valves shall have a self-centering replaceable stainless steel floating cone and a replaceable stainless steel seat with a .125" diameter orifice. The floating cone shall have a maximum diameter of .125" and lateral movement not in excess of .015". The valve shall have a molded TFE stem packing with an externally adjustable packing nut. The valve shall go from closed to fully open in 8 full revolutions of the handle.

   b. Fine control needle valves shall be fully assembled and individually tested at 300 PSI helium pressure under water. Maximum working pressure shall be 200 PSI air pressure.

3. Laboratory Ball Valves:

   a. Laboratory ball valves shall have a forged brass valve body, a removable straight ten serration hose end and a forged brass lever-type handle with a full view color-coded index disc. Valves shall have a chrome plated ball and molded TFE seals with self-closing retainers.

   b. Ball valves shall be individually tested at 125 PSI air pressure under water. The maximum working pressure for ball valves shall be 75 PSI air pressure. Where used for gas service, valves are AGA-and CGA-certified to ½ PSI.
I. Remote Control Valves for Fume Hoods:

1. Remote control valves 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. Valves shall have a threaded collar to hold the valve in place, and shall have a forged brass body and a forged brass four-arm handle with a full view color-coded type index disc. Valves for gas, air, and vacuum service shall be needle-type design with a self-centering replaceable stainless steel floating cone and a replaceable stainless steel valve seat. Valves for water and steam service shall have a renewable flat valve disc and a replaceable stainless steel seat.

J. Atmospheric Vacuum Breakers: shall be provided on Fume Hoods with potable water service and where otherwise indicated on the Laboratory Equipment drawings to prevent backflow or backsiphonage into the potable water system. Vacuum breakers shall be installed:

1. In accordance with the manufacturer’s instructions and applicable plumbing codes.
2. In a location where they are accessible for maintenance.

K. Service Outlet Identification: The handle of each laboratory fitting, except pressure regulators, shall be marked to indicate the particular liquid or gas that is delivered by or through such fitting. The handle or the index button fastened to the handle shall be color coded, and the index button shall be embossed with identification letters to designate the service. Letters used to designate the service or symbol shall be legible and easy to read. Color code index discs as follows:

<table>
<thead>
<tr>
<th>Basic Air &amp; Water</th>
<th>Index Color</th>
<th>Letter Color</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purified Air</td>
<td>Orange</td>
<td>Black</td>
<td>Pair</td>
</tr>
<tr>
<td>Air</td>
<td>Orange</td>
<td>Black</td>
<td>Air</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Orange</td>
<td>Black</td>
<td>CA</td>
</tr>
<tr>
<td>Lab Air</td>
<td>Orange</td>
<td>Black</td>
<td>LA</td>
</tr>
<tr>
<td>Cold Water</td>
<td>Dk. Green</td>
<td>White</td>
<td>CW</td>
</tr>
<tr>
<td>Chilled Water Supply</td>
<td>Dk. Green</td>
<td>White</td>
<td>CWS</td>
</tr>
<tr>
<td>Chilled Water Return</td>
<td>Dk. Green</td>
<td>White</td>
<td>CWR</td>
</tr>
<tr>
<td>Industrial Cold Water</td>
<td>Dk. Green</td>
<td>White</td>
<td>ICW</td>
</tr>
<tr>
<td>Hot Water</td>
<td>Red</td>
<td>White</td>
<td>HW</td>
</tr>
<tr>
<td>Industrial Hot Water</td>
<td>Red</td>
<td>Red</td>
<td>IHW</td>
</tr>
<tr>
<td>Steam</td>
<td>Black</td>
<td>White</td>
<td>STM</td>
</tr>
<tr>
<td>Tempered Water</td>
<td>Green</td>
<td>White</td>
<td>TW</td>
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<td>Glycol Supply</td>
<td>Lt. Green</td>
<td>Black</td>
<td>GYLS</td>
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<tr>
<td>Glycol Return</td>
<td>Lt. Green</td>
<td>Black</td>
<td>GYLR</td>
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<tr>
<td>Process Water Supply</td>
<td>Green</td>
<td>White</td>
<td>PCWS</td>
</tr>
<tr>
<td>Process Water Return</td>
<td>Green</td>
<td>White</td>
<td>PCWR</td>
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<tr>
<td>Deionized Water</td>
<td>White</td>
<td>Black</td>
<td>DI</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>White</td>
<td>Black</td>
<td>DW</td>
</tr>
<tr>
<td>Purified Water</td>
<td>White</td>
<td>Black</td>
<td>PW</td>
</tr>
<tr>
<td>Reverse Osmosis</td>
<td>White</td>
<td>Black</td>
<td>RO</td>
</tr>
</tbody>
</table>
PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE FIXTURES

A. Install in a precise manner in accordance with manufacturer's directions. Adjust moving parts to operate freely without excessive bind.

B. Follow the manufacturer's recommended test and working pressures for fittings. Testing or using a fitting at pressure for which it is not designed can result in leakage or failure.

3.2 REPAIRING, CLEANING, AND PROTECTION

A. Repairing: Repair or remove and replace defective work as directed upon completion of installation.

B. Cleaning: Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Laboratory Architect.
C. Protection: Advise Contractor of procedures and precautions for protection of installed laboratory service fixtures from damage by work of other trades.

END OF SECTION
Remote Control Outlet Fittings

L074WSA Outlet Fitting, Panel Mounted, 6" Rigid/Swing

NOTES:
1. IF VACUUM BREAKER IS REQUIRED, ADD SUFFIX "55". IF AERATOR IS REQUIRED IN PLACE OF HOSE END, ADD SUFFIX "55".
2. FITTING IS FURNISHED WITH A POLISHED CHROME PLATED OR POWDER-COATED FINISH COLOR-CODED PER SERVICE INDEX COLOR AS STANDARD. OTHER FINISHES ARE AVAILABLE UPON REQUEST.

Measurements may vary ± 1/4".
L739 Panel Mounted Valve, Angle Face Fume Hood

**Application:** Panel mounted valve for installation on angle face of hood. Valve is installed from behind panel and is secured with external locking ring and escutcheon on front of hood. All working components of valve are accessible from front exterior face of hood. Specify left hand or right hand mounting when ordering.

**Valve Body:** Forged brass.

**Handle:** Forged brass four-arm handle with color-coded index disc.

**Inlet / Outlet:** 3/8″ NPT female inlet and outlet.

**Quality Assurance:** Valve is fully assembled and factory tested prior to shipment.

**Models**

- **L739LFCN / L739RFCN** Fine control needle valve construction.
- **L739LN / L739RN** Needle valve construction.
- **L739LS / L739RS** Steam valve construction.
- **L739LW / L739RW** Water valve construction.
- **L739LWTTL / L739RWTL** Tin-lined water valve construction for pure water.
L112WSA
PANEL MOUNTED ATMOSPHERIC VACUUM BREAKER WITH 3/8" IPS MOUNTING SHANKS

MEASUREMENTS MAY VARY ±1/4".

NOTE:
ASSE CERTIFIED UNDER STANDARD 1001.
CSA CERTIFIED UNDER CAN/CSA B64.
**L3180-131WSA** Needle Valve Assembly, Overhead Mounted Single

**LA, Lab Air**

- **L3180-131WSA** Single
- **L3180-132AWSA** 90° Double
- **L3180-132SWSA** 180° Double
- **L3180-133WSA** 3-Way
- **L3180-134WSA** 4-Way

**NOTES:**
1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ANSI 2112 AND CGA 9.1.
2. FIXTURE IS FULLY ASSEMBLED AND FACTORY TESTED AT 225 PSI NITROGEN PRESSURE. MAXIMUM WORKING PRESSURE IS 150 PSI.
3. SPECIFY IF CLEANING FOR OXYGEN AND HIGH PURITY GASES IS REQUIRED.

**Dimensions:**
- 3/8" NPT MALE INLET
- 3/8" IPS HEAVY DUTY MOUNTING SHANK WITH LOCKNUT AND WASHER
- Ø1 - 5/8" (51 mm)
- 2 - 3/8" (60 mm)
- 2 - 1/16" (52 mm)
- 3 - 1/8" (79 mm)
- 5 - 3/8" (137 mm)

**Materials:**
- FORGED BRASS FOUR-ARM HANDLE
- COLORED PLASTIC INDEX DISC
- FORGED BRASS VALVE BODY
- REMOVABLE TEN SERRATION HOSE END
- REPLACEABLE STAINLESS STEEL SEAT
- REPLACEABLE STAINLESS STEEL FLOATING NEEDLE

**Measurements may vary ± 1/4".**

© 2008 / WaterSaver Faucet Co.
L122WSA
PANEL MOUNTED FLANGE WITH ANGLE SERRATED HOSE END AND MOUNTING SHANK

3-1/8” (79mm) 2-1/8” (54mm)

30°

#2-1/16” (52mm)

3/8” IPS MOUNTING SHANK WITH LOCKNUT AND WASHER

REMOVABLE ANGLE TEN SERRATION HOSE END

MEASUREMENTS MAY VARY ±1/4”.

Drawing Number: _____________________________  Revision Number: 120799-KJS
SECTION 11 53 43.10
LABORATORY 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. Laboratory benchtops.
2. Laboratory sinks.
3. Overhead Service Carrier.
4. Miscellaneous Unistrut framing.
5. Suspended Acoustic Tile Cloud System. (Base Bid) (Alternate No. 1 – Existing ceiling system to remain)

B. Related Sections include the following:

1. Division 9, Section "Gypsum Board Assemblies" for sheet metal fastening grounds in gypsum board partitions for anchoring laboratory casework and accessories.
2. Division 11, Section, Fume Hoods".
3. Division 11, Section "Laboratory Service Fixtures and Safety Equipment".
4. Division 12, Section “Painted Metal Laboratory Casework”.

1.1 PERFORMANCE REQUIREMENTS

C. Seismic Performance: Provide assemblies and systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 9, "Earthquake Loads", whichever is more stringent.

1.3 SUBMITTALS

A. Product Data: Submit product data for manufactured items.

B. Samples: Submit samples of the following:
1. Benchtop materials.
2. Phenolic Resin.
3. Painted metal finishes.

C. Shop Drawings: Submit shop drawings for laboratory accessory assemblies that are factory and/or field assembled from manufactured components. Submit shop drawings showing locations, materials, connections and all details of construction and installation.

1. Benchtops showing joint locations and fixture holes and cut outs.
2. Overhead service carriers.
3. Miscellaneous Unistrut framing.

D. Product Test Reports: Based on tests performed by a qualified independent testing agency, indicate compliance with SEFA 3 and 8 for laboratory casework finishes and countertops with requirements specified for chemical and physical resistance.

E. Qualification Data: Firms and/or persons specified shall demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Coordinate the interface of the laboratory accessories with the laboratory casework. Verify and coordinate all requirements for cutouts, attachments, reinforcing, piping, electrical devices, sizes and locations with laboratory casework and other laboratory items.

B. Manufacturer shall identify and designate a full time factory representative for on-site supervision and coordination during the installation of laboratory casework and laboratory accessories.

C. Single Source Responsibility: Laboratory casework manufacturer shall provide and install all laboratory accessories in order to maintain single source responsibility for laboratory fit-up items.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver laboratory accessories until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate materials or assemblies have been completed in installation areas. If items must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in “Project Conditions” Article below.

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

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory accessories until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain
temperature and relative humidity at occupancy levels through remainder of construction period.

1.7 COORDINATION

A. Coordinate layout and installation of metal framing and reinforcement in gypsum board assemblies for support of laboratory accessories.

1.8 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of laboratory accessory provided. Include fillers, primers, paints, fabric patches, and other materials necessary to perform permanent repairs to damaged items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, other manufacturers offering products may be incorporated into the Work subject to approval by laboratory architect.

2.2 MATERIALS

A. Unless specified otherwise under an individual laboratory accessory, provide the following materials.

1. Metal: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness. Minimum 18 ga.

2. Stainless Steel: AISI Type 304 with No. 4 satin finish unless otherwise indicated.

3. Chemical-Resistant Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, chemical-resistant, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and 2 mils (0.05 mm) for system.

2.3 FABRICATION

A. Laboratory Benchtops, General:

1. Provide and install type and configuration of laboratory benchtops as indicated on drawings.

2. Fabricate benchtops in as large components as practicable to minimize field jointing.
3. Provide separate box curbs and splash trims with benchtops.

4. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project site processing of top and edge surfaces is not required. Locate field joints where shown on approved Shop Drawings.

5. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection. Provide flush hairline joints in tops using clamping devices.
   a. Where necessary to penetrate tops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to top in chemical resistance, hardness, and appearance.

6. Provide required holes and cutouts for service fittings.

7. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

8. Provide scribe moldings for closures at junctures of top, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

2.4 (E-#) EPOXY RESIN BENCHTOPS

A. Benchtop Thickness: Maintain 1" thickness, except as otherwise specified with tolerance not exceeding plus or minus 1/32". Provide front and end overhang of 1" beyond face of base cabinets, formed with continuous drip groove on under surface ½" from edge.

B. Backsplash, side splashes and curbs: Same material as top, 4" high back and side splashes unless noted and detailed otherwise. Provide back and side splashes where tops abut wall surfaces, tall cabinets and fume hoods.

C. Factory molded of modified epoxy-resin formulation, uniform mixture throughout full thickness with smooth, non-glare and non-specular finish.

D. Physical Properties: Comply with the following minimum requirements:

   1. Flexural Strength: 15,000 psi (100 Mpa).
   2. Compressive Strength: 30,000 psi (200 Mpa).
   3. Tensile Strength: 10,000 psi (69 Mpa).
   4. Flexural Modulus: 2 x 10^6
   5. Density: 2.03 g/cc
   6. Hardness (Rockwell M): 100.
   7. Water Absorption (24 hours): 0.02 % (maximum).

E. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:
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<thead>
<tr>
<th>CHEMICAL - ACIDS</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hydrochloric Acid, 20%</td>
<td>No Effect</td>
</tr>
<tr>
<td>2. Hydrochloric Acid, 37%</td>
<td>No Effect</td>
</tr>
<tr>
<td>3. Nitric Acid, 20%</td>
<td>Excellent</td>
</tr>
<tr>
<td>4. Nitric Acid, 70%</td>
<td>Good</td>
</tr>
<tr>
<td>5. Sulfuric Acid, 30%</td>
<td>No Effect</td>
</tr>
<tr>
<td>6. Sulfuric Acid, 77%</td>
<td>No Effect</td>
</tr>
<tr>
<td>7. Sulfuric Acid, 96%</td>
<td>Poor</td>
</tr>
<tr>
<td>8. Phosphoric Acid, 85%</td>
<td>No Effect</td>
</tr>
<tr>
<td>9. Perchloric Acid, 60%</td>
<td>No Effect</td>
</tr>
<tr>
<td>10. Aqua Regia</td>
<td>No Effect</td>
</tr>
<tr>
<td>11. Chromic Acid, 60%</td>
<td>Good</td>
</tr>
<tr>
<td>12. Acetic Acid, 98%</td>
<td>No Effect</td>
</tr>
<tr>
<td>13. Formic Acid, 90%</td>
<td>No Effect</td>
</tr>
<tr>
<td>14. Boric Acid, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>15. Citric Acid, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>16. Oxalic Acid, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>17. Hydrobromic Acid, 48%</td>
<td>No Effect</td>
</tr>
<tr>
<td>18. Hydrofluoric Acid, 48%</td>
<td>Good</td>
</tr>
<tr>
<td>19. Vinegar</td>
<td>No Effect</td>
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<table>
<thead>
<tr>
<th>CHEMICAL - BASES</th>
<th>RATING</th>
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</thead>
<tbody>
<tr>
<td>20. Ammonium Hydroxide, 28%</td>
<td>No Effect</td>
</tr>
<tr>
<td>21. Sodium Hydroxide, 10%</td>
<td>No Effect</td>
</tr>
<tr>
<td>22. Sodium Hydroxide, 40%</td>
<td>No Effect</td>
</tr>
<tr>
<td>23. Sodium Hydroxide, Flake</td>
<td>No Effect</td>
</tr>
<tr>
<td>24. Potassium Hydroxide, 10%</td>
<td>No Effect</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEMICAL - SALTS</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Zinc Chloride, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>26. Calcium Hypochlorite, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>27. Clorox Bleach</td>
<td>No Effect</td>
</tr>
<tr>
<td>28. Silver Nitrate, 10%</td>
<td>No Effect</td>
</tr>
<tr>
<td>29. Sodium Sulfide, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>30. Sodium Chloride, Sat.</td>
<td>No Effect</td>
</tr>
<tr>
<td>31. Iodine, Tincture</td>
<td>No Effect</td>
</tr>
<tr>
<td>32. Hydrogen Peroxide</td>
<td>No Effect</td>
</tr>
<tr>
<td>33. Phenol, 80%</td>
<td>No Effect</td>
</tr>
<tr>
<td>34. Cresol</td>
<td>No Effect</td>
</tr>
<tr>
<td>35. Formaldehyde, 40%</td>
<td>No Effect</td>
</tr>
<tr>
<td>36. Mineral Oil, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>37. Glycerin, 100%</td>
<td>No Effect</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEMICAL - SOLVENTS</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Methyl Alcohol, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>39. Ethyl Alcohol, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>40. Buty Alcohol, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>41. Naphtha, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>42. Turpentine, 100%</td>
<td>No Effect</td>
</tr>
<tr>
<td>43. Kerosine, 100%</td>
<td>No Effect</td>
</tr>
</tbody>
</table>
44. Heptane, 100% No Effect
45. Gasoline, 100% No Effect
46. Benzene, 100% No Effect
47. Toluene, 100% No Effect
48. Xylene, 100% No Effect
49. Acetone, 100% No Effect
50. Methyl Ethyl Ketone, 100% No Effect
51. Methyl Isobutyl Ketone, 100% No Effect
52. Ethyl Acetate, 100% No Effect
53. Ethyl Ether, 100% No Effect
54. Chloroform, 100% No Effect
55. Methyl Chloride, 100% No Effect
56. Trichloroethylene, 100% No Effect
57. Carbon Tetrachloride, 100% Excellent
58. Monochloro Benzene, 100% No Effect
59. Dioxane, 100% No Effect
60. Furfural No Effect

**CHEMICAL - DYES**

61. Congo Red, 1% No Effect
62. Eosin Y, 0.5% No Effect
63. Gentian Violet, 1% No Effect
64. Indigo Carmine, 0.5% No Effect
65. Methyl Green, 0.5% No Effect
66. Wrights Blood Stain, 0.35% No Effect

F. Colors: Provide products that result in colors complying with the following requirements:

1. Color: Color to be selected from manufacturers’ standard by laboratory architect.

G. Top Fabrication: Fabricate with factory cutouts for lab and cup sinks.

1. Top Configuration: Square edge with drip groove and separate backsplashes. Ease outside corners and edges to prevent sharp edges to the touch.
2. Assemble with plain butt-type joints and fill with epoxy adhesive and pre-fitted, concealed metal splines.
   a. Exception: Where fume hoods are identified on plan as “future” provide breakable seams filled with an acid resistant sealant.

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

1. Durcon Company, Inc.
2. Epoxyn, Products
3. Laboratory Tops, Inc.

2.5 (LS-#) LABORATORY SINKS and (CS-#) CUP SINKS

A. Laboratory and Cup Sinks: Provide and install laboratory sinks in materials and sizes as indicated on laboratory equipment drawings. Provide sizes as indicated or manufacturers'
closest stock size of equal or greater volume. Provide all sinks complete with strainers, tail pieces, traps, stops and escutcheons.

B. Outlets: 1-1/2" diameter, manufacturer's standard length, fabricated of silicon iron, cast epoxy resin, stainless steel, glass, or lead; of same material as sink wherever possible, or as otherwise acceptable to laboratory architect.

C. Overflows: For each sink, except cup sinks, provide overflow of standard beehive or open top design and with separate strainer. Height 2" less than sink depth. Provide in same material as sink.

D. Material:

1. Cast Epoxy Resin Sinks: Non-glare molded in one piece with surfaces smooth, corners, coved and bottom sloped to outlet. Minimum physical properties, chemical resistance and color as specified for cast epoxy resin tops. Thickness, ½" minimum.


E. Installation of Sinks:

1. Flush Drop-in Installation for Epoxy Resin and Plastic Cupsinks: Rout groove in top to receive sink rim if not prepared in shop. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and top manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

2.6 (OSC-#) OVERHEAD SERVICE CARRIER

A. General requirements for "Wing" style overhead service carriers:

1. Overhead service carrier is to be pre-wired and pre-piped for services as indicated on laboratory equipment drawings.

2. Carrier body and inside/outside access covers shall be fabricated from 16-gauge cold rolled steel.

3. Carrier body shall incorporate UL approved, factory installed junction boxes for electrical and tele/data outlets. Junction boxes shall be inset and flush to the exterior of the carrier body. Electrical and tele/data outlets to be field installed.

4. Carrier body shall also incorporate factory punched and plugged service ports. Service fixtures to be field installed.

5. Exhaust system to be constructed of 3" PVC duct collar that fasteners to the carrier body to accept specified local extraction device.

B. Carrier Body:

1. Carrier body shall incorporate a slim-line eclipse radiused carrier body.

2. Interior service bracket: Utility support bracket of 11-gauge cold rolled steel that can accept attachment brackets for copper and conduit service lines.
3. Carrier body end covers shall include a set of two end covers to enclose exposed ends of the carrier body.

4. Load bearing capabilities:
   a. Total overhead service carrier plus 400 pounds (evenly distributed) per unit.

C. General requirements for ceiling umbilical assemblies, extension assemblies’ structures:
   1. Vertical structural support: 16-gauge cold rolled vertical shall integrate removable end and side panels.
   2. Umbilical chase shall incorporate support members that utilize standard pipe and conduit supports.
   3. Umbilicals uprights shall ship separately from the carrier body and mechanically fastened at the jobsite.

D. Finish: Service chase shall be shop prime painted with corrosion resisting primer and receive shop finish coating. Provide color as listed in the Laboratory Component Finish Schedule on the drawings.

E. Installation:
   1. Install system in strict accordance with manufacturer's instructions.
   2. Set system components plumb, square, and straight with no distortion and securely anchored to building structure.
   3. Umbilical supports shall be spaced properly as to provide adequate support to each section.
   4. Assembly shall be stable and properly reinforced to prevent lateral movement during normal usage.
   5. Carrier shall be installed in the location as shown on drawings.

2.7 MISCELLANEOUS UNISTRUT FRAMING

A. Provide, fabricate and install metal, FRP and stainless steel Unistrut framing:
   1. Provide as detailed and indicated on drawings.
   2. Provide as required to support fixed benches, service chases, overhead service carriers and utility support for conduit and piping.

B. The following lists Unistrut framing integral with the installation of laboratory casework, fume hoods, service fittings and accessories.
   1. Overhead service carriers.
   2. Pipe and service drop supports.
   3. Shelving standards, Type B.
   4. Suspended equipment supports.
   5. Exhaust snorkel support framing.
   6. Miscellaneous structures and supports as detailed on drawings.

C. Provide Unistrut framing as indicated, complete with all nuts, bolts, fittings, and accessories as required.

D. Metal unistrut framing shall be shop prime painted with corrosion resisting primer and receive a shop finish coating. Provide color as listed in the Laboratory Component Finish Schedule on the drawings.
E. Provide Owner with 12 copies of current parts catalog and price guide.

F. Install unistrut framing plumb, level and true. Secure framing to structure and walls with fasteners, appropriate for the intended use. Provide engineering data and locations of all fasteners used.

2.8 (ACC-1) SUSPENDED ACOUSTIC TILE CLOUD SYSTEM (Base Bid)  
(Alternate No. 1 – Existing ceiling system to remain)

   1. Provide 10-foot x 14-foot cloud suspended system. Include all moldings, components, fasteners and accessories as required for a complete installation.
      a. 15/16” Prelude suspension system.
      b. 6” high Axiom Vector (inverted) Trim.
      c. Ultima Tegular Panels.
      d. Ultima 1911 Panel Kit.

B. Approved Manufacturers:
   1. Armstrong World Industries.
   2. USG.
   3. Celotex Building Products.

C. Prep and install as per manufacturer’s instructions and recommendations. Install system level, plumb and without racking or other distortions.

PART 3 - EXECUTION

3.1 INSTALLATION AND CLEANING

A. Install accessories according to approved Shop Drawings and manufacturer’s written instructions.

B. General: Install all items plumb, level, properly aligned, rigid, and securely anchored to building and casework components.

C. Repair, remove or replace defective work as directed on completion of installation.

D. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION
Start by choosing the Formations cloud that fits your project needs.

<table>
<thead>
<tr>
<th>CLOUD TYPE</th>
<th>DESCRIPTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Formations Curves</td>
<td>Soften and quiet an open room design by adding a few curves.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 suspension system/trim colors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 shapes and sizes</td>
<td></td>
</tr>
<tr>
<td>Formations Squares/Rectangles</td>
<td>Create a bold, captivating ceiling design with outstanding sound absorption.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 suspension system/trim colors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 15 shapes and sizes</td>
<td></td>
</tr>
<tr>
<td>Formations Staggered</td>
<td>Create visually interesting clouds the easy way.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 suspension system/trim colors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 78 shapes and sizes</td>
<td></td>
</tr>
<tr>
<td>Formations Planks</td>
<td>Reduce the amount of visible suspension and create a sleek, clean look.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 16 suspension system/trim colors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 30 shapes and sizes</td>
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</tr>
<tr>
<td>Formations for Drywall</td>
<td>Improved floating visual compared to field constructed track and channeled clouds.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 standard trim heights</td>
<td></td>
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<tr>
<td></td>
<td>• 21 shapes and sizes</td>
<td></td>
</tr>
<tr>
<td>Formations with Integrated Lighting</td>
<td>Distribute safe, low-voltage direct current electrical power through the acoustical ceiling suspension system (grid) for more efficient lighting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 suspension systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 4 shapes and sizes</td>
<td></td>
</tr>
<tr>
<td>Formations with DC FlexZone™</td>
<td>Distribute safe, low-voltage direct current (DC) electrical power through the acoustical ceiling suspension system (grid) for more efficient lighting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2 standard trim heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2 suspension systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 12 shapes and sizes</td>
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</table>

View installation videos or download CAD, Revit®, and SketchUp™ files at armstrong.com/formations

Axiom® customer service is available to help with your project from start to finish. Call 1 800 840 8521.
Select a ceiling panel that works with your cloud.

ACOUSTICAL PANELS  Due to printing limitations, shade may vary from actual product.

Curves / DC FlexZone™ / with Integrated Lighting
OPTIMA®/ULTIMA® Tegular and Vector® Panels

- Optima Tegular & Vector
- Ultima Tegular & Vector

NOTE: Ultima and Optima Vector are the only available factory-cut curved panels. Other 2’ x 2’ mineral fiber/fiberglass panels may be used but may require field cutting.

For other non-standard acoustical options, see pages 20-21.

Squares / with Integrated Lighting
CALLA®/LYRA®/OPTIMA/ULTIMA/CIRRUS®/CORTEGA®/DUNE™/FINE FISSURED™ Tegular, Vector®, and Square Lay-in Panels

- Calla Beveled Tegular & Square Lay-in
- Lyra Beveled Tegular
- Optima Tegular & Vector
- Ultima Tegular & Vector
- Cirrus Tegular
- Cortega Tegular
- Dune Tegular
- Fine Fissured Tegular

ULTIMA® Health Zone™ Create!™ Lay-in Panels

- Bamboo (BA)
- Barnwood (BW)
- Light Cherry (LC)
- Oak (OK)
- Walnut (WN)
- RAL and Custom Colors Available

For more information on Create!, visit armstrong.com/create

NOTE: Effects colors are only available for extra microperforated panels.
Solid wood panels cannot be used for clouds.

METALWORKS™ Square Tegular and Vector Panels

- Micro-perforated
- Extra Micro-perforated
- White (WH)
- Silver Grey (SG)
- Gun Metal Grey (MY)
- Effects™ Maple (FXMP)
- Effects Cherry (FXCH)
- Effects Dark Cherry (FXDC)
- Effects Walnut (FXWN)

NOTE: Effects colors are only available for extra microperforated panels. Solid wood panels cannot be used for clouds.

ACCENT PANELS  Due to printing limitations, shade may vary from actual product.

Squares
METALWORKS Tin Tegular and Vector Panels (11 available)

- White (WH)
- Chrome (TAM)
- Lacquered Steel (TLS)
- Copper (TCP)

INFUSIONS® Lay-in Panels

- Dimensions (15 available)
- Arbors (4 available)

- Splash Lagoon (FZTRL)
- Splash Tangerine (FZTRI)
- Clear Arbor (TCA)
- Blue Arbor (TBA)

NOTE: For a complete list of panels, visit armstrong.com/metalworks; armstrong.com/infusions; armstrong.com/woodworks

RAL is a registered trademark of RAL gGmbH
Select your suspension system and trim colors.

**COLOR SELECTION** Due to printing limitations, shade may vary from actual product.

### Suspension System / Axiom® Trim Colors

<table>
<thead>
<tr>
<th>Suspension System</th>
<th>Axiom® Trim Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC FlexZone™ Silhouette®</td>
<td>1/4” Reveal 9/16”</td>
</tr>
<tr>
<td>DC FlexZone™ Suprafine®</td>
<td>9/16”</td>
</tr>
<tr>
<td>Prelude® 15/16”</td>
<td>Unfinished (UF)</td>
</tr>
<tr>
<td>Drywall 1-1/2”</td>
<td>White</td>
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</tbody>
</table>

**NOTE:** If specifying a color other than White for Curves, Squares, Planks, or Staggered Clouds, remember to add the color suffix at the end of the Suspension Kit item number.

### Colorations® Colors

<table>
<thead>
<tr>
<th>Colorations® Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (WH)</td>
</tr>
<tr>
<td>Shell (SH)</td>
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<tr>
<td>Pale Lemon (LM)</td>
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<tr>
<td>Pecan (PC)</td>
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<tr>
<td>Sky (SK)</td>
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<td>Moss (MS)</td>
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<tr>
<td>Stone (SE)</td>
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<tr>
<td>Reef (RE)</td>
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<tr>
<td>Lagoon (LA)</td>
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<tr>
<td>Plum (PM)</td>
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<tr>
<td>Cranberry (CA)</td>
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<tr>
<td>Kiwi (KW)</td>
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<tr>
<td>Tangerine (TG)</td>
</tr>
<tr>
<td>Black (BL)</td>
</tr>
</tbody>
</table>
|†Use BL suffix for suspension systems and Axiom

### AXIOM TRIM TYPES

- Axiom® Vector® for Formations™
- Axiom Vector (Inverted) for Formations
- Axiom Knife Edge® for Formations
- Axiom Knife Edge Vector for Formations

**AXIOM TRIM PROFILE OPTIONS**

- Axiom for Formations Vector trim (available in 2”, 4”, and 6” heights)
- Vector panel with Axiom for Formations Vector trim (available in 2”, 4”, and 6” heights)
- Tegular panel with inverted Axiom for Formations Vector trim (available in 2”, 4”, and 6” heights)
- Tegular panel with Axiom for Formations Knife Edge for Vector trim (available in 2”, 4”, and 6” heights)
- Vector panel with Axiom for Formations Knife Edge for Vector trim (available in 2”, 4”, and 6” heights)

Axiom customer service is available to help with your project from start to finish. Call 1 800 840 8521.

View installation videos or download CAD, Revit®, and SketchUp™ files at armstrong.com/formations

Rev® is a registered trademark of Autodesk, Inc.; SketchUp™ is a trademark of Trimble Navigation Limited.

---

8
### COMPATIBLE CEILING PANELS

<table>
<thead>
<tr>
<th>Edge Profile</th>
<th>Panel</th>
<th>Trim Choices:</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Axiom® Vector®</td>
<td>Axiom Vector (Inverted)</td>
<td>Axiom® Knife Edge®</td>
<td>Axiom Knife Edge Vector</td>
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<tr>
<td>FORMATIONS™ Curves</td>
<td>Lay-in</td>
<td>Available in 2&quot;, 4&quot;, and 6&quot; heights</td>
<td>Available in 2&quot;, 4&quot;, and 6&quot; heights</td>
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<td>Optima® Square Tegular</td>
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<td></td>
<td>Optima® Vector® (Factory-cut)</td>
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<td>Ultima® Beveled Tegular</td>
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<td></td>
<td>Ultima Vector (Factory-cut)</td>
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<td>Lyra™</td>
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<td>Optima Square Tegular</td>
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<td>Ultima® Health Zone™ Create!™ Square Lay-in</td>
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<td>WoodWorks® Grille Tegular</td>
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<td>WoodWorks Open Cell Vector</td>
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<td></td>
<td>Infusions® Lay-in</td>
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<td>FORMATIONS™ Planks &amp; Staggered</td>
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<td>FORMATIONS with DC FlexZone™ / with Integrated Lighting</td>
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<td>Optima Square Tegular</td>
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</tr>
</tbody>
</table>

* 2" trim height not available with DC FlexZone

**AVAILABLE (SEE PAGES 20-21)**

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N/A: Axiom One-piece Drywall Trim
Specify kits, colors, and panel selections.

HOW TO SPECIFY

Based on the cloud size and shape you choose, you need to specify and order the suspension and trim kit item number and the panel item number you select. Standard square and rectangle clouds feature 15/16" Prelude® suspension system and your choice of 2", 4", or 6" high Axiom® Vector® trim, Axiom® Knife Edge® Tegular or Vector® trim.

EXAMPLE:

C4VEA 0606 _ _
4" High 6' x 6' Color Axiom Cloud Suffix* Vector Trim

Also order Squares Optima® Vector® Panel Kit: 3900 (2' x 2' panels – 1 carton).

Custom options available that include a wide range of Axiom trim and suspension system options.

* If specifying a color other than White, remember to add the color suffix at the end of the Suspension Kit item number.

SQUARE/RECTANGLE CLOUD KITS

Specify kits, colors, and panel selections.

VISUAL SELECTION

Cloud Size Axiom Profile Suspension Item No. (Axiom Trim & Suspension System)

<table>
<thead>
<tr>
<th>Squares/Rectangles</th>
<th>Cloud Size</th>
<th>Axiom Profile</th>
<th>Suspension Item No. (Axiom Trim &amp; Suspension System)</th>
<th>Optima® Vector Panels</th>
<th>Ultima® Vector Panels</th>
<th>Optima® Tegular Panels</th>
<th>Ultima® Tegular Panels</th>
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<tr>
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<td>10' x 10' Vector</td>
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<td>5 5</td>
<td>5 5</td>
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</tr>
</tbody>
</table>

Panel options featured on pg. 20-21:

- **Calla®**
- **Cirrus®**
- **Cortega®**
- **Dune™**
- **Fine Fissured™**
- **Ultima® Health Zone™ Create!™**
- **MetalWorks™ Tegular**
- **MetalWorks Vector**
- **MetalWorks Tin**
- **MetalWorks™ Mesh™**
- **Infusions®**
- **WoodWorks® Grille**
- **WoodWorks Open Cell**

CUSTOM OPTIONS

Place these panel orders with Armstrong Customer Service - 1 877 276 7876

Panel options featured on pg. 20-21:

- **Calla**
- **Cirrus**
- **Cortega**
- **Dune**
- **Fine Fissured**
- **Ultima Health Zone Create**
- **MetalWorks Tegular**
- **MetalWorks Vector**
- **MetalWorks Tin**
- **MetalWorks Mesh**
- **Infusions**
- **WoodWorks Grille**
- **WoodWorks Open Cell**

* These items use Axiom® for Formations® Vector® trim (inverted).
take the next step

1 877 ARMSTRONG (276-7876)
Customer Service Representatives
7:45 a.m. to 5:00 p.m. EST
Monday through Friday

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Contacts – reps, where to buy, who will install

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Detail drawings
Specifications
Planning and budgeting

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Layout drawings for standard and premium products
Project installation recommendations
Contractor installation assistance

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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. Painted metal laboratory casework.
   2. Provide and install painted metal casework in locations listed and as indicated on laboratory equipment drawings.

B. Related Sections include the following:
   1. Division 09 Section "Resilient Wall Base and Accessories" for resilient base applied to metal laboratory casework.
   3. Division 11 Section 11 53 43, "Laboratory Service Fittings and Fixtures".
   4. Division 11 Section 11 53 33, "Laboratory Safety Equipment".
   5. Division 11, Section 1153 43.10, "Laboratory Accessories", for benchtops, sinks, service chases, drying racks, adjustable shelving, cylinder restraints, etc.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide certification that casework, components and hardware has been tested in accordance to and meet the structural performance requirements as described in SEFA 8.

B. Structural Performance: Provide metal laboratory casework capable of withstanding the following minimum loads without permanent deformation, excessive deflection, or binding of drawers and doors:
   1. Shelves of Base, Wall, and Storage Cabinets: 100 lbs (45 kg).
   2. Drawers: 150 lb (68 kg).
   3. Wall Cabinets: 150 lb/ft (224 kg/m) along the width of the cabinet.
   4. Floor-Supported Base Cabinets: 250 lb/ft (373 kg/m) along the width of the cabinet.

C. Seismic Performance: Provide metal laboratory casework system capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9,
"Earthquake Loads," whichever is more stringent.

1.4 SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: For metal laboratory casework. Include plans, elevations, sections, details, and attachments to other work.
   1. Indicate locations of blocking and other supports required for installing casework.
   2. Indicate locations and types of service fittings, together with associated service supply connection required.
   3. Include details of utility spaces including service chases showing supports for conduits and piping.
   4. Show adjacent walls, doors, windows, other building components, and other laboratory equipment. Indicate clearances from above items.
   5. Include coordinated dimensions for laboratory equipment, fume hoods and laboratory accessories specified in other Sections.

C. Samples for Verification: 6-inch- (150-mm-) square samples for each type of finish, including top material.

D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

E. Product Test Reports: Based on tests performed by a qualified independent testing agency, indicate compliance with SEFA 3 and 8 for laboratory casework finishes and countertops with requirements specified for chemical and physical resistance.

F. Coordinate shop drawings with other work involved.

1.5 QUALITY ASSURANCE

A. Manufacturer shall identify and designate a full time factory representative for on-site supervision and coordination during the installation of laboratory casework and all components.

B. Single Source Responsibility: Provide laboratory casework with tops, sinks, accessories, fume hoods and service fixtures, manufactured or furnished by same laboratory furniture company for single responsibility.

C. Product Designations: Drawings indicate sizes and configurations of casework. Manufacturers' of casework of similar sizes, similar door and drawer configurations, and complying with the Specifications may be considered.

D. Acid Storage: Provide units with the following features:
   1. Cabinets shall have a minimum 2 inch deep liquid tight pan in bottom of same size as cabinet.
   2. All acid cabinets shall be labeled in conspicuous lettering: “ACID”.
3. Corrosion resistant hardware plastic door roller catch.
4. Provide a fusion welded threaded vent connection using standard plastic pipe fittings.
5. Provide vent kit with flexible plastic hose to connect between the cabinet and the fume hood above.

E. Flammable Liquid Storage: Provide units that are listed and labeled as complying with the requirements of NFPA 30 for design, construction, and capacity of storage cabinets by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

1. Cabinets shall be grounded.
2. Coordinate with Electrical Contractor grounding lug locations.
3. Cabinets shall have a minimum 2 inch deep liquid tight pan in bottom of same size as cabinet.
4. All OSHA cabinets shall be labeled in conspicuous lettering: “FLAMMABLE – KEEP FIRE AWAY”.
5. Cabinets shall have an auto-closer and a latch handle with a lock.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver laboratory casework until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article below.

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

1.7 PROJECT CONDITIONS

A. Existing Conditions: Verify casework dimensions with field measurements. Entry ways, corridors, and door openings shall be verified to ensure casework and equipment can be properly installed.

1.8 COORDINATION

A. Coordinate layout and installation of metal framing, reinforcement and sheet metal fastening grounds in gypsum board assemblies for support of metal laboratory casework.

1.9 EXTRA MATERIALS

A. Furnish to Owner complete touchup kit for each type and color of laboratory casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Metal Laboratory Casework:
   a. CiFLab Solutions.
   b. Labcase.
   c. Kewaunee Scientific Corp.
   d. Mott Manufacturing.

2. Substitutions: are subject to the review and approval of the architect. All products for consideration require documentation of equivalent performance to be submitted by the contractor.

2.2 MATERIALS

A. Metal: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Minimum Metal Thickness: Provide metal laboratory furniture components of the following minimum thicknesses:

1. Fixed Panels including sides, ends, backs, bottoms, tops, soffits, and items not otherwise indicated: 18 ga., 0.0478 in (1.2 mm). Except for flammable liquid storage cabinets, bottoms may be 20 ga., 0.0359 in (0.9 mm) if reinforced.
2. Removable access panels, doors, drawer fronts and cabinet bodies, security panels, sloped tops and shelves: 20 ga., 0.0359 in (0.9 mm). For back panels and doors for flammable storage cabinets, use 18 ga., 0.0478 in (1.2 mm) thick metal. For shelves more than 36 in (900 mm) long, use 18 ga., 0.0478 in (1.2 mm) thick metal or provide suitable reinforcement.
3. Top, front and intermediate horizontal rails, aprons, stretchers, cross rails, table legs, center posts, frames and gussets: 16 ga., 0.0598 in (1.5 mm).
4. Drawer suspensions, L-shaped front corner gussets sink supports, and hinge reinforcements: 14 ga., 0.0747 in (1.9 mm).
5. Table leg corner brackets and leveler gussets: 12 ga., 0.1046 in (2.7 mm).

C. Acid and Ventilated Storage-Cabinet Lining: Acid Cabinets are supplied with a one piece molded polyethylene liner with radiused corners and a 2" raised lip for spill containment. The liner shall be removable to provide access to the back of the cabinet. The liner shall have integral shelf supports so that the shelf is adjustable to several positions. The shelf is a ridged phenolic resin.

D. Clear Tempered Glass for Glazed Doors: with ground edges ASTM C 1048, Kind FT, Condition A, Type I, Class I, Quality q3, 7/32 in (5.5 mm) thick or Clear Laminated Safety Glass for Doors: ASTM C 1172, Kind LT; Kind FT, Condition A, Type I, Class I, Quality q3 lites
with clear, polyvinyl butyral interlayer.

2.3 FABRICATION

A. General: Complete assembly and finish work at point of manufacture. Perform assembly on precision jigs to provide units which are square; fully reinforced with angles, gussets, and channels; and integrally framed and welded to form a dirt and vermin-retardant enclosure. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).

B. Fabricate units on precision dies for interchangeability of like-size drawers, doors, and similar parts.

C. Flat Panel Doors: Outer and inner pans formed and telescoped into box formation, with channel reinforcement's full height on center of each pan. Fill doors solid with noncombustible, sound-deadening material.

D. Glazed Doors: Hollow-metal stiles and rails of similar construction as flat panel doors and welded corners, with glass held in resilient channels or gasket material.

E. Hinged Doors: Mortise at flanges for hinges and reinforce with angles, welded inside inner pans at hinge edge.

F. Flat Panel Drawers: Assemble fronts from telescoping outer and inner pans, designed to eliminate raw edge of steel at top. Fabricate sides, back, and bottom of one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides, back, and bottom to form a single, integral unit. Provide drawers with rubber bumpers, runners, and positive stops to prevent metal-to-metal contact or accidental removal.

G. Adjustable Shelves: Front, back, and ends formed down with returned lip at front and back.

H. Toe Space: Provide an adjustable height metal toe space, fully enclosed, adjustable in height from a minimum 4in to a maximum 6 in high set 3 inches (75 mm) back from the face of the cabinet, with no open gaps or pockets. The adjustable height shall provide backing for the resilient base in the event of varying floor elevations.

I. Base Molding: 4 in high, to be provided around the base of fixed cabinets along sides, toe kicks, side panels and access panels.

J. Tubular Frames: Table supports.
   1. Table supports to be adjustable height in 1" increments.
   2. Table support frames to have levelers equipped.

K. Tubular Table Legs:
   1. 2" outside diameter, 12ga. powder coated cold rolled steel or stainless steel outer leg.
2. 1-¾” outside diameter, 11ga. powder coated cold rolled steel or stainless steel inner telescoping leg.

3. 2” diameter nylon leveling glide 3/8” x 2-1/2” long.

4. Capable of vertical height adjustment in 1” increments.

5. Leveling Bolt: Frame shall be fitted with a leveling bolt which will allow the legs to be adjusted for proper alignment of work surface height.

6. Load Capacity: Table frame shall support the work surface plus 100lbs/linear ft. of table length up to a maximum load rating of 800lbs.

L. Utilities: Provide space, cutouts, and holes for pipes, ductwork, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.

M. Service Chase Framing: Manufacturer's standard steel framing units consisting of 2 cold-rolled C-channel uprights, not less than 1-5/8 inches (41 mm) square by 0.10 inch (2.5 mm) thick, connected together at the top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) flat bars. Framing units may be made by welding C-channel material specified for uprights into rectangular frames instead of using U-shaped brackets.

N. Filler Strips: Provide as needed to close space between cabinets and walls, ceilings, and indicated equipment. Fabricate from the same material and with the same finish as cabinets. Hem exposed edges.

O. Closure Panels: Closure panels shall be fabricated from the same material and with the same finish as cabinets, and shall mount flush with the front edge of the cabinet, self supporting and extend vertically to underside of finished ceiling.

P. Mobile Instrument Carts:
   1. Nominal Dimensions:
      a. Width: 24”, 36”, 48”, 60”,72”
      b. Depth: 34”
      c. Height: 78”
   2. Caster: Four per cart assembly. 4” x 1.25” wheels with grey non-marking tire. Each caster shall have a 300 pound load rating. Front two casters shall be equipped with a modern total lock (locks both wheel rotation and caster swivel). Casters shall be attached to extreme corners of the cart base by threading into welded inserts.
   3. Cart base assembly: Cart base assembly shall be fabricated from 1.5” x 3” rectangular tube steel of 16 gage wall thickness. Base shall be welded together with neat, professional MIG weld fillets. For maximum strength, fillets shall be left unground. Mobile cart base shall be in a “C” shape with two members across the back and one member at each end. Cart base shall be open at front to allow knee space for seated users. Vertical upright attachment members of 24” in length shall be welded to each end of the “C” shaped base. All open tube ends shall be plugged with black plastic plugs.
   4. Slotted vertical uprights shall be the same construction and hole pattern as other steel laboratory furniture system components. Slotted uprights shall be bolted to
vertical upright attachment members using four 5/16" socket head cap screws. Screws shall be concealed beneath snap in plugs.

a. All hanging components attached to vertical uprights shall be adjustable in 1" increments.

5. Mobile Instrument Cart shall accept all shelves, cantilevered work surfaces suspended casework and upper storage cabinets designed for other steel laboratory furniture system components.

6. Fully assembled 78" high instrument cart shall support the following components. Each component has an individual maximum load, but total load shall not exceed 1000 pounds.

a. Shelves - 6", 8", 12" - 180 lbs.; 18" - 130 Lbs.; 24" - 100 lbs.

b. Wall cases - 300 Lbs

7. One cantilever work surfaces - 600 Lbs each (includes weight of work surface and suspended cabinets (if any).

2.4 FINISH FOR METAL LABORATORY CASEWORK

A. Cleaning and Pretreatment: After assembly, thoroughly clean surfaces of grease, dirt, oil, flux, and other foreign matter by physical and chemical means. Treat entire unit with metallic phosphate process, leaving surfaces with uniform, fine-grained, crystalline phosphate coating to provide bond for finish.

B. Chemical-Resistant Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, chemical-resistant, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and 2 mils (0.05 mm) for system.

C. Chemical and Physical Resistance of Finish System: Provide metal laboratory casework with finish system complying with the following requirements for chemical and physical resistance:

1. Chemical Resistance, Moisture Resistance, Cold Crack and Adhesion and Flexibility: Compliant testing and performance requirements as outlined by with SEFA 3 and SEFA 8 standards.

2. Chemical Resistance: Capable of withstanding application of not less than 5 drops (0.25 mL) of the following reagents applied to finish surface; covered with a watch glass for 60 minutes, rinsed, and dried; with no permanent change in gloss, color, film hardness, adhesion, or film protection.

1) Acetic acid (98%)
2) Acetone
3) Acid Dichromate (5%)
4) Ammonium hydroxide (28 %)
5) Amyl Acetate
6) Benzene
7) Carbon tetrachloride
8) Chloroform
9) Chromic Acid (60%)
10) Cresol
11) Dichlor Acetic Acid
12) Dimethylformamide
13) Dioxane
14) Ethyl acetate
15) Ethyl alcohol
16) Ethyl ether
17) Formaldehyde (37%)
18) Formic acid (90%)
19) Furfural
20) Hydrochloric acid (37%)
21) Hydrofluoric Acid (48%)
22) Hydrogen peroxide (5%)
23) Iodine
24) Methyl ethyl ketone
25) Methylene chloride
26) Mono chlorobenzene
27) Napthalene
28) Nitric acid (60%)
29) Phenol (90%)
30) Phosphoric acid (85%)
31) Potassium hydroxide (40%)
32) Silver nitrate
33) Sodium carbonate (saturated)
34) Sodium chloride (saturated)
35) Sodium hydroxide (40%)
36) Sodium sulfide (saturated)
37) Sulfuric acid (85%)
38) Toluene
39) Trichloroethylene
40) Xylene
41) Zinc chloride (saturated)

3. Moisture Resistance: No visible effect when exposed to the following:
   a. Hot water at a temperature of 190 to 205 deg F (88 to 96 deg C), trickled down the surface at a 45-degree angle for 5 minutes.
   b. Constant moisture using a 2 in x 3 in x 1 in (51 mm x 76 mm x 25 mm) cellulose sponge, soaked with water, in contact with surface for 100 hours.

4. Cold Crack: No effect when subjected to 10 cycles of temperature change from 20 deg F (minus 7 deg C) for 60 minutes to 125 deg F (52 deg C) for 60 minutes.

5. Adhesion and Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a ½ in (13 mm) diameter mandrel.

D. Colors: Comply with the following requirements for colors of metal laboratory casework finish:
1. Colors: Provide manufacturer's full range of standard colors and finishes for selection by laboratory architect.

2.5 CASEWORK HARDWARE

A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA 156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors less than 48 inches (1200 mm) high and 3 for doors more than 48 inches (1200 mm) high.

C. Pulls: Stainless steel, fastened from back with 2 screws. For sliding doors, provide stainless-steel recessed flush pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.

D. Door Catches: Nylon-roller spring catch or dual, self-aligning, permanent magnet catch with strike. Provide 2 catches on doors more than 48 inches (1200 mm) high.

E. Drawer Guides: Metal-channel, self-closing drawer guides, designed to prevent rebound when drawers are closed, with nylon-tired, ball-bearing rollers for self centering operation, capable of supporting 100 lbs. (45 kg.) and complying with BHMA A156.9, Type B05091.

F. Full Extension Interior Drawer Guides: Accuride or equivalent drawer guide all ball bearing, rail mount, clear zinc finish and capable of supporting 100 lbs. (45kg.) at 33 inches wide or less or 200 lbs (90 kg) for 42 inches wide or less.

1. Provide where indicated on drawings.

G. Shelf Clips: Die-formed steel, zinc plated or 14 ga steel. They are to be adjustable vertically in 1 in increments.

H. Number Plates and Label Holders: Stainless steel or chrome plated, sized to receive standard label cards approximately 1 by 2 ½ inches (25 by 63 mm), attached with screws or rivets.

1. Provide where indicated on drawings.

I. Drawer and Cupboard Locks: Half-mortise or cylindrical type, 5-pin tumbler and dead bolt or cam, only cylinder exposed, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.

1. Provide minimum of 2 keys per lock and 6 master keys.
2. Provide where indicated on drawings.

J. Sinks, General: Provide sizes as indicated on drawings or manufacturer's closest standard size of equal or greater volume, as approved by Architect.

1. Shelf Thickness: 3/4 inch (19 mm) for spans up to 36’.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcement, and other conditions affecting performance of metal laboratory casework installation.

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

3.2 CASEWORK INSTALLATION

A. Install plumb, level, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Utility-Space Framing: Secure to floor with 2 fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Set cabinets straight, plumb, and level. Adjust subtops within 1/16 inch (1.5 mm) of a single plane. Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm).

1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with concealed fasteners spaced 24 inches (600 mm) o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than 2 fasteners.

D. Wall Cabinets: Hang cabinets straight, plumb, and level. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches (600 mm) o.c. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

F. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF ACCESSORIES

A. Install accessories according to approved Shop Drawings and manufacturer’s written instructions. Coordinate locations and installation at all laboratory accessories specified in Section 11 53 43.10.

B. Securely fasten all casework, service chase frames, shelving, to metal fastening grounds or
walls.

3.4 CLEANING AND PROTECTING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at minimum of 48 inches (1200 mm) o.c.

END OF SECTION
SECTION 15 - MECHANICAL SPECIFICATION

MECHANICAL MATERIALS, METHODS AND EXECUTION

WORK INCLUDED:
FURNISH ALL LABOR AND MATERIAL, APPLIANCES, EQUIPMENT AND SUPERVISION TO PUT IN PLACE A COMPLETE AND FUNCTIONING MECHANICAL INSTALLATION READY FOR OPERATION, AS SPECIFIED HEREIN AND AS INDICATED ON THE DRAWINGS. SYSTEMS SHALL INCLUDE BUT NOT NECESSARILY LIMITED TO THE FOLLOWING MAJOR EQUIPMENT OR OPERATIONS:

1. PLUMBING
2. HEATING, VENTILATION AND AIR CONDITIONING
3. INSULATION
4. TEMPERATURE CONTROLS
5. FIRE PROTECTION

DEFINITIONS:
"PROVIDE": TO FURNISH AND COMPLETELY INSTALL SPECIFIED PRODUCTS AND INCIDENTALS, WHETHER SPECIFICALLY INDICATED OR NOT, NECESSARY FOR A COMPLETE, FUNCTIONAL INSTALLATION. INCLUDES ALL GENERAL AND SPECIALIZED LABOR, EQUIPMENT AND TOOLS NECESSARY TO COMPLETE THE INSTALLATION.

"PIPING": A COMPLETE SYSTEM, INCLUDING PIPE, TUBING, FITTINGS, HANGERS, SUPPORTS, VALVES, AND ALL SPECIALTIES THAT COM普ICE A FULLY FUNCTIONAL PIPING SYSTEM, WHETHER SPECIFICALLY INDICATED OR NOT.

CODES, ORDINANCES, AND STANDARDS:
ALL WORK SHALL CONFORM IN ALL RESPECTS TO THE REQUIREMENTS OF THE LATEST ADOPTED FEDERAL, STATE, LOCAL AND UNIVERSITY OF MICHIGAN CODES, ORDINANCES, AND STANDARDS HAVING JURISDICTION OVER THE WORK.

WHERE CONTRACT DOCUMENT REQUIREMENTS EXCEED THE REQUIREMENTS OF THE REFERENCED CODES, ORDINANCES, AND STANDARDS, THE CONTRACT DOCUMENT REQUIREMENTS SHALL BE TAKEN AS MINIMUM.

ALL EQUIPMENT CONTAINING ELECTRICAL WIRING AND/OR ELECTRICAL COMPONENTS SHALL HAVE A UNDERWRITERS LABORATORIES (UL) "PACKAGE" LABEL.

ALL GAS FIRED EQUIPMENT SHALL HAVE THE AMERICAN GAS ASSOCIATION (AGA) LABEL.

PERMITS, FEES AND INSPECTIONS:
SECURE ALL NECESSARY PERMITS, CONNECTION FEES, TAD FEES, LICENSES AND APPROVALS AND ARRANGE FOR ALL INSPECTIONS, INCLUDE ALL RELATED COSTS.

FURNISH CERTIFICATES OF FINAL INSPECTION AND APPROVAL UPON COMPLETION OF PROJECT.
EXAMINATION OF SITE:

VISIT PROJECT SITE AND BECOME FULLY COGNIZANT OF ALL EXISTING ARCHITECTURAL, MECHANICAL, ELECTRICAL, STRUCTURAL AND SITE CONDITIONS, OR EXISTING CODE VIOLATIONS WHICH MAY AFFECT THE WORK.

NOTIFY ARCHITECT PRIOR TO SUBMITTING BID IF REVISIONS TO CONTRACT DOCUMENTS ARE NECESSARY TO RECTIFY ANY OF THE AFOREMENTIONED EXISTING CONDITIONS.

NO "EXTRAS" TO CONTRACT PRICE WILL BE ALLOWED AFTER RECEIVING BID IN ORDER TO RECTIFY EXISTING CONDITIONS IN ORDER TO MEET THE DESIGN INTENT OF THE CONTRACT DOCUMENTS OR SATISFY CODE REQUIREMENTS.

COORDINATION WITH OTHER TRADES:

COORDINATE ALL WORK BEFORE AND DURING CONSTRUCTION WITH ALL OTHER AFFECTED TRADES.

WHERE INTERFERENCES DEVELOP, NOTIFY ARCHITECT FOR RESOLUTION OF CONFLICT.

RELOCATION OF CONFLICTING INSTALLED WORK, DUE TO LACK OF COORDINATION, OR POOR COORDINATION WILL NOT BE CONSIDERED EXTRA WORK.

APPROVED MANUFACTURERS:

USE ONLY MATERIALS SPECIFICALLY INDICATED IN CONTRACT DOCUMENTS, OR COMPARABLE MATERIALS BY OTHER LISTED ACCEPTABLE MANUFACTURERS. NOTE THAT "ACCEPTABLE MANUFACTURER" DOES NOT CONSTITUTE AUTOMATIC APPROVAL OF SPECIFIC MATERIALS BY ONE OR ALL OF THE LISTED ACCEPTABLE MANUFACTURERS. ARCHITECT AND/OR ENGINEER OF RECORD RESERVES THE RIGHT OF FINAL DETERMINATION OF ACCEPTABILITY OF EACH ITEM.

SHOP DRAWINGS:

SUBMIT COMPLETE SHOP DRAWINGS FOR ALL MATERIALS AND EQUIPMENT INTENDED FOR USE ON THIS PROJECT.

SHOP DRAWINGS SHALL CLEARLY INDICATE ALL PHYSICAL, PERFORMANCE AND ELECTRICAL CHARACTERISTICS FOR ALL MATERIALS AND EQUIPMENT.

SUBMIT ELECTRONIC COPIES OF ALL SHOP DRAWINGS FOR REVIEW BY ARCHITECT.

NO WORK IS TO BE INSTALLED PRIOR TO RETURN OF ARCHITECT REVIEWED SHOP DRAWINGS.

OPERATION AND MAINTENANCE MANUALS:

UPON COMPLETION OF PROJECT, SUBMIT TWO (2) COMPLETE BOUND SETS AND (2) CD DIGITAL COPIES OF OPERATING AND MAINTENANCE MANUALS FOR ALL EQUIPMENT AND SYSTEMS INSTALLED IN THIS PROJECT.

MANUALS SHALL INCLUDE GUARANTEE(S), COMPLETE OPERATING INSTRUCTIONS, REPAIR PARTS LIST, PREVENTATIVE MAINTENANCE SCHEDULE, BELT AND FILTER SCHEDULE, AND LIST OF ALL SUBCONTRACTORS ASSOCIATED WITH THE WORK, INCLUDING TELEPHONE NUMBER AND CONTACT PERSON.
OPERATING AND MAINTENANCE INSTRUCTIONS:

PRIOR TO FINAL ACCEPTANCE BY OWNER, PROVIDE ALL PERSONNEL, EQUIPMENT, AND LABOR AS NECESSARY TO INSTRUCT OWNER’S PERSONNEL IN PROPER OPERATION AND MAINTENANCE OF THE SYSTEMS AND EQUIPMENT INSTALLED IN THIS PROJECT. PROVIDE INSTRUCTIONAL SESSION DURING TIME PERIOD AGREED TO WITH OWNER.

CUTTING AND PATCHING:

ALL CUTTING AND PATCHING SHALL BE PROVIDED BY THE GENERAL TRADES UNDER THE DIRECTION OF THE MECHANICAL TRADES. COST WILL BE PAID BY THE MECHANICAL TRADE REQUESTING THE WORK.

RESTORED SURFACES SHALL BE OF SAME MATERIALS AND QUALITY AS ADJACENT SURFACES, AND SHALL MATCH SURROUNDING SURFACES, AND/OR BE RESTORED TO PRE-CONSTRUCTION CONDITION.

PROTECTION OF EXISTING SERVICES:

PROTECT FROM ALL DAMAGE, EXISTING SERVICES (I.E., GAS, WATER, ELECTRICAL, ETC.), ENCOUNTERED IN THE WORK, NOT SPECIFICALLY INDICATED TO BE DEMOLISHED. INCLUDE ALL RELATED COSTS.

REPAIR AND/OR REPLACE EXISTING ACTIVE SERVICES INTENDED TO REMAIN IN SERVICE, BUT DAMAGED DURING THE COURSE OF CONSTRUCTION. ABSORB ALL RELATED COSTS. NO "EXTRAS" WILL BE PAID TO RESTORE EXISTING ACTIVE SERVICES DAMAGED DURING CONSTRUCTION.

ARCHITECT WILL DETERMINE COURSE OF ACTION WHEN EXISTING INACTIVE SERVICES ARE DAMAGED DURING COURSE OF CONSTRUCTION. ABSORB ALL COSTS RELATIVE TO ADDITIONAL DEMOLITION, TERMINATION, RELOCATION AND/OR RESTORATION OF EXISTING, DAMAGED INACTIVE SERVICES AS DIRECTED BY ARCHITECT.

ELECTRICAL WORK:

PROVIDE ALL ELECTRICAL WORK ASSOCIATED WITH, AND NECESSARY TO COMPLETE THIS PROJECT, WHICH IS NOT INCLUDED AS ELECTRICAL TRADES WORK.

PROVIDE ALL ELECTRICAL WORK, AS APPLICABLE, IN ACCORDANCE WITH DIVISION 16 REQUIREMENTS.

CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION (WITH ELECTRICAL TRADES) OF CORRECT VOLTAGES FOR ALL MECHANICAL EQUIPMENT. IN CASE OF DISCREPANCY, NOTIFY ENGINEER IMMEDIATELY AND PRIOR TO SHOP DRAWING SUBMITTALS. FAILURE TO COMPLY WITH THIS REQUIREMENT HOLDS THE CONTRACTOR FULLY RESPONSIBLE FOR ANY SUBSEQUENT PROBLEMS

CLEANING AND FINISHING:

PRIOR TO FINAL ACCEPTANCE BY OWNER, THOROUGHLY CLEAN ALL WORK INSIDE AND OUT AS APPLICABLE, AND LEAVE ALL SYSTEMS AND EQUIPMENT IN PERFECT WORKING ORDER. THOROUGHLY CLEAN ALL PLUMBING FIXTURES, EXPOSED PIPING, FLOOR DRAIN GRATES, AND CLEANOUT COVERS AS APPLICABLE.
GUARANTEE:

REFER TO ARCHITECTURAL SPECIFICATIONS FOR GUARANTEES, IF NONE EXIST THE FOLLOWING MINIMUM GUARANTEES SHALL BE PROVIDED.

PROVIDE A ONE (1) YEAR GUARANTEE COVERING ALL LABOR AND MATERIAL PROVIDED IN THIS PROJECT. GUARANTEE SHALL INCLUDE ALL SHIPPING AND TRANSPORTATION CHARGES NECESSARY TO RETURN DEFECTIVE MATERIALS TO MANUFACTURER, AS WELL AS LABOR CHARGES NECESSARY TO REMOVE AND REPLACE DEFECTIVE MATERIALS.

PROVIDE 5 YEAR GUARANTEE FOR ALL COMPRESSORS.

DEFECTIVE MATERIALS AND/OR EQUIPMENT MAY BE REPAIRED IN LIEU OF REPLACED WITH PRIOR APPROVAL OF ARCHITECT AND/OR OWNER.

DEMOLITION:

DEMOLITION DRAWINGS ARE DIAGRAMMATIC, INTENDED TO CONVEY THE SCOPE OF THE WORK AND INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, DUCTS, PIPING AND APPROXIMATE SIZES AND APPROXIMATE LOCATIONS. DO NOT SCALE DRAWINGS FOR EXACT MEASUREMENTS.

ALL MECHANICAL WORK SHOWN ON THE DEMOLITION DRAWINGS HAS BEEN TAKEN FROM THE OWNER'S RECORD DRAWINGS AND/OR CERTAIN FIELD OBSERVATIONS. EXACT SIZES, LOCATIONS, ARRANGEMENT AND ELEVATIONS OF ALL EXISTING MECHANICAL EQUIPMENT, EXISTING DUCTWORK, EXISTING PIPING AND EXISTING MECHANICAL DEVICES SHALL BE VERIFIED IN THE FIELD.

THE CONTRACTOR SHALL INCLUDE, IN HIS QUOTE, ALLOWANCES FOR REASONABLE DEVIATIONS BETWEEN WHAT IS SHOWN AND ACTUAL JOB CONDITIONS IN ORDER TO COMPLETE THE WORK IN THE SCOPE INDICATED.

REMOVE, RECONNECT, CAP, PLUG AND REPLACE EXISTING PIPING AND DUCTWORK ONLY WHERE INDICATED IN THE CONTRACT DOCUMENTS.

REMOVE AND/OR REPLACE EXISTING EQUIPMENT, VALVES, CONTROLS, ETC., ONLY WHERE INDICATED IN THE CONTRACT DOCUMENTS.

INTERRUPTION OF EXISTING ACTIVE PIPING: WHERE THE WORK MAKES TEMPORARY SHUT-DOWNS OF SERVICE UNAVOIDABLE, SHUT-DOWN AT TIME AS APPROVED BY THE OWNER, WHICH WILL CAUSE LEAST INTERFERENCES WITH ESTABLISHED OPERATING ROUTINE. ARRANGE TO WORK CONTINUOUSLY, INCLUDING OVERTIME, IF REQUIRED TO MAKE NECESSARY CONNECTION TO EXISTING WORK.

UNLESS SPECIFICALLY NOTED TO THE CONTRARY, REMOVED MATERIALS SHALL NOT BE REUSED IN THE WORK. SALVAGE MATERIALS THAT ARE TO BE REUSED SHALL BE STORED SAFE AGAINST DAMAGE AND TURNED OVER TO THE APPROPRIATE TRADE FOR REUSE.

SALVAGED MATERIALS OF VALUE THAT ARE NOT TO BE REUSED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS POSSESSION RIGHTS ARE WAIVED. THE MATERIALS ARE TO BE REMOVED FROM THE SYSTEMS BY THIS CONTRACTOR AND TURNED OVER TO THE OWNER IN THEIR ORIGINAL CONDITIONS. THE OWNER SHALL MOVE AND STORE THE MATERIALS. WHERE THE OWNER WAIVES POSSESSION RIGHTS, THESE MATERIALS SHALL BECOME THE PROPERTY OF THIS CONTRACTOR, WHO SHALL REMOVE AND LEGALLY DISPOSE OF THE SAME, AWAY FROM THE PREMISES.
SANITARY WASTE CLEANOUT:

PROVIDE CLEANOUTS AS REQUIRED BY LOCAL CODES. THE FINISH OF COVER PLATES, TOP AND TOP FRAME ACCESS COVERS SHALL BE NICKEL BRONZE, UNLESS OTHERWISE SCHEDULED.

DOMESTIC WATER PIPING:

ABOVEGROUND DOMESTIC COLD, HOT AND HOT WATER RETURN, 2” AND SMALLER:

PIPE: ASTM B88, TYPE L, SEAMLESS HARD DRAWN RIGID COPPER WATER TUBE.
FITTINGS: ANSI B16.22, WROUGHT COPPER.
JOINTS: ASTM B32-95TA SOLDER JOINT.

DOMESTIC WATER VALVES:

BALL VALVES 2” AND SMALLER: BRONZE, 2 PIECE, FULL PORT, CHROME BALL. NIBCO OR APPOLO
CHECK VALVES: 150 LB., SWP 300 LB., WOG COMPOSITION DISC, THREADED ENDS. MILWAUKEE NO. 510.

COMPRESSED AIR PIPING:

ABOVEGROUND, 2” AND SMALLER:

PIPE: BLACK STEEL, SCHEDULE 40, ASTM A 53, ERW OR SEAMLESS, GRADE B.
FITTINGS: CAST IRON, 125 LB. ASTM A 126 OR MALLEABLE IRON 150 LB. ASTM A 197; UNIONS, 250 LB. ASTM A 197.
JOINTS: SCREWED.

COMPRESSED AIR VALVES:

ISOLATION VALVES 2” AND SMALLER: BALL VALVE.
CHECK VALVES: SWING CHECK VALVE.

VALVES GENERAL:

PROVIDE ALL VALVES NECESSARY FOR THE PROPER OPERATION AND DRAINAGE OF THE SYSTEMS.

PROVIDE DRAIN VALVES AT ALL LOW POINTS IN ALL SYSTEMS.

PROVIDE BALL VALVES AT EACH PIECE OF EQUIPMENT REQUIRING A WATER CONNECTION, IN RISERS AND MAIN BRANCHES AT POINTS OF TAKE-OFF FROM THEIR SUPPLY AND RETURN MAINS, ADJACENT TO CONTROL VALVES AND ALL EQUIPMENT REQUIRING DISCONNECTION FOR REPAIRS.

PROVIDE CHECK VALVES WHERE SHOWN OR NECESSARY TO PREVENT BACKFLOW.

PROVIDE BALANCING VALVES IN LINES WHERE IT IS NECESSARY TO REGULATE THE QUANTITY OF WATER FLOWING IN A CIRCUIT.

ALL VALVES SHALL BE LINE SIZE UNLESS OTHERWISE INDICATED.

ALL PRODUCTS THAT CONSTITUTE A PART OF ANY VALVE ASSEMBLY SHALL BE ASBESTOS-FREE.
PIPING INSULATION:

ALL ADHESIVES, SEALERS AND COATINGS SHALL BE INCOMBUSTIBLE. INSULATION SHALL BE APPLIED BY EXPERIENCED PIPE COVERERS AS PER BEST TRADE PRACTICE. WHERE EXISTING INSULATED PIPING AND SURFACES ARE EXPOSED DUE TO RENOVATIONS, RE-INSULATE EXPOSED SURFACES TO MATCH THE EXISTING INSTALLATION.

APPLY INSULATION TO PIPE LINES AND EQUIPMENT ONLY AFTER TESTING AND INSPECTION, AND ALL SURFACES HAVE BEEN THOROUGHLY CLEANED.

DOMESTIC COLD, HOT AND HOT WATER RETURN PIPING INSULATION:

1" THICK FIBERGLASS INSULATION WITH ALL SERVICE JACKET. PIPING INSULATION AND COVERING SHALL HAVE FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPED RATING OF 50 AND SHALL BE SIMILAR TO OWENS-CORNING NO. 25ASJ/55L-11. PROVIDE PUC FITTING COVERS BY PROTO AT ALL FITTINGS. FINISH WITH MASTIC VAPOR BARRIER.

PIPING INSTALLATION:

INSTALL ALL PIPING PARALLEL OR PERPENDICULAR TO BUILDING WALL AND COLUMNS IN LOCATIONS TO AVOID INTERFERENCE WITH DUCTWORK, STRUCTURE, OTHER PIPING, LIGHTING AND ELECTRICAL EQUIPMENT OR OTHER EQUIPMENT.

DO NOT LOCATE PIPING ABOVE OR WITHIN 3 FEET HORIZONTALLY OF ELECTRICAL PANELS OR EQUIPMENT.

FOR PIPING PASSING THROUGH WALLS, PACK VOID BETWEEN PIPE AND STRUCTURE WITH APPROVED, NON-COMBUSTIBLE MATERIAL.

DO NOT ALLOW CONTACT BETWEEN PIPING AND MASONRY OF CONCRETE SURFACES.

PROVIDE ALL THE NECESSARY HANGERS, RODS, SUPPORTS, CHANNELS, ANGLES, STRUCTURAL MEMBERS AND CONCRETE INSERTS TO PROPERLY SECURE PIPING AND RELATED EQUIPMENT. ALL SUPPORTS AND PARTS SHALL CONFORM TO THE LATEST REQUIREMENTS OF ANSI CODE FOR PRESSURE PIPING B31.1, AND MSS STANDARD PRACTICE SP-58.

PROTECT ALL INSULATED PIPE LINES AGAINST INSULATION DAMAGE AT ALL HANGERS BY THE USE OF 1 FOOT LONG, 12 GAUGE STEEL SEMI-CIRCULAR SHIELDS FOR PIPE SIZES WITH 12” OD AND LESS (INCLUDING INSULATION) AND 2 FOOT LONG, 1/2” STEEL SEMI-CIRCULAR SHIELDS FOR PIPE SIZES OVER 12” OD (INCLUDING INSULATION). SECURELY CEMENT ALL SHIELDS TO THE INSULATION. PROVIDE RIGID PIPE INSULATION AT EACH HANGER.

PIPE IDENTIFICATION:

IDENTIFY ALL NEW PIPING INSTALLED IN THIS PROJECT IN ACCORDANCE WITH ANSI A13.1 1981, OSHA, AND OWNER’S STANDARDS USING COILED PLASTIC MARKERS.
PIPE TESTING:

TEST AND ADJUST ALL NEW PIPING SYSTEMS INSTALLED IN THIS PROJECT. PROVIDE ALL TESTING INSTRUMENTS, GAUGES, PUMPS AND OTHER EQUIPMENT REQUIRED OR NECESSARY FOR TEST. REPAIR ALL DEFECTS DISCLOSED BY TESTS WITHOUT ADDITIONAL COST TO THE OWNER. REPEAT TESTS AFTER ANY DEFECTS DISCLOSED ARE REPAIRED OR REPLACED, UNLESS WAIVED BY ARCHITECT. ARRANGE AND PAY THE COST OF ALL UTILITIES USED ON TESTS. COMPLETE ALL TESTS BEFORE COVERING IS APPLIED. ISOLATE ALL PIPING SYSTEM COMPONENTS NOT CONSTRUCTED TO WITHSTAND TEST PRESSURES.

WATER AND COMPRESSED AIR SYSTEM:

TEST AT 150 PSIG FOR EIGHT (8) HOURS WITH ZERO LOSS IN PRESSURE. CHECK JOINTS AND FITTINGS FOR LEAKS WITH LIQUID SOAP SOLUTION.

FIRE PROTECTION:

FIRE PROTECTION CONTRACTOR SHALL SUBMIT NECESSARY DRAWINGS AND DOCUMENTS TO FACTORY MUTUAL, LOCAL AND STATE AGENCIES AND OBTAIN APPROVALS OF SAME PRIOR TO INSTALLATION.

FIRE PROTECTION CONTRACTOR SHALL DESIGN AND PROVIDE ALL MODIFICATIONS TO THE SPRINKLER SYSTEM INCLUDING RELOCATION OF HEADS TO ACCOMMODATE NEW CEILING AND WALL CONFIGURATIONS AS SHOWN OR REQUIRED COMPLYING WITH N.F.P.A. 13, U.L. AND ALL STATE AND LOCAL CODES.

SPRINKLER HEADS ARE TO BE CONCEALED TYPE WITH WHITE COVER.

ALL SPRINKLER HEADS SHALL BE CENTERED WITHIN THE GRID (UNLESS NOTED OTHERWISE) THE FIRE PROTECTION CONTRACTOR SHALL COORDINATE HEAD AND BRANCH LINE LOCATIONS TO ALLOW INSTALLATION OF LIGHTING, GRILLES AND DUCTWORK AS SHOWN.

THE FIRE PROTECTION CONTRACTOR SHALL RELOCATE EXISTING HEADS AND BRANCH LINES AS REQUIRED TO ACCOMMODATE NEW MECHANICAL WORK, LIGHT FIXTURE LAYOUT AND ALL APPLICABLE CODES.

FIRE PROTECTION PIPING SHALL BE SCHEDULE 40 PIPE.

SHEET METAL NOTES:

BLANK-OFF RETURN DUCTWORK IN AREAS OF WORK THAT CREATES DUST TO PREVENT DEBRIS FROM ENTERING MECHANICAL SYSTEM.

DUCTWORK: ALL DUCTWORK AND SHALL BE CONSTRUCTED AND SUPPORTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST SMACNA’S ISSUE OF DUCT CONSTRUCTION STANDARDS”. IN ADDITION, ALL JOINTS AND SEAMS SHALL BE SEALED WITH DUCT SEALANT EQUAL TO FOSTER #32-14. APPROVED SEALANT MANUFACTURERS: 3M COMPANY, BENJAMIN FOSTER COMPANY, UNITED SHEET METAL, FLINTKOTE.

ALL ROUND TAKE-OFFS DOWNSTREAM OF TERMINAL UNITS SHALL BE MADE WITH CONICAL TAKE-OFF SPIN-IN FITTINGS TYPE SM-2DG, WITH FACTORY INSTALLED ADJUSTABLE DAMPER AS MANUFACTURED BY GENERAL ENVIRONMENT CORPORATION, GLENDALE, CALIFORNIA OR EQUAL.
FLEXIBLE CONNECTIONS: AT EACH POINT OF CONNECTION OF DUCTWORK TO FANS, PROVIDE A FLEXIBLE CONNECTION, VENTFABRICS, INC., "VENTGLAS L.A." NOT LESS THAN 1/2" IN LENGTH AND MADE OF HEAVY GRADE GLASS FABRIC DOUBLE COATED WITH NEOPRENE AND PROVIDED WITH A SUITABLE FRAME AT EACH END ARRANGED FOR BOLTING TO INLET AND OUTLET OF FAN AND DUCTWORK, RESPECTIVELY. ALL AS APPROVED BY THE FIRE MARSHAL, AND ANY OTHER LOCAL AUTHORITY HAVING JURISDICTION.

VANES AND DEFLECTORS: ALL ELBOWS AND TURNS SHALL BE MADE WITH A RADIUS NOT LESS THAN THE 1-1/2 TIMES THE DUCT DIAMETER OR WIDTH. WHERE BUILDING CONSTRUCTION DOES NOT PERMIT A LONG RADIUS ELBOW OR TURN OR IF SHOWN ON THE CONTRACT DOCUMENTS, ACoustical turning vanes and deflectors shall be provided.

FLEXIBLE DUCTWORK: ALL LOW PRESSURE AND HIGH PRESSURE FLEXIBLE DUCT SHALL BE FLEXMASTER USA, INC., TYPE 1 INSULATED FLEXIBLE DUCT CONSISTING OF A FACTORY FABRICATED ASSEMBLY OF A TRILAMINATE ALUMINUM FOIL, FIBERGLASS AND POLYESTER. THE FLEXIBLE DUCT SHALL BE UL LISTED 181 CLASS 1 AIR DUCT AND COMPLY WITH NFPA 90A AND 90B AND HAVE A FLAME SPREAD OF NOT OVER 25 AND A SMOKE DEVELOPED OF NOT OVER 50. THE FLEXIBLE DUCT SHALL HAVE A MINIMUM PRESSURE RATING OF 12" WC THROUGH TEMPERATURE RANGE OF -20 DEGREES F. TO + 250 DEGREES F.

POLYPROPYLENE EXHAUST DUCTWORK:

EXHAUST DUCTWORK SERVING POLYPROPYLENE FUME HOOD SHALL BE SIMTECH PRO-DUCT FLAME RETARDANT POLYPROPYLENE.

MATERIAL: MATERIAL SHALL BE GROUP 1, CLASS 1, GRADE 0 POLYPROPYLENE HOMOPOLYMER MATERIAL PER ASTM- D4101, FEDERAL SPECIFICATION L-P-39413 AND MILITARY SPEC MIL P 461096. PP MATERIAL TO BE HEAT STABILIZED, U.V. STABILIZED AND WILL HAVE A FLAME RETARDANT ADDITIVE, AND PIGMENTED TO RAL 7037. COMBUSTION BEHAVIOR SHALL BE AS FOLLOWS:

- BI FLAME RETARDANT PER DIN 4102
- 28% OXYGEN INDEX PER ASTM2863
- >380° C IGNITION TEMPERATURE PER ASTM 1929
- Y=0 CLASS PER U.L. 94

DUCT: SHALL BE SEAMLESS, EXTRUDED FROM THE SPECIFIED MATERIAL AND SHALL HAVE UNIFORM, CONSISTENT WALL THICKNESS AND ROUNDNESS. WALL THICKNESS AS DETAILED BELOW.

FITTINGS: ALL DIRECTIONAL FITTINGS SHALL BE MOLDED FROM THE SPECIFIED MATERIAL. MITERED AND HOT AIR WELDED FITTINGS ARE NOT ALLOWED EXCEPT FOR ASSEMBLIES WHICH ARE NOT MANUFACTURED AS A MOLDED COMPONENT. FITTINGS AND COUPLING SHALL HAVE SOCKET ENDS WHICH FIT SNUGLY AROUND THE ENTIRE PERIPHERY OF THE PIPE. JOINTS ARE COMPLETED BY BACK WELDING WITH HOT AIR AND WELDING ROD.

WELDING: WELDING ROD SHALL BE THE SAME MATERIAL AS THE PIPE AND FITTING. WELDING IS TO BE PERFORMED USING A HOT AIR WELDER HAVING A SOURCE OF CLEAN DRY AIR. COMPRESSED AIR SHALL NOT BE USED FOR WELDING.
WALL THICKNESS: MINIMAL WALL THICKNESSES WILL BE AS FOLLOWS:

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<tr>
<th>DIAMETER (IN)</th>
<th>THICKNESS (MM)</th>
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<tr>
<td>3&quot; (90MM)</td>
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<tr>
<td>4&quot; (110MM)</td>
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<td>6&quot; (160MM)</td>
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<td>12&quot; (315MM)</td>
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<td>20&quot; (500MM)</td>
<td>8.0MM</td>
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<tr>
<td>24&quot; (630MM)</td>
<td>10.0MM</td>
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STATIC LOADING: DUCT AND FITTINGS SHALL BE CAPABLE OF A MAXIMUM 1 BAR (14.5PSI) STATIC PRESSURE AND A MAXIMUM OF 0.5 BAR NEGATIVE STATIC PRESSURE.

AIR TESTING AND BALANCING:

BALANCE ALL OUTLETS AND TERMINAL BOXES TO WITHIN 10% OF RATED C.F.M IN ACCORDANCE WITH AABC AND NEBB, SUBMIT BALANCING REPORT.

END OF SECTION 15
SECTION 16 - ELECTRICAL SPECIFICATION

GENERAL REQUIREMENTS:

ALL WORK SHALL BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE, LATEST EDITION, AND ALL LOCAL AND STATE AUTHORITIES HAVING JURISDICTION THEREOF.

IN ADDITION TO THE REQUIREMENTS SPECIFIED AND INDICATED, COMPLY WITH THE REQUIREMENTS OF THE WAYNE STATE DESIGN GUIDELINES. WHERE REQUIREMENTS OF THE DESIGN GUIDELINES ARE IN EXCESS OF THE CONTRACT DOCUMENTS, THE DESIGN GUIDELINES SHALL GOVERN. PROVIDE PRODUCTS ONLY AS LISTED ON THE WAYNE STATE MANUFACTURERS LIST.

ALL EQUIPMENT SHALL BE SPECIFICATION GRADE AND SHALL HAVE U.L. LABEL FOR INTENDED USE.

ELECTRICAL SYSTEMS SHALL BE COMPLETE IN EVERY DETAIL, INCLUDING ALL INCIDENTAL ITEMS FOR A PROPER AND FUNCTIONING INSTALLATION SUBJECT TO FINAL APPROVAL OF ARCHITECT/ENGINEER.

ALL REQUIRED PERMIT AND INSPECTIONS SHALL BE OBTAINED BY CONTRACTOR AND SUCH COSTS SHALL BE INCLUDED IN BID PRICE FOR THIS WORK.

PROVIDE UL LISTED SYSTEM FOR FIRE STOPPING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES. PROVIDE SYSTEM WITH EQUAL OR GREATER RATING THAN ASSEMBLY. REFER TO ARCHITECTURAL DOCUMENTS FOR RATINGS AND LOCATIONS OF ASSEMBLIES.

EXAMINATION OF SITE IS MANDATORY. CONTRACTOR IS HEREBY HELD TO HAVE EXAMINED THE SITE AND HAVE INCLUDED IN HIS BID PRICE ALL COSTS DUE TO SITE AND FIELD CONDITIONS.

COMPLETE IDENTIFICATION OF PROJECT ELECTRICAL COMPONENTS IS REQUIRED. IDENTIFY ALL PANELS, DISCONNECTS, CONTROL DEVICES, ETC., WITH THE NOMENCLATURE INDICATED ON THE DOCUMENTS AND WITH POWER SOURCE AND ELECTRICAL RATINGS USING PLASTIC LAMINATE NAMEPLATE. PROVIDE NEW PLASTIC LAMINATE NAMEPLATES FOR ANY WORK TO EXISTING DISTRIBUTION EQUIPMENT. INSTALL TYPEWRITTEN DIRECTORIES OF ALL CIRCUITS ON INSIDE OF PANELS. IDENTIFY WIRING DEVICE COVERPLATES WITH PANELBOARD AND BRANCH CIRCUIT NUMBER SERVING DEVICE, E.G. "A-15". PROVIDE 1/4" MACHINE-WRITTEN BLACK LETTERING ON CLEAR PLASTIC ADHESIVE TAPE. LOCATE ON BOTTOM FRONT OF COVERPLATE, CENTERED BELOW WIRING DEVICE(S). SUBMIT SAMPLE OF LABELED TAPE WITH WIRING DEVICE/Coverplate SUBMITTAL. SAMPLE MAY BE ADHERED TO PAPERWORK IN SUBMITTAL, RATHER THAN TO A COVERPLATE.

PROVIDE TEMPORARY POWER AND LIGHTING DURING CONSTRUCTION. REMOVE TEMPORARY WIRING UPON COMPLETION OF THE PROJECT. TEMPORARY SERVICES SHALL BE AS REQUIRED, BY N.E.C. AND OSHA.

GROUND CONTINUITY SHALL BE MAINTAINED THROUGHOUT THE ELECTRICAL SYSTEM. INSTALL EQUIPMENT GROUNDING CONDUCTOR WITH EVERY CIRCUIT.

COORDINATE SIZE AND LOCATION OF ANY REQUIRED ACCESS PANELS IN WALLS OR FINISHED CEILINGS WITH ARCHITECT PRIOR TO INSTALLATION.

LICENSED JOURNEYMAN OR REGISTERED APPRENTICE ELECTRICIANS SHALL PERFORM ELECTRICAL WORK. THE NUMBER OF APPRENTICES ON A PROJECT SHALL NOT EXCEED THE NUMBER OF
JOURNEYMAN. ELECTRICIANS SHALL CARRY A COPY OF THEIR LICENSE OR REGISTRATION WHILE WORKING ON SITE.

WARRANTY:
UNLESS A LONGER PERIOD IS SPECIFIED IN INDIVIDUAL PARAGRAPHS, PROVIDE A MINIMUM OF A ONE YEAR WARRANTY ON ALL ELECTRICAL WORK BEGINNING THE DATE OF FINAL ACCEPTANCE OF THE PROJECT BY THE OWNER.

SUBMITTALS:
SUBMIT SHOP DRAWINGS TO THE A/E AND TO THE UMHS ELECTRICAL ENGINEER.
SUBMIT THE FOLLOWING IN ADDITION TO ANY OTHER SPECIFIED SYSTEMS/EQUIPMENT:

* WIRING DEVICES & COVERPLATES
* LIGHTING FIXTURES, LAMPS, BALLASTS
* LIGHTING CONTROLS
* IDENTIFICATION
* FIRE ALARM

NO APPARATUS OR EQUIPMENT SHALL BE SHIPPED FROM STOCK OR FABRICATED UNTIL SHOP DRAWINGS FOR SAME HAVE BEEN STAMPED 'REVIEWED' OR "REVIEWED AS NOTED". SUBMIT DATA REQUIRED FOR TRANSFORMERS SUCH AS EFFICIENCY, REGULATION, CORE LOSS AND SOUND LEVELS. (SEE APPLICABLE SECTIONS).

SUBMIT SYSTEM COMPONENTS, PRODUCT DATA AND SHOP DRAWINGS COMPLETE FOR EACH SYSTEM UNDER ONE SUBMITTAL. DO NOT BREAK OUT EQUIPMENT FOR ONE SYSTEM BETWEEN MULTIPLE SUBMITTALS.

ALL SHOP DRAWINGS MUST BE CLEARLY MARKED TO SHOW EQUIPMENT SUBMITTED AND ANY DEVIATIONS FROM SPECIFICATIONS SHALL BE NOTED THEREON. DO NOT INCLUDE ONLY MODEL NUMBERS TO INDICATE SUBMITTED EQUIPMENT. STRIKE OUT ANY INFORMATION ON PRODUCT DATA THAT IS NOT PROJECT SPECIFIC, AND EDIT RELEVANT INFORMATION TO SHOW ACTUAL EQUIPMENT SUBMITTED. ELECTRICAL CONTRACTOR MUST SIGN AND APPROVED ALL SHOP DRAWINGS PRIOR TO SUBMITTAL.

UNIQUELY NUMBER EACH PAGE IN SUBMITTAL.

IF DIFFERENT SYSTEMS ARE INCLUDED IN ONE SUBMITTAL, CLEARLY SEPARATE INFORMATION AND PROVIDE DIFFERENT SUB-NUMBERING OF SYSTEMS. SHOP DRAWINGS THAT ARE INCOMPLETE, UNSIGNED AND NOT PLAINLY MARKED WILL NOT BE REVIEWED.

REMOVE AND REINSTALL CEILINGS, WALLS AND FLOORING, INCLUDING OUTSIDE THE RENOVATION AREAS, AS REQUIRED TO PERFORM WORK. REINSTALL REMOVED SURFACES TO PRE-CONSTRUCTION CONDITION OR BETTER, SUBJECT TO REVIEW AND APPROVAL OF THE ARCHITECT.

RECORD DRAWINGS:
BURIED, EMBEDDED AND CONCEALED CONDUITS SHALL BE DIMENSIONED FROM PERMANENT BUILDING FEATURES.

IN ADDITION TO HARD COPY, SUBMIT ON COMPACT DISKS ELECTRONIC VERSIONS OF AS BUILT PANEL SCHEDULES. SUBMIT TO A/E AND TO OWNER’S BUILDING ENGINEER IN MICROSOFT EXCEL FORMAT. MATCH FORMAT OF SCHEDULE USED FOR CONSTRUCTION DOCUMENTS. TEMPLATE FILE IS AVAILABLE TO CONTRACTOR FROM ENGINEER UPON REQUEST.

DEMOLITION AND RENOVATION WORK:

DISCONNECT, REMOVE, RELOCATE, REWIRE OR DISPOSE OF ANY EQUIPMENT INTERFERING WITH NEW CONSTRUCTION OR AFFECTED BY RENOVATION WORK.

ANY ELECTRICAL EQUIPMENT OR SYSTEMS WHICH ARE TO REMAIN, AND ARE AFFECTED BY THIS WORK, SHALL BE IMMEDIATELY RESTORED TO FULL OPERATING CONDITION AND AT NO ADDITIONAL COST TO THE CONTRACT.

EQUIPMENT REMOVED SHALL BE DISPOSED OF AS DIRECTED, EITHER TO STORAGE OR OFF THE PREMISES.

WHERE SERVICES OR CIRCUITS ARE DISCONNECTED OR DISCONTINUED, IT IS MANDATORY THAT ANY EXISTING UNUSED WIRING BE REMOVED TO THE SOURCE UNLESS SPECIFICALLY NOTED ON THE DRAWINGS. IT IS THE INTENT OF THIS ARTICLE TO PERMANENTLY DISCONNECT ALL UNUSED CIRCUITS AT THE MAIN SOURCE WHENEVER POSSIBLE. NO ENERGIZED CIRCUIT SHALL BE TAPED AND ABANDONED IN OUTLET BOXES UNLESS SO SPECIFIED ON DRAWINGS.

CIRCUIT TRACE EXISTING TO REMAIN CIRCUITS AS NECESSARY FOR PROPER IDENTIFICATION, AND AS REQUIRED TO PERFORM WORK. ANY EXISTING PANEL SCHEDULES AND CIRCUITING SHOWN ARE NOT INTENDED TO IMPLY ACTUAL INSTALLED CONDITIONS. EXISTING INFORMATION IS ISSUED FOR REFERENCE ONLY. INFORMATION INDICATED IS TAKEN FROM OWNER’S EXISTING CIRCUIT DIRECTORIES AND DESIGN DRAWINGS, WHICH MAY NOT REFLECT EXISTING CONDITIONS. CONTRACTOR IS TO FIELD VERIFY ALL EXISTING CONDITIONS BY CIRCUIT TRACING PANEL FEEDERS AND ALL BRANCH CIRCUITS PRIOR TO DEMOLITION WORK.

CONTRACTOR IS REQUIRED TO INDICATE ACTUAL CONDITIONS ON AS-BUILT DOCUMENTATION INCLUDING LOADS OF EXISTING TO REMAIN CIRCUITS. WORK INVOLVING EXISTING PANELBOARDS AND DISTRIBUTION EQUIPMENT SHALL BE SUCH THAT, WHEN ALL WORK IS COMPLETED EXISTING PANELS ARE PROVIDED WITH NEW AND UPDATED ACCURATE DIRECTORIES. ALL VACATED CIRCUITS SHALL BE MARKED SPARE. WHEN NEW BREAKERS OR FUSIBLE SWITCHES ARE REQUIRED, THEY SHALL BE INSTALLED IN EXISTING SPACES AND SHALL MATCH THOSE THAT ARE EXISTING.

CONTRACTOR MAY USE EXISTING CONDUITS AND OUTLET BOXES, PROVIDED THEY ARE IN GOOD ELECTRICAL CONDITION. RE-SUPPORT EXISTING TO REMAIN CONDUIT AND BOXES IN RENOVATION AREA IF INADEQUATELY SUPPORTED. PROVIDE SUPPORT AS REQUIRED TO COMPLY WITH NEC AND LOCAL AUTHORITY REQUIREMENTS.

IT IS THE INTENT OF THE OVERALL DESIGN TO CONCEAL ALL WORK IN NEW WALLS AND ABOVE FINISHED CEILING. SURFACE MOUNTING TO EXISTING BLOCK/CONCRETE WALL IS ACCEPTABLE WHERE REQUIRED.
ALL ELECTRICAL OPENINGS THAT ARE ABANDONED IN WALLS, CEILINGS OR FLOOR SHALL BE PROVIDED WITH SUITABLE BLANK COVER PLATES. ABANDONED FLOOR OUTLET SHALL BE PROVIDED WITH .040 BRASS PLATES.

UNLESS OTHERWISE NOTED, WHERE ELECTRICAL OUTLETS AND DATA OUTLETS, SWITCHES AND OTHER WIRING DEVICES ARE REMOVED AND NOT REUSED, REMOVE THE DEVICE, WIRING, BOX AND RACEWAY AS NOTED BELOW AND PATCH SURFACE TO MATCH EXISTING.

* POWER: REMOVE DEVICE OUTLET BOX AND WIRING BACK TO PANEL, OR TO FIRST JUNCTION BOX ABOVE THE ACCESSIBLE CEILING WHERE CIRCUIT CONTINUES ON TO OTHER EXISTING, ACTIVE LOADS. DO NOT LEAVE CONDUCTORS SPLICED IN OUTLET BOXES IN WALLS WHERE THE BOX CONTAINS NO WIRING DEVICES.

* TELECOMMUNICATIONS/DATA: IT CONTRACTOR TO DISCONNECT AT SOURCE IN COMMUNICATION ROOM AND AT OUTLET. ELECTRICAL CONTRACTOR TO CAREFULLY REMOVE CABLE.

* CONCEALED CONDUIT IN WALLS: ABANDON IN PLACE. REMOVE OUTLET, CUT OFF CONDUIT ABOVE CEILING OR WHERE OTHERWISE ACCESSIBLE, AND PLUG OR CAP END. IF CONDUIT IN WALL IS FLEX, IT SHALL BE REMOVED.

* ACCESSIBLE CONDUIT ABOVE CEILINGS AND IN EXPOSED INSTALLATIONS: REMOVE CONDUIT AND PLUG OPENINGS IN PANELS AND BOXES LEFT FROM REMOVED CONDUIT.

* FIRE STOP ALL HOLES IN FLOORS AND IN FIRE WALLS.

WIRING SHALL BE DISCONNECTED, REMOVED TO THE SOURCE AND PROPERLY DISPOSED OF. THERE SHALL BE NO EXCEPTION TO THIS RULE. DO NOT ABANDON UNUSED WIRING IN RACEWAYS.

UNLESS OTHERWISE NOTED CONDUITS AND OTHER PARTS OF ELECTRICAL SYSTEMS THAT BECOME EXPOSED AS PART OF THE RENOVATION WORK SHALL BE REMOVED IF UNUSED ON RELOCATED IF IN SERVICE TO A POINT WHERE THE EXPOSED PORTION IS TOTALLY CONCEALED.

REPAIR FINISHED SURFACES AROUND REMOVED ELECTRICAL EQUIPMENT TO MATCH FINAL FINISHED CONDITION. COORDINATE WITH ARCHITECT FOR FINISH REQUIREMENTS.

COORDINATE SERVICE SHUTDOWN AND POWER OUTAGES WITH OWNER OR HIS REPRESENTATIVE PRIOR TO ANY WORK ON EXISTING SERVICES IS DONE. SCHEDULE SHALL BE IN WRITING AND SHALL SHOW A DETAILED DESCRIPTION OF THE PROPOSED WORK AND THE DURATION OF OUTAGE.

CONTRACTOR SHALL HAVE SUFFICIENT NUMBER OF WORKERS ON THE JOB TO ACCOMPLISH THE WORK DURING THE ALLOTTED TIME AS PER AGREED UPON SCHEDULE.

ALL OUTAGE WORK AND SERVICE MODIFICATION SHALL BE INCLUDED IN BASE BID AND SUBJECT TO THE CONDITIONS IN THE CONTRACT DOCUMENTS. COORDINATE AND SCHEDULE WORK WITH OWNER AND CM/GC TO AVOID DISRUPTIONS TO OTHER BUILDING OCCUPANTS, INCLUDING WORK ON OTHER FLOORS AS REQUIRED. INCLUDE ALL COSTS FOR OVERTIME/PREMIUM TIME WORK AS REQUIRED IN BASE BID.
ALL SURFACES DAMAGED BY THIS CONTRACTOR IN THE COURSE OF PERFORMING WORK SHALL BE RESTORED TO SATISFACTORY CONDITION, AS DIRECTED BY THE ARCHITECT AND ALL COSTS OF REPAIRS SHALL BE PAID FOR BY THE CONTRACTOR

REMOVE SERVICE TO MECHANICAL, ELECTRICAL AND BUILDING EQUIPMENT INDICATED AS REMOVED OR DISCONNECTED. MAINTAIN CIRCUITS TO EXISTING-TO-REMAIN EQUIPMENT. IDENTIFY UNUSED, REMOVED CIRCUITS ON PANEL SCHEDULE AS SPARE. COORDINATE WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR EXISTING TO REMAIN EQUIPMENT AND FOR DEMOLITION WORK. SERVICE SHUTDOWN AND POWER OUTAGES SHALL BE SCHEDULED WITH THE OWNER PRIOR TO PERFORMING ANY WORK ON EXISTING SERVICE. SCHEDULE SHALL BE IN WRITING AND SHALL SHOW A DETAILED DESCRIPTION OF THE PROPOSED WORK AND THE DURATION OF OUTAGE.

WHERE EXISTING SLABS/FLOORS ARE TO BE CUT OR DEMOLISHED THE CONTRACTOR SHALL INSPECT SCAN, TEST, AND PERFORM ALL REQUIRED SCANNING AND INVESTIGATIONS TO IDENTIFY THE PRESENCE OF TELECOMMUNICATION RACEWAYS, ELECTRICAL FEEDERS, BRANCH CIRCUITS AND OR SERVICES WHICH ARE TO BE MAINTAINED IN AND BELOW THE SLAB WHETHER NOTED ON THE DRAWINGS OR NOT, AND TAKE ALL STEPS NECESSARY TO PROTECT AND MAINTAIN THOSE SERVICES.

REPLACE ANY EXISTING TO REMAIN DUPLEX RECEPTACLES WITH GFR (GROUND FAULT CIRCUIT INTERRUPTER) TYPE. THESE RECEPTACLES MAY NOT BE INDICATED ON PLANS. TYPICAL FOR ANY RECEPTACLE WITHIN 6'-0" OF A WATER SOURCE.

WHERE PENETRATIONS ARE LEFT IN RATED WALLS, FLOORS AND CEILINGS, SEAL THE PENETRATION TO ACHIEVE A LISTED FIRE/SMOKE RATING WHICH MATCHES THE RATING OF THEEXISTING PENETRATED SURFACE. COORDINATE WITH ARCHITECT FOR RATINGS OF EXISTING SURFACES.

RE-SUPPORT EXISTING TO REMAIN RACEWAYS AND BOXES ABOVE FINISHED CEILING IN AREA OF WORK AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION. INCLUDE AN ALLOWANCE IN THE BID AS A SEPARATELY PRICED LINE ITEM FOR RE-SUPPORTING WORK. REMOVE EXISTING LAY-IN FINISHED CEILINGS IN AREA OF WORK TO INSPECT EXISTING CONDITIONS ABOVE FINISHED CEILING. FOR EXISTING GYPSUM BOARD/INACCESSIBLE CEILINGS, INSPECT THROUGH EXISTING ACCESS PANELS AND/OR THROUGH OPENINGS RESULTING FROM REMOVED MECHANICAL AND ELECTRICAL EQUIPMENT UNLESS CEILING REMOVAL IS REQUIRED BY THE ARCHITECT. DETERMINE EXTENTS OF RE-SUPPORT REQUIRED AND PROVIDE ACCORDINGLY AS REQUIRED TO ACHIEVE THE APPROVAL OF THE AUTHORITY HAVING JURISDICTION.

UTILITY SERVICES (EXISTING BUILDINGS):

ELECTRIC SERVICE TO THE SITE IS EXISTING AND SHALL BE UTILIZED AS INDICATED ON THE DRAWINGS.

ELECTRICAL EQUIPMENT AND DEVICES:

SWITCHES AND RECEPTACLES ARE TO CONTAIN SIDE-WIRED SCREW TERMINALS. CONNECT WIRING DEVICES TO BRANCH CIRCUITING WITH SIDE SCREW TERMINALS. DO NOT CONNECT BRANCH CIRCUITING WITH PUSH-IN BACK TERMINALS ON WIRING DEVICE. DO NOT CONNECT BRANCH CIRCUITING WITH MODULAR/SNAP-IN CONNECTORS ON WIRING DEVICE.

COORDINATE COMPATIBILITY BETWEEN DIMMER SWITCHES AND DIMMING BALLASTS / DEVICES PRIOR TO ORDERING EQUIPMENT.
WIRING DEVICE COVER PLATES SHALL BE OF TYPE AND NUMBER OF GANGS FOR DEVICES INSTALLED, SMOOTH EDGED 302/304 GRADE BRUSHED STAINLESS STEEL. PROVIDE BRANCH CIRCUIT IDENTIFICATION ON ALL COVERPLATES AS SPECIFIED UNDER “GENERAL REQUIREMENTS”. COVERPLATES FOR DEVICES CONNECTED TO THE EMERGENCY SYSTEM SHALL ALSO BE FACTORY LABELED WITH BLACK LETTERING TO READ “EMERGENCY”. RECEPTACLES DESIGNATED AS “WP” SHALL BE HOSPITAL GRADE GROUND FAULT CIRCUIT INTERRUPTER TYPE WITH A CAST BOX AND COVER LISTED AS WEATHERPROOF/RAIN TIGHT WHILE IN USE.

GROUND BUS SHALL BE 8” LONG, 2” WIDE AND MINIMUM 1/4” THICK WITH PRE-DRILLED HOLES FOR LUGGING CABLE. WALL MOUNT AS INDICATED. PROVIDE ALL HARDWARE FOR WALL MOUNTING.

CONDUCTORS:
ALL CONDUCTORS SHALL BE SOFT-DRAWN COPPER OF SIZES INDICATED ON THE DRAWINGS. ALL CONDUCTORS SHALL BE INSULATED FOR 600 VOLTS AND WITH 75 DEGREES (CENTIGRADE) CODE GRADE INSULATION.

ALL CONDUCTORS SHALL BE MADE UP OF STRANDED SINGLE CONDUCTOR CABLE. CONDUCTORS SHALL HAVE THWN OR THHN INSULATION AS APPLICABLE. CONDUCTORS IN UNDERGROUND CONDUIT AND FOR SERVICE ENTRANCE CONDUCTOR SHALL HAVE XHHW OR THWN INSULATION.

#12 AWG SHALL BE THE MINIMUM WIRE SIZE ALLOWED EXCEPT #14 AWG MAY BE USED FOR CONTROL WIRING.

TYPICAL BRANCH CIRCUITS FROM 20A, 1-POLE BRANCH OVERRCURRENT DEVICES ARE 3/4"C, 2 #12 AND 1#12G, UNLESS OTHERWISE NOTED.

MC AND AC CABLE ARE NOT APPROVED FOR USE IN PROJECT.

PROVIDE DEDICATED NEUTRALS WITH EACH NEW CIRCUIT.

PROVIDE EQUIPMENT GROUNDING CONDUCTOR WITH EACH CIRCUIT.

FLEXIBLE METAL DUCT MAY BE USED IN WALLS WHICH ARE NOT OTHERWISE BEING OPENED UP FOR OTHER CONSTRUCTION. PROVIDE HEALTHCARE LISTED TYPE MC OR AC CABLE FOR THIS APPLICATION IN PATIENT CARE AREAS PER NEC ARTICLE 517. IT IS THE CONTRACTOR’S RESPONSIBILITY TO PROVIDE INSTALLATION PER NATIONAL ELECTRICAL CODE REQUIREMENTS, STATE OF MICHIGAN REQUIREMENTS, AND TO ACHIEVE APPROVAL BY THE ELECTRICAL INSPECTOR.

STARTERS, SAFETY SWITCHES, FUSES AND HEATERS:

MANUAL MOTOR STARTERS SHALL BE 600V TOGGLE TYPE WITH THERMAL OVERLOAD ELEMENT FOR MOTOR PROTECTION STAINLESS STEEL COVER PLATE AND PILOT LIGHT; FLUSH IN ALL AREAS EXCEPT IN UNFINISHED SPACES. CONTRACTOR TO COORDINATE AND PROVIDE QUANTITY OF POLES AS REQUIRED FOR BRANCH CIRCUIT AND LOAD SERVED. MANUAL MOTOR SWITCHES SHALL BE THE SAME AS MANUAL STARTERS EXCEPT WITHOUT OVERLOADS AND USED AS DISCONNECTING MEANS.

MAGNETIC MOTOR STARTERS SHALL BE 600 VOLT 3-PHASE WITH 3 THERMAL OVERLOAD ELEMENTS, HOA SWITCH AND RESET BUTTON IN COVER AND GREEN RUNNING PILOT LIGHT, NEMA ENCLOSURE AND SIZE AS INDICATED. COMBINATION STARTERS SHALL HAVE BUILT-IN FUSED DISCONNECT. PROVIDE START-STOP PUSH BUTTONS FOR USE IN HAND (MANUAL) MODE.
Provide thermal alloy melting type heater elements for all motors based on motor nameplate data.

Safety and disconnect switches shall be 250 or 600 volts as required, heavy duty, two or three pole, 'quick-make', 'quick-break' switch mechanism and cover interlock. Switches shall be fused or unfused as indicated and shall have pad lock provisions, with NEMA type enclosure for location used. Switches shall be square "D"class 3110 or approved equal.

Provide all necessary fuses and replace all those blown during construction. All fuses shall be time lag, dual element, Bussman "Low Peak Yellow" or equal.

**TELECOMMUNICATIONS**

Provide outlet box and conduits as indicated.

**INSTALLATION AND METHODS OF EXECUTION:**

All wiring shall be in conduit or code-approved metal duct. Minimum 3/4" C. Flexible metal conduit shall be used for short connection to motors, final connection to recessed lighting fixtures from rigidly mounted outlet box (not between fixtures), vibrating equipment, etc., but never longer than 6 feet. Provide liquid tight flexible metal conduit for all applications exposed to water or weather. Provide anti-short bushings for all flexible conduit armor terminations. Provide separate equipment ground wire in all conduit runs.

Conduit concealed in ceiling, walls or furred spaces or exposed in dry locations shall be EMT, thin wall electric metallic tubing. Exposed conduit and conduit exposed to weather, in contact with concrete, buried in slab, or in hazardous areas, shall be heavy wall, rigid. All conduits shall be hot dipped galvanized steel.

Provide and install all necessary inserts, conduit sleeves, hanger bolts, etc., to hang equipment and to run conduit through walls, floor slabs or footings.

Holes through walls, ceilings or floor slabs shall be sealed completely in an approved manner to form a fire barrier.

For penetrations through fire-rated assemblies, provide UL listed system for the penetration, equal to or greater than the rating of the rated assembly. Refer to architectural documents for fire rated assembly types and locations.

In addition to manufactured systems indicated (such as fire-rated poke-throughs), fire stop components shall consist of packer-style red pillows and moldable fire-stop compound. Packets shall be used where multiple cables pass through a fire-rated wall, ceiling or floor, such as data and phone cable trays. Fire-stop compound shall be used where individual cables in conduit/sleeves penetrate fire-rated wall, ceiling or floors.

Provide sleeves for all conduits penetrating floors and concrete/masonry walls.
ALL WORK IN HAZARDOUS LOCATIONS SHALL BE DONE IN STRICT CONFORMANCE WITH NEC ARTICLE 500.

PLASTIC CONDUIT, PVC-40, SHALL BE USED ONLY AS INDICATED ON THE DRAWINGS. PLASTIC CONDUIT SHALL BE APPROVED FOR UNDERGROUND USE. PVC BURIAL DEPTH SHALL BE 36" MINIMUM BELOW FINISH GRADE. IN PVC CONDUIT SYSTEMS, RISERS ABOVEGROUND SHALL BE RIGID HEAVY WALL STEEL.

CONDUIT RUNS SHOWN ON DRAWINGS ARE DIAGRAMMATIC. EXACT ROUTING OF CONDUIT RUNS SHALL SUIT JOB CONDITIONS. EXPOSED CONDUIT SHALL BE RUN ONLY IN UNFINISHED AREAS SUBJECT TO FINAL APPROVAL OF ENGINEER AND SHALL RUN PARALLEL TO BUILDING LINES, NEVER DIAGONALLY.

PROVIDE CONDUIT TO ABOVE ACCESSIBLE FINISHED CEILING FROM EACH OUTLET / DEVICE BOX. DO NOT RUN CONDUIT HORIZONTALLY IN WALLS BETWEEN BOXES.

CONNECTION TO EQUIPMENT SHALL BE DONE IN ACCORDANCE WITH MANUFACTURER’S SHOP AND INSTALLATION DRAWINGS. REQUIREMENTS GENERALLY VARY FROM ONE MANUFACTURER TO ANOTHER AND CONTRACTOR IS BOUND TO COMPLY AND PROVIDE ALL WORK AS REQUIRED ALTHOUGH CERTAIN DISCREPANCIES MAY EXIST REGARDING THE REQUIREMENT FROM ONE MANUFACTURER TO ANOTHER.

PROVIDE POWER WIRING, DISCONNECTS, AND PROTECTION DEVICES TO ALL MECHANICAL EQUIPMENT AND MAKE FINAL CONNECTIONS, INCLUDING TESTING OF MOTORS FOR PROPER ROTATION.

OUTLET BOXES MAY-BE SURFACE MOUNTED ON EXISTING WALLS (CMU, BRICK OR CONCRETE) WITH SMALLEST SURFACE RACEWAY AS REQUIRED FOR WIRING INSTALLED. PROVIDE FLUSH OUTLET BOXES AND CONDUIT AT NEW CONSTRUCTION WALLS AND AT EXISTING WALLS (ALL TYPES) WHICH ARE NOT CMU, BRICK OR CONCRETE CONSTRUCTION. CUT AND PATCH EXISTING WALLS AS REQUIRED FOR FLUSH INSTALLATION.

PROVIDE 4" TALL CONCRETE HOUSEKEEPING PADS FOR ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT.

PROVIDE U-CHANNEL SUPPORTS AND MISCELLANEOUS STEEL AND HARDWARE AS REQUIRED TO SUPPORT ELECTRICAL WORK. PROVIDE FIBERGLASS/NON FERROUS FOR OUTSIDE / WET APPLICATIONS ATTACHMENT DEVICES SHALL BE A TYPE RESULTING IN THE LOAD BEING CENTERED ON THE CENTER OF THE MEMBERS.

RIGIDLY SUPPORT ALL ELECTRICAL EQUIPMENT.

SUPPORT ELECTRICAL ITEMS INDEPENDENTLY OF THE SUPPORTS PROVIDED BY OTHER TRADES AND INDEPENDENTLY FROM EXISTING ELECTRICAL SYSTEM SUPPORTS. DO NOT SUPPORT ELECTRICAL ITEMS FROM CONDUITS/RACEWAYS.

ALL BRANCH CIRCUIT WIRING IN PANEL, SHALL BE LABELED AS TO CIRCUIT NUMBER.
AT EACH OUTLET JUNCTION/PULL BOX, NOTE SOURCE PANEL FOR WIRING PASSING THROUGH OR TO, THE BOX. LABEL OUTSIDE COVER ALSO IF BOX IS IN A CONCEALED AREA. LABEL INSIDE COVER IF BOX IS VISIBLE. LABEL WIRES IN OUTLET BOX AS TO CIRCUIT NUMBER.

ALL CONTROL, SIGNAL, FIRE ALARM, SECURITY AND OTHER LIKE SPECIAL SYSTEMS CABLES SHALL BE LABELED IN ALL JUNCTION BOXES, DEVICE LOCATIONS, AND ENCLOSURES.

ALL JUNCTION BOXES SHALL BE LABELED AS TO FUNCTION.

USE PERMANENT MARKERS, AND WRITE FUNCTIONS IN A VISIBLE LOCATION INSIDE THE BOXES, AND ON THE OUTSIDE COVERS WHERE BOX IS IN A CONCEALED AREA. PROVIDE ACCESS PANELS FOR ANY WORK ABOVE IN ACCESSIBLE CEILING

SURFACE RACEWAYS AND FITTINGS:

A. PROVIDE AND INSTALL ALL SURFACE METAL RACEWAYS AND APPROPRIATE FITTINGS TO PROVIDE A SAFE AND COMPLETE INSTALLATION.

B. SURFACE METAL RACEWAYS AND FITTINGS SHALL BE GENERALLY G-4000 SERIES AS MANUFACTURED BY THE WIREMOLD COMPANY.

C. SURFACE METAL RACEWAY SHALL CONSIST OF A BASE SECTION, 10 FEET IN LENGTH, HAVING A NOMINAL MATERIAL THICKNESS OF .050" AND HAVE 9/32" DIAMETER TRADE SIZE KNOCKOUTS, 1-1/4" FROM EACH END AND ON CENTERS OF APPROXIMATELY 18" THROUGHOUT TO FACILITATE MOUNTING.

D. COVER SECTIONS SHALL HAVE A NOMINAL MATERIAL THICKNESS OF .04" AND BE FURNISHED IN 5 FOOT LENGTHS. THE BASE AND COVER SECTIONS SHALL BE MANUFACTURED OF GALVANIZED STEEL AND PAINTED WITH ANSI 61 GRAY FINISH WHICH IS CAPABLE OF BEING OVERPAINTED IN THE FIELD IF REQUIRED.

E. RACEWAY SHALL BE DIVIDED INTO TWO EQUAL BUT SEPARATE WIRING COMPARTMENTS TO FACILITATE INSTALLATION OF POWER AND LOW POTENTIAL WIRING. "SEPARATE COMPARTMENTS ARE TO BE IDENTIFIED BY SHARPLY CONTRASTING COLORS OF INTERIOR FINISH OF THE Divider."

F. A FULL COMPLEMENT OF FITTINGS FOR THE SURFACE METAL RACEWAY SHALL BE AVAILABLE INCLUDING, BUT NOT LIMITED TO ELBOWS (90 DEGREES, INTERNAL AND EXTERNAL), COUPLINGS FOR JOINING RACEWAY SECTIONS, WIRE CLIPS FOR HOLDING CONDUCTORS OR CABLES IN PLACE, BLANK END FITTINGS FOR CLOSING OPEN ENDS OF THE RACEWAY, TRANSITION CONNECTORS TO OTHER SURFACE METAL RACEWAYS AND 1/2", 3/4", 1", 1-1/4" AND 1-1/2" TRADE SIZE CONDUIT OR ARMORED CABLE.

G. ALL COMMUNICATIONS OUTLETS SHALL BE VOICE/DATA CONNECTIONS WITH INTERCHANGEABLE LAN ADAPTERS PER OWNER STANDARDS. IN ADDITION, DEVICE BRACKETS TO INSTALL SINGLE OR TWO GANG DEVICES BOTH HORIZONTALLY OR VERTICALLY WITHIN THE RACEWAY AND COMBINATION RECEPTACLE AND TELEPHONE OUTLET COVERS SHALL BE PROVIDED.
H. Surface metal raceway and fittings shall meet all requirements of the National Electrical Code Article 352A and shall be listed by the Underwriters' Laboratories, Inc., in full compliance with their standard for surface metal raceways and fittings. (UL-5).

I. Coordinate finish color with architect.

**Lighting:**

LED ballasts shall be universal voltage 120V through 277V, programmed rapid start, maximum 10% THD, normal ballast factor. Osram Sylvania QTP series, or approved equal by Advance, GE, Lutron or Motorola.

Where dimming is specified for lighting, provide dimming ballasts with minimum 1% dimming drivers. Coordinate dimmer with dimming ballast / driver for compatibility.

LED drivers shall be universal voltage 120V through 277V with integral dimming.

LED sources shall be minimum 80 color rendering index (CRI) 4000K color temperature.

Provide factory installed fusing in each fixture where fusing is voltage-specific and fixture is universal voltage input. Coordinate fuse voltage with voltage of branch circuit indicated on plans for each application.

For all electric-discharge lighting fixtures, provide a luminaire disconnecting means to disconnect phase and neutral conductors from the branch circuit to the ballast. Locate disconnecting means concealed within the fixture.

Typical for new, reused and relocated fixtures. Assume all reused and relocated fixtures require the field addition of the disconnecting means and include work in bid. Provide all new fixtures with disconnecting means factory-installed. Provide Thomas & Betts STA-KON luminaire disconnect or equal.

Provide photometric calculations for any fixture substitutions proposed, including fixtures submitted as equal if requested by the A/E.

Submit lamp and ballast product data with each fixture type.

**Fire Alarm:**

**Part 1 - General**

A. Fire alarm system devices indicated on plans are schematic only in type, location and quantity. System’s quality and performance shall be as covered in these specifications. Fire alarm designer and installer is a subcontractor to the electrical contractor.
1.01 SCOPE OF WORK:

A. PROVIDE A COMPLETE MANUAL/AUTOMATIC ADDRESSABLE FIRE ALARM DETECTION AND NOTIFICATION SYSTEM AND PANEL FOR THE AREA OF WORK, WITH TIE-IN TO THE EXISTING BUILDING PANEL. INCLUDE ALL WORK FOR A COMPLETE, FUNCTIONING AND APPROVED INSTALLATION INCLUDING BUT NOT LIMITED TO THE FOLLOWING MAJOR ITEMS:

1. SYSTEM DESIGN.
2. DEVICE LOCATION.
3. BATTERY CALCULATIONS.
4. CIRCUIT VOLTAGE DROP CALCULATIONS.
5. BUILDING PLANS WITH LOCATION OF ALL DEVICES AND EQUIPMENT.
6. INTERFACE WITH OTHER SYSTEMS OR EQUIPMENT AS APPLICABLE.
   a. AIR HANDLING UNITS SMOKE DETECTION.
   b. FIRE CURTAINS AND SMOKE BARRIERS, FIRE AND SMOKE DAMPERS.
   c. FIRE SUPPRESSION SYSTEM.
   d. EXISTING TO REMAIN FIRE ALARM SYSTEM.
   e. ANY OTHER RELATED DEVICES OR EQUIPMENT.
7. SYSTEM RISER.
8. LEGEND FOR ALL DEVICES AND EQUIPMENT SHOWN ON PLANS AND RISERS.
9. SYSTEM OPERATION MATRIX AND AS REQUIRED FOR FULL COMPLIANCE WITH REQUIREMENTS OF NFPA 71-2002 AND APPLICABLE LOCAL, STATE AND NATIONAL RULES AND REGULATIONS.
10. THE EXISTING PANEL/SYSTEM SERVING THE BUILDING IS BY STANDARD ELECTRIC TIME COMPANY, WITH THE PANEL LOCATED IN THE BASEMENT MECHANICAL ROOM. THE PANEL SERVICES MANUAL PULL STATIONS. PRIOR TO DESIGN, THE ALARM DESIGNER IS TO PERFORM INSPECTION, EVALUATION AND TESTING OF EXISTING FIRE ALARM SYSTEM TO DETERMINE EXISTING FUNCTIONALITY. ALSO DETERMINE CAPABILITY OF THE OLD EXISTING ANALOG SYSTEM TO ACCEPT INPUTS FOR ALARM, TROUBLE AND SUPERVISORY SIGNALS FROM THE NEW PANEL. REPORT FINDINGS TO A/E AND OWNER. INCLUDE IN BID COST TO RUN AND TIE-IN THESE SIGNALS FROM THE NEW PANEL TO THE OLD PANEL.
B. EMPLOY THE SERVICES OF A QUALIFIED NICET CERTIFIED FIRE ALARM CONTRACTOR/CONSULTANT TO PREPARE THE SYSTEM DESIGN AND RELATED CONSTRUCTION DOCUMENTS INCLUDING ALL RELATED CALCULATIONS AND DEVICE PLACEMENT; FULLY COMPLETE WITH ALL INFORMATION AND RELATED DATA, AS REQUIRED, TO OBTAIN SYSTEM APPROVAL BY THE AUTHORITY HAVING JURISDICTION (AHJ). COORDINATE WITH ARCHITECT FOR BUILDING USE GROUP AND OCCUPANCY INFORMATION. ALL WORK IS TO BE DONE BY A CONTRACTOR/CONTRACTOR CERTIFIED TO THE MICHIGAN STATE FIRE MARSHALL (MSFM).

C. DETERMINE THE APPLICABLE AUTHORITIES HAVING JURISDICTION FOR ALL PROJECT WORK AND PHASES, AND COMPLY WITH THE PERMITTING, DESIGN, PLAN REVIEW, INSTALLATION AND INSPECTION REQUIREMENTS OF ALL AUTHORITIES HAVING JURISDICTION. MULTIPLE AUTHORITIES MAY EXIST. AUTHORITY, AUTHORITIES AND AHJ ARE USED INTERCHANGEABLY IN THE SPECIFICATION AND ALL APPLICABLE AUTHORITIES ARE IMPLIED.

D. SYSTEM DESIGN SHALL PROVIDE FOR MINIMUM 25% SPARE CAPACITY ALL ACROSS IN THE FRONT END CONTROL EQUIPMENT BATTERY CAPACITY, AND IN EVERY NEW AND/OR MODIFIED CIRCUIT CAPACITY AND CONDUCTOR SIZING AND BATTERY SIZE.

E. PROVIDE SYSTEM TESTING AND CORRECT ALL DEFECTS PRIOR TO FINAL DEMONSTRATION AND OWNER ACCEPTANCE.

F. COORDINATE ALL DESIGN REQUIREMENTS, WORK AND SUBMITTAL REVIEW WITH OWNER'S FACILITIES PERSONNEL, MICHIGAN STATE FIRE MARSHALL (MSFM) FOR EDUCATIONAL OCCUPANCIES, THE MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS (MDLARA) BUREAU OF FIRE SERVICES (BFS) AND WITH THE AUTHORITIES HAVING JURISDICTION FOR DESIGN, PLAN REVIEW, TESTING, CERTIFICATION AND INSPECTION AS APPLICABLE.

G. THE NEW PANEL IS TO PROVIDE COMPLETE FIRE ALARM COVERAGE FOR THE ENTIRE WORK AREA AS REQUIRED BY CODE, AND ALSO IS TO INCLUDE TIE-IN TO THE EXISTING BUILDING SYSTEM AS REQUIRED TO ACHIEVE AND APPROVED INSTALLATION WITHIN THE WORK AREA.

H. MAINTAIN CIRCUIT INTEGRITY FOR OCCUPIED SPACES DURING CONSTRUCTION. PROVIDE TEMPORARY WIRING IF REQUIRED TO MAINTAIN PROPER SYSTEM OPERATION DURING CONSTRUCTION AND REMOVE TEMPORARY WIRING AFTER CONSTRUCTION IS COMPLETE.

I. OBTAIN BUILDING AND AREA OF WORK USE GROUP AND OCCUPANCY INFORMATION FROM ARCHITECT AS REQUIRED TO FIRE ALARM SYSTEM. THE AREA OF WORK IS LABELED CLASSROOM 410.2 AND CORRIDOR 410. COORDINATE ANY HIGH-RISE APPLICABILITY AND FIRE PROTECTION COVERAGE WITH ARCHITECT AND PROVIDE SYSTEM DESIGN ACCORDINGLY.

J. FURNISH AND INSTALL A COMPLETE POINT ADDRESSABLE TYPE FIRE ALARM SYSTEM WHICH COMPLIES WITH NFPA 70, 72, AND 101, AND IN ACCORDANCE WITH OFFICE OF FIRE SAFETY CODES, AND THE UNIVERSITY’S OFFICE OF RISK MANAGEMENT REQUIREMENTS AS IF APPLICABLE. THE SYSTEM SHALL BE CAPABLE OF ON SITE PROGRAMMING TO ACCOMMODATE SYSTEM EXPANSION AND FACILITATE CHANGES IN OPERATION. ALL SOFTWARE OPERATIONS SHALL BE STORED IN A NON-VOLATILE PROGRAMMABLE MEMORY. THE MANUFACTURER SHALL PROVIDE ALL SOFTWARE AND HARDWARE REQUIRED, INCLUDING A PROGRAMMER.
K. THE SYSTEM SHALL HAVE THE CAPABILITY OF RECALLING ALARMS AND TROUBLE CONDITIONS IN CHRONOLOGICAL ORDER FOR THE PURPOSE OF RECREATING AN EVENT HISTORY. AT LEAST TWO PAIR OF ALARM DRY CONTACTS SHALL BE PROVIDED FOR CONNECTION TO THE UNIVERSITY PUBLIC SAFETY DEPARTMENT AND BUILDING AUTOMATION SYSTEM. CONDUIT TO THE APPROPRIATE COMMUNICATION CLOSET OR BUILDING AUTOMATION SYSTEM PANEL SHALL BE INSTALLED, AS REQUIRED BY FIRE ALARM CONTRACTOR.


AN EMERGENCY VOICE ALARM COMMUNICATION SYSTEM SHALL BE INSTALLED IN ALL UNIVERSITY ASSEMBLY OCCUPANCIES, IN ACCORDANCE WITH NFPA 101.

1.02 SUBMITTALS TO PLAN REVIEWER AND AUTHORITIES HAVING JURISDICTION:

A. THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED FOR REVIEW PRIOR TO INSTALLATION AS A MINIMUM. SUBMIT HARD COPY AND AUTO-CAD FORMAT.

1. FLOOR PLANS, EXISTING AS AFFECTED BY WORK AND NEW.

2. LOCATION OF CONTROL AND ANNUNCIATION EQUIPMENT, EXISTING AND NEW.

3. LOCATION OF INITIATING DEVICES AND ALARM INDICATED APPLIANCES ON PLANS.

4. BUILDING POWER CONNECTIONS (QUANTITY, LOCATION, CIRCUIT NUMBERS).

5. SYSTEM RISER DIAGRAM.

6. DEVICE CIRCUITING ON PLANS AND OR RISER.

7. BATTERY CALCULATIONS.

8. CIRCUIT CONDUCTORS, TYPE AND SIZE.

9. VOLTAGE DROP CALCULATION FOR EVERY CIRCUIT WITH THE 25% SPARE CAPACITY INCLUDED.

10. INTERFACE WITH OTHER SYSTEMS OR EQUIPMENT (CONTROL FUNCTIONS) AS REQUIRED, SPECIFIED OR NOTED.

11. SYSTEM MATRIX FOR EVENTS (FUNCTIONAL MATRIX).

12. MANUFACTURER DATA, CUTS, SHEETS, LISTING AND ALL RELATED INFORMATION FOR THE EQUIPMENT AND DEVICES PROVIDED FOR THE SYSTEM.

13. DIMENSIONED ELEVATION OF FIRE ALARM CONTROL PANEL WITH ALL COMPONENTS IDENTIFIED.
B. REVIEW AND REPLY IN WRITING TO ALL PLAN/SYSTEM REVIEW COMMENTS MADE BY THE AUTHORITY HAVING JURISDICTION. COPY THE ARCHITECT AND ENGINEER ON ALL COMMENT RESPONSES.

1.03 ARCHITECTS/ENGINEERS REVIEW:

A. ARCHITECT/ENGINEER WILL REVIEW SYSTEM DOCUMENTS AFTER THEY HAVE BEEN APPROVED BY LOCAL AUTHORITY.

B. REVIEW WILL COVER GENERAL COMPLIANCE WITH PROJECT REQUIREMENTS AND THE INTENT OF THESE SPECIFICATIONS.

1.04 APPROVED MANUFACTURERS:

A. SIMPLEX GRINNELL

B. SIEMENS

C. NATIONAL TIME AND SIGNAL

1.05 CODES AND STANDARD:

A. EQUIPMENT AND INSTALLATION SHALL BE IN FULL COMPLIANCE WITH:

1. NFPA 72, 2007 – NATIONAL FIRE ALARM CODE

2. NFPA 101 – LIFE SAFETY CODE

3. NEC 760, 2005 – FIRE PROTECTIVE SIGNALING SYSTEMS (NATIONAL ELECTRICAL CODE)

4. NEC 725, 2005 – SIGNALING AND POWER LIMITED CIRCUITS (NATIONAL ELECTRICAL CODE)

5. LOCAL ORDINANCES AS APPLICABLE

6. UMH GUIDELINES AND REQUIREMENTS

7. NFPA 70-, 70E, 75 AND 99.

1.06 REGULATORY REQUIREMENTS:

A. CONFORM TO REQUIREMENTS OF NATIONAL FIRE CODE (NFC).

B. UFAS GUIDELINES

C. CONFORM TO STATE AND LOCAL FIRE CODES

D. CONFORM TO RULES AND REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
1.07 SYSTEMS SUPERVISION:

A. PROVIDE ELECTRONICALLY SUPERVISED SYSTEM, WITH SUPERVISED ALARM INITIATING AND ALARM SIGNALING CIRCUITS. OCCURRENCE OF SINGLE GROUND OR OPEN CONDITION IN INITIATING OR SIGNALING CIRCUIT PLACES CIRCUIT IN TROUBLE MODE. OCCURRENCE OF SINGLE GROUND CONDITION ON ALARM INITIATING OR SIGNALING CIRCUIT DOES NOT DISABLE THAT CIRCUIT FROM TRANSMITTING AN ALARM.

END OF SECTION 16