

PROJECT MANUAL
FOR

**ENGINEERING RESEARCH LABS – PHASE II PART 1
2ND AND 3RD FLOORS**

WAYNE STATE UNIVERSITY

DETROIT, MICHIGAN

WSU PROJECT NO. 090-250890-1

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BID ISSUE

SECTION 00 01 07

SEALS PAGE

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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.: _____

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SECTION 01 10 00

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 alteration of two separate groups of spaces (Area 'A' and Area 'B') on the third floor and one space (Area 'C') on the second floor located within the Engineering Building located on the campus of Wayne State University in Detroit Michigan. The third floor area of work totals approximately 3,751 sf (1,768 sf Area 'A' plus 1,983 sf Area 'B'). The second floor area of work totals approximately 650 sf (Area 'C'). The total project area of both floors combined equals approximately 4,400 sf.

This project is addressing two separate research activities, separated between the two floors.

The purpose of the work to be performed on the third floor is to accommodate a group of faculty researchers whose focus is on optical and biomedical microsystem technology and research.

The rooms shall be adapted to accommodate the addition of new laboratory benches, equipment identified by the researcher and supporting services to support the research activities. The rooms shall continue to utilize existing light fixtures where possible, general HVAC, water and compressed gas services. The existing Clean Room within the group of spaces shall be improved to meet the requirements of a Class 1000 Clean Room with the addition of new floor and some wall finishes, new lighting and additional HVAC support accomplished via a new roof top mechanical unit located on the roof.

The purpose of the work to be performed on the second floor is to accommodate a group of faculty researchers whose focus is on Chemical Engineering research.

The rooms shall be adapted to accommodate the addition of new laboratory benches, equipment identified by the researcher and supporting services to support the research activities. The rooms shall continue to utilize existing light fixtures where possible, general HVAC, water and compressed gas services.

In summary, these changes are necessary to accommodate specific

research activities. 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.

END OF SUMMARY OF WORK

SECTION 01 35 13.11

CLEANROOM CONSTRUCTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Clean Room Construction Protocol at each construction stage for the construction and modification of the existing cleanroom.
2. This Section is intended to give the subcontractor a general framework of Clean Construction Protocol. This section does not relieve the construction manager and/or subcontractor from the responsibility to develop additional protocol guidelines to ensure an effective cleanroom installation.

C. Related Sections:

1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."
3. Division 01 Section "Cleanroom Special Construction and Cleaning Procedures".
4. Division 01 Section "Cleanroom Certification and Acceptance".

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

1.3 DEFINITIONS

A. Stages of construction cleanliness: defined as clean stages in construction schedule where cleaning requirements in project area are more stringent and type and methods of work are more restrictive.

1. Normal Clean
2. Very Clean
3. Ultra Clean

- B. Thorough Clean-Up: Defined as three passes starting at ceiling support structure level and working down to floor level.
- C. Cleanroom Protocol: Defined as the philosophy of clean construction and the commitment to following the procedures outlines in this section.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Special Handling: All items being transported into the cleanroom are to be cleaned in such a way as to remove all obvious dirt, loose particles, and contaminants while located in the adjacent existing space which shall serve as the equipment Wipe Down Room. Owner must accept all the equipment designated to enter the cleanroom. All transport boxes, test equipment, tool cases, etc., are to be blown off with a filtered air gun immediately prior to entering the cleanroom in the Wipe Down Room. Items known or suspected as particle generators such as, cardboard boxes, dry mops, etc., are not permitted in the cleanroom.

1.5 PROJECT/SITE CONDITIONS OR SPECIAL CONDITIONS

- A. Typical construction activities during the Normal Clean Stage include:
 - 1. Pipe racks
 - 2. Sprinkler mains and laterals
 - 3. HEPA filter ceiling grid support structure
 - 4. Carbon steel pipe
 - 5. Coating/painting
 - 6. Drywall partitions
 - 7. Exhaust systems
 - 8. Power distribution/grounding
 - 9. Non-process utility piping
 - 10. Resilient Flooring
 - 11. Mechanical systems
- B. Very Clean Stage:
 - 1. Recirculation Air Handling Units
 - 2. HEPA filter ceiling grid
 - 3. Make-Up air fans and ductwork
 - 4. Fab lighting
 - 5. Sprinkler head installation
 - 6. Process piping
 - 7. DI Water piping
 - 8. Gas cabinet installation and piping
 - 9. Chemical supply systems and piping
 - 10. Cleanroom walls and FRP Panels
 - 11. Controls and detection systems
 - 12. High purity piping should start near the end of this stage. If started earlier, exercise extreme protective measures.
- C. Ultra Clean Stage:
 - 1. Install HEPA filters
 - 2. System Certification
 - 3. Manufacturing equipment installation

1.6 SCHEDULING

- A. Cleanroom Protocol Training: Coordinate, schedule and lead training classes for all site subcontractors at least one week before they are required on the job.
 - 1. TRAINING – General Contractor shall determine who will perform the Cleanroom training. Cleanroom training will be completed prior to construction.
 - 2. PRODUCTS – Adequate supplies of proper garments shall be ordered timely by the General Contractor or whoever the General Contractor designates responsible.

1.7 PREPARATION

- A. Provide Cleanroom Protocol classroom training for all workers employed by contractors and subcontractors entering work site. Provide identification for attendees completing training. Training class will contain but not be limited to following:
 - 1. Clean room protocol
 - 2. Hazardous Communication awareness
 - 3. Hazardous Materials awareness
- B. Upon completion of any portion of work, clean and wipe down affected areas.
- C. Restrict number of entrances to cleanroom. Location of entrances may change during construction due to construction schedule.
- D. Locate trash containers throughout project interior. Empty daily, or more often if required.
- E. Workers must display identification badge at all times clearly identifying themselves and their company.
- F. Provide two or more sets of cleanroom garments for all employees required to enter the cleanroom, subcontractors and Owner Project Team including shoes, smocks or jumpsuits, and head covers. Clean reusable garments every two days. Disposable garments are an alternate option. Also provide disposable facemasks, shoe covers and gloves which will be used for one time only.
- G. Provide shoe covers at beginning of very clean stage at all project area entrances for all contractors and subcontractors.
- H. Ensure employees and subcontractors follow cleanroom protocol, including wearing cleanroom garments in designated areas and changing to cleanroom and shoes, as construction progresses to ultra clean stage.

1.8 APPLICATION

- A. Entrances to cleanroom to include:
 - 1. Shelves for storage of hard hats and shoes
 - 2. Space and bench for workers to change shoes
 - 3. Hanging bars for smocks and method to control use of smocks
 - 4. Sticky/tacky mats to remove dust from shoes

5. Seal entrances airtight to maintain positive pressure of cleanroom relative to adjacent spaces
 6. Mirror so people can see if their gowning is adequate
 7. Waste containers for disposable cleanroom garments
 8. Adequate supplies of required cleanroom garments
- B. Post signs in English and other applicable local languages at cleanroom entrances explaining cleanliness procedures, including but not be limited to:
1. No eating or drinking
 2. No smoking
 3. No tobacco
 4. No sleeping
 5. No cosmetics
 6. Gowning requirements (use photos)
 7. Gowning procedures (use photos)

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

- A. Normal Clean Stage:
1. Upon completion of demolition of existing, Subcontractor will complete cleaning of all cleanroom construction areas.
 2. Subcontractor shall have completed all "normal clean" stage items under his scope of work at this time.
 3. Cleanroom specialty subcontractors to participate at this time, and complete a general clean up for those items under this contract.
 4. Types of work to be completed during this stage of clean build:
 - a. Drilling
 - b. Cutting
 - c. Welding
 5. Beginning of Normal Clean Stage
 - a. Clean Shoes at entrance of the project area
 - b. No smoking, tobacco products, food or beverages are allowed in the project area.
 - c. Entrance control for workers and materials shall be assured.
 6. Cleanroom resilient flooring installed during this stage will be cleaned and then a protective covering of a rigid material such as masonite shall be used to protect the floor during further construction phases.
- B. Very Clean Stage:
1. Complete thorough clean-up of facility at start of very clean stage. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program.

2. Clean stages of construction rules and requirements also apply to cleanroom and interstitial level of the entire project area.
 3. Where high purity systems are being installed, designate an area supervisor to coordinate activity and maintain area cleanliness.
 4. Begin turning on Recirculation Air Handling Unit fans.
 5. Very Clean Stage shall include the requirements of the Normal Clean Stage plus the following:
 - a. Furnish full time workers to:
 - 1) Keep entrances clean.
 - 2) Inform other workers and visitors about clean construction requirements.
 - 3) Ensure that only clean materials are brought into project area and that cleaning materials are available at entrances to wipe down materials before proceeding into the project area.
 - b. Provide special shoes or shoe covers for every person entering the project area including other contractors and visitors.
 - c. Clean with house vacuum (if available) or portable units with HEPA filters.
 - d. Clean all tools and material before entry into the project area.
 - e. Run fresh air fan to maintain positive pressure.
 - f. Clean working clothes are required at all areas.
 - g. No wood or corrugated cardboard on the fab level.
 - h. Remove or wrap all particle-generating materials in PVC or polyethylene sheet.
 - i. Wear Identification badges.
 6. If drilling, welding, or cutting needs to be performed during this stage of clean build, follow the requirements below.
 - a. Provide exhausted area around cutting, drilling, and welding surfaces to collect particles that will be generated.
 - b. Clean surface completely after performing work.
- C. Ultra Clean Stage:
1. Complete another thorough clean-up of facility at start of ultra clean stage.
 2. Beginning of HEPA filter installation for room.
 3. The Ultra Clean Stage shall include the requirements of the Very Clean Stage plus the following:
 - a. Do not perform dirty work (no smoke or dust generation in cleanroom)
 - b. Wipe down material with cleanroom wipes
 - c. Wear cleanroom garments in clean room
 - d. Only lint-free notebooks and paper and low-sodium cleanroom pens are allowed in cleanroom.
 - e. No pencils or any other pens are to be used in the cleanroom. This is not required in unclassified areas.
 - f. Visitors should not enter the cleanroom, unless necessary. The Owner and/or, if approved, the Construction Superintendent will be responsible and authorized to permit entry.
 - g. The wearing of cosmetics in the cleanroom is strictly prohibited.
 - h. No eating, drinking or smoking is permitted in the cleanroom area, both classified and unclassified.
 - i. If an ISO classified area is entered, the door should be open not longer than the necessary time to enter and exit, if there are no air locks.
 - j. Do not allow both doors of the cleanroom and of the smock area to be opened at the same time.

- k. No hydrocarbon lubricants, whether naturally nor synthetically, are permitted in the cleanroom area.
 - l. Everyone has to ensure that his/her hair will be covered completely by the hair cover.
4. Gowning:
- a. Garments: Hard hats and safety glasses are required in the project area and in the construction area. In the cleanroom they shall be worn over the cleanroom garments. Dedicated cleanroom hard hats shall be worn until not required based on OSHA and Owner regulations. In ISO classified cleanroom areas, it is necessary to wear complete cleanroom garments as described below. Each person entering the cleanroom has to wear a head cover, facemask, jumpsuit, and designated footwear. A serviceable garment will be free of holes and tears. Head and face covers should be of a type that covers all the hair on an individual's head except their eyebrows and eyelashes. Face covers must be worn to cover the nose at all times. Properly fitting or rubber disposable gloves are required. Each person entering an ISO unclassified area will wear a head cover, jumpsuit, and special shoes cover. It is not required to wear a face cover. Each person shall check the condition of his or her cleanroom garments. In the case of a torn garment or a broken zipper, the garment should be put in a bin to be repaired as needed. All personnel will use safety glasses before entering designated areas.
 - b. Gloves: Properly fitting vinyl or rubber disposable gloves are required. Gloves will be put on immediately before entering the cleanroom area, as described by the gowning procedure. Caution is necessary to prevent puncturing gloves. If a puncture should occur, the gloves must be replaced immediately. This should be done in the gowning area. If gloves become contaminated with body oil, chemicals, or other materials, they must change immediately. Writing on cleanroom gloves is not permitted. Gloves used for cleaning equipment and workstations must not be worn for manufacturing operations.
 - c. Gowning Procedure: The gowning areas will be provided with shelves for leaving hard hats and shoes before entering. The gowning areas before entering the cleanroom will also be provided with hangers where, when the employees leave, they must hang their jumpsuits, head covers and face covers. The gowning areas will be provided with a set of shelves for the booties. At the end of the workday, clean-up garments are to be placed in the bins to be washed and the cleanroom garments are to be left in the hangers. There has to be different shelves for shoes and booties.
 - 1) First, put on the head cover and face cover. Then adjust them, ensuring all hair and nose are covered.
 - 2) Second, put on the jumpsuit. Then zip up the zipper completely.
 - 3) Third, put on the booties. They are of the same material as the jumpsuit, or may be disposable versions.
 - 4) Finally, put on safety glasses and gloves prior to entering the cleanroom. Also put on hard hat if needed.
 - 5) Use mirror to verify that garments are on properly.
 - d. The procedure for removing the garment is prescribed at follows:
 - 1) Remove gloves and discard them into the trash container.
 - 2) Remove the head cover and hang it on a hanger.
 - 3) Remove the booties and put them into the opposite shelf.
 - 4) Remove the jumpsuit and hang it on a hanger.
 - 5) Wear your shoes, hardhat, and safety glasses.

5. Cleaning: In accordance with Division 01 Section "Special Procedures", Paragraph 3.5.

3.2 FIELD QUALITY CONTROL

- A. The purpose of this protocol is to achieve, that each employee knows, which guidelines, practices and policies they need to follow in the cleanroom area. Each employee must read the protocol first before he starts work on site and must sign, that he understands the guideline. The signed personnel list must be supplied to the Owner before personnel enter the construction site. It is the task of the subcontractors and the Owner and the Superintendent to control the behavior of personnel in the cleanroom and take corrective action, if necessary. The Superintendent has the right to forbid personnel entrance to the clean areas after repeated wrong behavior. The subcontractor has to replace such personnel. Each employee has the responsibility to insure that all policies, practices, and procedures described in this protocol are followed. Any deviation(s) shall be reported to one's supervisor or to the Superintendent immediately.

END OF SECTION

Cleanroom Construction Protocol Levels

Level	Duration	Cleaning	Restriction	Protocols	Gowning	
C O N S T R U C T I O N P H A S E	1	Building Enclosed	Gross Clean	Food, Drink, Tobacco in any form, Gum, Spitting, Lubricants, Petroleum Products, Rust, Duct Tape, Cardboard, Pencils, Erasers, Aerosols, Leather, Unprotected Metal, Cutting, Grinding, Cover Motor Vents, HEPA Vacuums		Clean Oil Free Work Clothes
	2	Cleanroom Perimeter Enclosed	Continuous Clean, Material Pass-Thru		Task Related Zone Protocol related to work being performed, ie any work in return air stream, must be Protocol 4	Hair Covers, Gloves, Shoe Covers, Optional Gowning @ Level 3
	3	Cleanroom Floor, Walls, Ceiling Installed	Super Clean Full Wipe of all materials (DI Water & IPA)		Glove Liners Hair Covers, Shoe Covers, Face Covers, Overalls, Boots, Gloves	
	4	HEPA / ULPA Filters Installed	Cleanroom Paper & Pens			
O W N E R	5	Certification	Owner's Continuous Clean	Owner's Protocol		

SECTION 01 35 13.12

CLEANROOM SPECIAL CONSTRUCTION AND CLEANING PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

- B. Section Includes:
 - 1. Special Construction Procedures
 - 2. General Cleaning Procedures
 - 3. Special (Clean Room) Cleaning Procedures.
 - 4. This Section is intended to give the Subcontractor a general framework for cleanroom cleaning procedures. This Section does not relieve the Construction Manager and/or Subcontractor from the responsibility to maintain a generally clean, orderly and safe worksite and to develop more stringent cleaning guidelines to ensure an effective cleanroom installation

- C. Related Sections:
 - 1. Division 01 Section "General Requirements."
 - 2. Division 01 Section "Special Procedures."
 - 3. Division 01 Section "Cleanroom Construction Procedures".
 - 4. Division 01 Section "Cleanroom Certification and Acceptance".

1.2 DEFINITIONS

- A. Stages of Construction Cleanliness: Defined as clean stages in construction schedule where cleaning requirements in project site are more stringent and type and methods of work are more restrictive.
 - 1. Normal Clean.
 - 2. Very Clean.
 - 3. Ultra Clean.

- B. Thorough Clean Up: Defined as three passes starting at ceiling framing level and working down to the floor level.

- C. Cleanroom Protocol: Defined as the philosophy of clean construction and the commitment to following the Procedures outlined in this section. Refer to Division 01 Section "General Requirements" for activities during each protocol stage.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. CREW 2 or equivalent cleanroom wipe
- B. Deionized water
- C. 10 percent Isopropyl Alcohol 90 percent Deionized water solution
- D. Disposable sticky roller – cleanroom rated
- E. Cleanroom Detergent: NovaClean Floor, NovaClean Lab & Glass and NovaHol Cleanroom Cleaner

PART 3 - EXECUTION

3.1 CLEANING

- A. General: The tasks of the specialty cleaning subcontractor are described as follows:
 - 1. Responsible for maintaining cleanliness in the cleanroom area at the beginning of the very clean stage.
 - 2. Responsible for maintaining and securing all entrances to the cleanroom at the beginning of the very clean stage.
 - 3. Provide all equipment, materials, and manpower required to maintain the project site clean.
 - 4. Supply trash containers throughout the project site and emptied regularly as required.
- B. Normal Clean Stage:
 - 1. Conduct cleaning and non-hazardous, non-toxic waste disposal operations in compliance with local laws and ordinances. Comply with federal and local environmental and anti-pollution regulations.
 - 2. Complete the following cleaning operations:
 - a. Remove tools, construction equipment, machinery and surplus material from the cleanroom area.
 - b. Remove waste material and rubbish from the cleanroom area.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - d. Remove debris and surface dust from limited access spaces, including roofs, plenums, trenches, and similar spaces.
 - e. Broom clean concrete floors in unoccupied spaces.
 - f. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - g. Remove labels that are not permanent.

- h. Touchup and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
 - j. Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - k. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs and defective and noisy starters in fluorescent fixtures.
3. Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of construction period.

C. Very Clean Stage:

1. At the start of the very clean stage a thorough cleaning of the facility should be performed starting at the ceiling support level and working down to the floor level.

Items	Job description
Steel structure	Vacuum and wipe clean
Hepa filter support	Vacuum and wipe clean
Floor	Vacuum and wipe clean
Other fixtures	Wipe clean
Support areas	Vacuum and wipe clean
Sprinkler mains	Vacuum and wipe clean

2. Daily Cleaning Routine
- a. Vacuum floor with dry vacuum cleaner at least twice daily.
 - b. Removal of waste from waste containers at least twice daily.
 - c. Spot clean glass panels to remove finger marks and stains.
 - d. Spot clean wall to remove stains.
 - e. Spot mop floor with solution of mild and compatible cleaning agents. Follow with DI water rinse. This must be repeated after any spill.
3. Full time protocol workers will keep the entrances clean and inform the workers and visitors about the clean construction requirements.
4. Cleaning material will be available at the entrances for the workers to wipe down materials before transportation inside the project site.
5. Shoe racks are provided at the entrances.
6. During the very clean stage materials will unpacked in designated areas. The materials are wiped down in the entrance area.

7. This entrance will also act as air-locks to keep the project site with positive pressure, i.e. they are relatively sealed.
8. Special attention will be paid to the housekeeping, to keep the working area in the whole construction site safe, neat and clean.

D. Ultra Clean Stage:

1. At the start of the ultra clean stage again a thorough cleaning of the facility should be performed starting at the ceiling support level and working down to the floor level.

Items	Job Description
Repeat all items of first cleaning	
Filter ceiling grid	Vacuum and wipe clean
Make up air units and ductwork	Vacuum and wipe clean
Lighting fixtures	Wipe clean
Sprinkler piping	Wipe clean
Piping	Wipe clean
Exhaust ducts and piping	Vacuum and wipe clean
Walls	Wipe clean
Floors and trenches	Vacuum and wipe clean
Entrances	Vacuum and wipe clean

2. Daily Cleaning Routine
 - a. Cleaners are to use the Hepa Vacuum cleaner to remove heavier than air particle matter, such particle matter is too heavy to be swept from the room by air treatment system (twice a day).
 - b. All wet cleaning will be accompanied with the use of a 10 percent IPA/DI water solution within the cleanroom to reduce ionic contamination brought into the area by unfiltered water.
 - c. Use sticky roller to remove particle matter. Such particles are solidly deposited on the floor and cannot be removed by vacuum cleaner (twice a day).
 - d. Collect the waste material from the cleanroom area and dispose of it in the designated containers (three times daily).
 - e. Vacuum cleaner brush and attachment will be inspected and cleaned outside the cleanroom to prevent contamination within the cleanroom area.
 - f. Spot clean glass and wall panels with Crew 2 wiper and 10 percent IPA/DI water solution.
 - g. All incoming material filter, blanks, must be cleaned again just before installation.

3. Weekly Cleaning Routine:
 - a. All glass panels, walls will be wiped with Crew 2 Wiper using cleanroom detergent and dilute with DI water (according to Manufacturing Specification).
 - b. All doors, partition walls, cabinet top and equipment top will be wiped with Crew 2 Wiper using cleanroom detergent diluted with DI water (according to cleaning procedures specification).
 - c. Thorough washing of waste containers. Such cleaning should be done outside the cleanroom area.
4. Full time protocol workers keep the entrances clean and inform the workers and visitors about the clean construction requirements, which are valid for the ultra-clean stage.
5. Prohibit entrance to the project site of staff, which show repeatedly or serious irregular behavior.
6. Materials for the interior of the project site will arrive on-site individually packed.
7. Before entering into the ultra clean area the following general procedure of cleaning the material will be used:
 - a. The materials will be unpacked outside the project site in a designated entrance area. This entrance will also act as an air-lock to keep the project site with positive pressure, i.e. they are relatively sealed. The outer box will be removed into trash containers. The material will be wiped down in the designated entrance area.
 - b. For filters and blanks, the polyethylene plastic bags will be removed in steps according to temporary storage and final clean/quality check just before installation.
 - c. Special attention will be paid to the housekeeping, to keep the working area in the whole fab safe, neat and clean.
 - d. Components, which arrive not in clean condition, are cleaned with humid cloths or vacuum cleaner before the assembly.
8. The passenger and material traffic is only allowed via air locks. See Division 01 Section "Cleanroom Construction Procedures", Paragraph 3.1.C.4 for Gowning Procedures. Sticky tacky mats are installed at the entries to the clean areas. Humid wiping is the preferred cleaning method using 10 percent IPA/DI water solution. Surfaces are treated either with an anti-static or blown off with ionized, very fine filtered compressed air.
9. Just before the end of the ultra clean stage the cleaning is performed according to the procedures, which will be used during cleanroom operation. An example of a frequency chart is given below:

Item	Method	Cleaning Frequency
Flooring	Wet mop (DI water) and vacuum	Every hour, on-going
Baseboards	Scrub	Weekly
Floor grates	Damp wipe	Daily
Air vents	Vacuum	Weekly
Door jambs, walls and	Damp wipe	Daily

windows		
Mats	Wet mop	Twice a day
Interstitial areas, plenums and ceiling	Damp wipe and vacuum	Daily
Steel work, pipe racks	Damp wipe and vacuum	Daily
Other horizontal surfaces	Damp wipe and vacuum	Daily

10. The cleaning operations shall be documented continuously during all stages of construction.

END OF SECTION

SECTION 01 35 13.13
CLEANROOM CERTIFICATION AND ACCEPTANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Subcontractor shall employ the services of a "Certifying Agency" to measure and record the cleanroom conditions and resolve all nonconforming areas prior to attesting that the cleanroom is complete and ready for owners occupancy. Refer to Section 1.05 Performance Requirements for a list of tests to be conducted.
2. The field Engineer for the Certifying Agency shall visit the job site a minimum of once every two weeks for one day's duration each during the period that construction work is being performed on the finished cleanroom for knowledge of the installation, inspections, and completion of construction. The cost of the time and associated expense for these visits shall be included in the bid.
3. HEPA Filter Repair and Replacement: If defective HEPA filters are identified during the course of work, the Certifying Agency shall immediately notify the Subcontractor and owners Representative, and repair or replacement shall be performed under the direction of the Subcontractor with approval from the owners Representative.

C. Related Sections:

1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."
3. Division 01 Section "Cleanroom Construction Procedures".
4. Division 01 Section "Cleanroom Special Construction and Cleaning Procedures".
5. Division 06 Section "Fiberglas Reinforced Plastic".
6. Division 09 Section "Resilient Flooring".
7. Division 13 Section "Fan Filter Units".

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

4. In the event of conflict regarding requirements for the referenced cleanroom testing and certification between this section and any other section, the provisions of this section shall govern
- B. ISO Standards: Institute of Environmental Sciences and Technology (IEST), 940 East Northwest Highway, Mount Prospect, IL 60056
 1. 14644-1: Cleanrooms and Associated Controlled Environments
 2. (Including Part 1: Classification of Air Cleanliness).
 3. 14644-3: Metrology and Test Methods (including Annex A, B, and C)
 4. 14644-4: Design, Construction and Start-Up
 5. 14644-6: Terms and Definitions
 - C. IES-RP-CC006.2 -Testing Cleanrooms
 - D. IES-RP-CC-002.1 -Laminar Flow Clean Air Device
 - E. IES-RP-CC-013-86T -Equipment Calibration or Validation Procedures
 - F. IES-RP-CC-001-86 -HEPA Filters
 - G. "Procedural Standards for Certified Testing of Cleanrooms": National Environmental Balancing Bureau (NEBB), 8224 Old Courthouse Road, Vienna, VA 22180
 - H. ESD Association Standard ESD-S-7,1-1994 Electrostatic Discharge Association, 200 Liberty Plaza, Rome, NY 13440
 - I. SEMI S2 Safety Guidelines for Semiconductor Manufacturing Equipment. Semi 178 0998 Electrostatic compatibility guide to assessment and control of ESD and Electrostatic attraction for equipment. SEMI 3081 Zanker Road, San Jose, California 95135
 - J. NEBB, Procedural Standards for Measuring Sound and Vibration. National Environmental Balancing Bureau (NEBB), 8224 Old Courthouse Rd, Vienna, VA 22180
- 1.3 DEFINITIONS
- A. Cleanroom Types:
 1. UNIDIRECTIONAL AIRFLOW (laminar): Controlled airflow through the entire cross section of a clean zone with a steady velocity and approximately parallel streamlines.
 2. NON-UNIDIRECTIONAL AIRFLOW (turbulent): Air distribution where the supply air entering the clean zone mixes with the internal air by means of induction.
 - B. Occupancy States:
 1. As-Built: Condition where the installation is complete with all services connected and functioning but with no production equipment, materials, or personnel present.
 2. At-Rest: Condition where the installation is complete with equipment installed and operating in a manner agreed upon by the customer and supplier, but no personnel present.

3. Operational: Condition where the installation is functioning in the specified manner, with the specified number of personnel present and working in the manner agreed upon.

C. Certifying Agency: The Cleanroom Certifying Company or agency.

D. Balancing Agency: The air testing a balancing company or agency.

E. HEPA Filter: Generic term that covers types of HEPA, i.e. ULPA, Ultra, 14EPA, etc.

F. Protocol Manager: The person vested with authority to enforce compliance to clean build protocols

1.4 PERFORMANCE REQUIREMENTS

A. The certifying agency shall perform all tests listed below. These tests shall be conducted for a Unidirectional Airflow (laminar) state for Class 1, Class 10, Class 100 (or ISO equivalent) and Non-unidirectional airflow (turbulent) state for Class 1,000, Class 10,000 or Class 100,000 (or ISO equivalent) .Tests shall be in the as-built cleanroom occupancy state.

B. Cleanroom Classification Test

C. Installed Filter Leakage Test

D. Air Flow Test

E. Temperature and Humidity Test

F. Unidirectional Flow Test

1.5 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. The following submittals are required prior to start of construction work inside the cleanroom:

1. Qualifications of all Field Technicians, the Field Engineer, the Project Director, and the Certifying Agency.
2. Documentation that the Certifying Agency, the Field Engineer, and the Project Director have met all qualification requirements of the NEBB.
3. Written presentation outlining the testing and certification procedures and sequence to be performed.
4. Description of all instrumentation and test equipment to be used, as well as calibration documentation.
5. Sample of all field reports, charts, and forms proposed to document the field measured conditions.
6. Sequence of test procedures to be used.

- C. After completion and acceptance of all required tests, the Certifying Agency shall compile the test and certification data and shall submit copies of the complete report to the Owner for review and approval. The report submitted shall include a signed and dated certificate.
- D. Contents of the completed report shall be in accordance with IES-RP-CC-006-84-T. The completed report shall include, but is not limited to, the following items:
 - 1. Report: Tabulate all test data on 8-1/2 x 11-inch sheets bound in a report. Identify all test data by grid location. Grids shall be reviewed with the owners Representative. Tabulations shall be cross referenced to reflected ceiling plans and cleanroom floor plans.
 - 2. Drawings: Print of the 1/4-inch scale Cleanroom Floor Plans and Reflected Ceiling Plans made from the contract drawings with testing and certification locations shown on the drawings. Drawings shall be titled, "Testing and Certification Drawings."
 - 3. Test Equipment: Complete list of all test equipment used in performing the work with serial numbers and verification of the latest calibration date. All equipment will be reviewed with the owner's Representative prior to commencement of work.
 - 4. Guarantee: Written statement signed by the Project Director and Certification Firm and person in charge of on-site work stating that all work has been performed in accordance with these specifications unless approved by the owner's Representative and specifically noted otherwise in report.
 - 5. Description of all tests performed, including the purpose, instrumentation, procedure, results, and analysis of the data. Data shall be presented and graphically displayed in an approved form by the owners Representative to permit full understanding of all tests. Include the date tests were taken and the names of field technicians performing the tests. Clear indications whether data is acceptable-or-failing are required.
 - 6. Five copies of the completed Certification Report, submitted for review and acceptance by the owners Representative.
 - 7. Description of the operating condition of all clean areas. Operating conditions must include individual fan speed and air speed for all Fan Filter Units in the cleanrooms.

1.6 QUALITY ASSURANCE

- A. All cleanroom air systems shall be tested and certified by a qualified firm specializing in cleanroom certification. The Certifying Agency shall work closely with all construction trades as required to complete construction of the cleanroom in accordance with the Construction Documents.
- B. Firms or agencies proposing on this service shall have been in business a minimum of five (5) years specializing in cleanroom testing and certifying work. A list shall be available upon request of projects similar in size, complexity, and cleanliness classification to this project that the firm has completed. Include the project name, description of mechanical system, range of services provided, and the name and phone number of the design consultant who were responsible for final acceptance of the service.
- C. The Certifying Agency's Project Director shall have a minimum of two years of experience testing and certifying cleanroom as a field Engineer or field technician. He shall supervise all field technicians assigned to complete the testing and certifying of the work, and shall be responsible for all on-site testing and data acquisition. No field tests shall be taken without the Field Engineer's presence.

- D. All Certifying Agency Field Technicians shall have completed previous training in cleanroom operations and certifying procedures, shall have worked in this capacity on at least one other similar project, and shall only perform fieldwork under direct supervision of the Field Engineer.
- E. A sample of all field data reports, charts, and forms used by the Certifying Agency shall be submitted with the proposal. In addition, a sample test report of a similar project shall be available for inspection by the owners Representative to verify the Certifying Agency's expertise in data collection, interpretation, and documentation.
- F. Reference standards for all field tests shall be the Institute of Environmental Sciences (IES) IES-RP-CC-006-84T, Recommended Practice for Testing Cleanrooms and the Procedural Standards for Certified Testing of Cleanrooms, National Environmental Balancing Bureau.

1.7 PROJECT CONDITIONS

- A. Certification shall not proceed until all other work on the cleanroom has been completed and the commencement of certification work has been approved.
- B. Condition of Cleanrooms Prior to Testing:
 - 1. The HVAC system installation for the cleanroom, including all of the exhaust systems and makeup air system associated with the cleanroom operation, shall have been completed, including all air and water side testing, adjusting, and balancing.
 - 2. All fans and fan filter units shall have been balanced in-place and an acceptance report submitted. All fan filter units shall have been set for appropriate speeds to meet both noise and cleanliness requirements before testing.

1.8 WARRANTY

- A. The service to be furnished by the Certifying Agency shall be considered complete and accepted when the Certification Report has been approved by the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Certification Agencies:
 - 1. Midwest Cleanroom Associates 2055 Oak Industrial Dr NE Suite A Grand Rapids, MI 49505 Ph: 800-815-1393
 - 2. Acorn Industries 11844 Brookfield, Livonia, Michigan 48150 Ph: (800) 831-535
 - 3. Clean Air Technology, Inc. 41105 Capital Drive, Canton, MI 48187 USA Ph: 800-459-6320
 - 4. Mechanical Testing Services, Inc. 4275 Spartan Industrial Drive, Suite B, Grandville, Michigan 49418

- B. The Certifying Agency shall supply materials, tools, equipment, cleanroom garments. And instrumentation required to perform the cleanroom system testing and certification as described in this section.
- C. Once the cleanroom has been installed, only a polystyrene latex (PSL) aerosol of 0.26 micron shall be used.

2.2 EQUIPMENT

- A. All test equipment used in the certification procedures shall be state-of-the-art. Calibration of equipment shall be traceable to NBS Standards within the previous nine months.
- B. The equipment for the following tests shall comply, at a minimum, with the standards set forth in ISO 14644-3, Annex C - Test Instrumentation:
 - 1. Cleanroom Classification Test
 - 2. Installed Filter Leakage Test
 - 3. Air Flow Test
 - 4. Temperature and Humidity Test

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Certifying Agency shall supervise and conduct all tests in the presence of the Subcontractor's Field Superintendent or his assigned Cleanroom Inspector.
- B. The as-built facility tests shall be performed after the air systems balancing agency and piping systems balancing agency have made their initial operating and balancing adjustments and are satisfied that the installation is ready for acceptance certification testing. Final clean down and commissioning procedures shall also be completed.
- C. All cleanroom re-circulation fans, makeup fans, fan filter units, process fume exhaust systems, and automatic control loops shall be in operation during tests. All mechanical systems and all fans related to the cleanroom system shall be certified to be operating normally and delivering design airflow.
- D. Certification reports shall be reviewed and approved by the owners Representative before the cleanroom is complete.
- E. Tests described below are not identified necessarily in their sequence. The sequence of test procedures shall be as stated in the submittals.

3.2 FIELD TESTING AND CERTIFYING PROCEDURES

- A. Measurement procedures will be performed in accordance with ISO 14644 and IEST RP 006.2 Testing Cleanrooms. All testing shall be conducted in the "as-built" occupancy state.

- B. Cleanroom Classification Test:
- C. Perform this test to verify that facility can achieve intended air cleanliness level.
1. Scope of measurement: All cleanroom spaces (HEPA filter installed spaces). Number of points per ISO 14644-1 for each area classification.
 2. Measuring procedure: Per ISO 14644-3, Annex B1. Airborne Particle Count.
 3. Tolerance: Meets requirement of specification for each area, as shown on Room Conditions drawing CRA 0.3.
- D. Installed Filter Leakage Test:
1. Scope of measurements: All installed ULPA or HEPA filters are leak-free.
 2. Measurement procedure: Per ISO 14644-3, Annex B6 using aerosol challenge method with PSL.
 3. Tolerance: No leaks as defined by a guaranteed efficiency of filters at 99.9995 percent for particles @ MPPS. Any leaks shall be recorded and re-tested after replacement or repair. Repairs shall be limited according to IES-RP-CC-006.2 to a total of 3 percent or less of the filter face and patches shall be limited to 1.5 inches in one direction. The filter manufacturer or supplier shall correct deficiencies found as directed by the Certifying Agency.
- E. Airflow Test:
1. Scope of measurements: All installed ULPA or HEPA filters.
 2. Measurement procedure: Per ISO 14644-3, Annex B4
 3. Tolerance: Average velocity per specification standards. Deviation shall not to exceed 15 percent. Refer to Cleanroom FFU Layout CRM 3.2-1 for air velocities.
- F. Temperature and Humidity Test:
1. Scope of measurement: Take temperature and humidity reading in each cleanroom bay, and each chase.
 2. Measuring procedure: Per ISO 14644-3, Annex B9 (Temperature) and B10 (Humidity).
 3. Tolerance: Meets requirement of specification and ranges shown on Room Conditions drawing CRA 0.3.
 4. Tolerance: Meets requirement of specification and lighting levels shown on Room Conditions drawing CRA 0.3.
- G. Unidirectional Flow Test:
1. Scope of Measurement: All cleanroom areas per criteria listed on Drawing CRA0.3.
 2. Measuring Procedure: Take one measurement per 100 square feet (9.3 m²) of unidirectional classified cleanroom area. Use FloViz streamers (or equivalent) to evaluate laminarity from ceiling to 30 inches (762 mm) above the floor.
 3. Tolerance: Allowable offset angle will not exceed 14 degrees.

3.3 ACCEPTANCE CRITERIA

- A. Verification Procedures:
1. At the beginning of all field certification procedures, the Certifying Agency shall demonstrate to the owners Representative each of the tests performed in the course of field data collection, using instruments from the original readings.

2. The Project Director shall present and review all field data with the owners Representative to ensure that a full understanding is transferred to the owner's staff of the base operating condition of the cleanroom at completion of construction.
- B. Documentation:
1. The Project Director shall oversee any changes or corrections required of the final report, and then stamp the final sets signifying his approval of the final certification log.
 2. The Certifying Agency shall deliver five complete sets of all certification data and logs in bound form to the owners Representative.
- C. Corrective Actions:
1. In case of any failure, corrective action shall be as follows. Installation subcontractor shall work with certifying agent to adjust FFU Speed, HEPA Filter Angle, or replace FFU(s), HEPA Filters, Lighting, Grid Sections, or Flooring as needed, to meet specification.
 2. Following corrective action, all failing tests shall be repeated, as well as any other tests required per this specification for items that have been replaced or repaired. Subcontractor must work with certifying agent to provide adequate data to show that both new and repaired cleanroom elements which previously failed, now meet the complete requirements of this specification.

END OF SECTION

SECTION 01 40 00

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:
 - 1. Wayne State University, Construction Design Standards, Second Revision, September, 2012
 - 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.

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 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

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

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.
 2. Application: Protection of existing structure and adjacent assemblies, finishes and materials.
 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.
 6. Salvage: Designated items.
 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

SECTION 06 52 13

FIBERGLASS-REINFORCED PLASTIC (FRP)

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:

1. Section Includes: Fiberglass reinforced plastic (FRP) panels for cleanroom wall surfaces, including panel installation adhesive and panel seam sealant.
2. Drawings and general provisions of the Subcontract apply to this Section.
3. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:

1. Furnishing and installing framing pieces, fittings, Fiberglas® grating devices, bearing plates, bolts, and providing special instructions, templates and setting plans for their installation.
2. Installing Fiberglas® grating shown on the Drawings.
3. Supplying complete erection drawings and instructions.

C. Related Sections:

1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. Manual of Steel Construction of the AISC, 9th edition.

C. ASTM International:

1. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
2. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
3. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
4. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C and 30 Degrees C With A Vitreoussilica Dilatometer.

5. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 6. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 7. ASTM D3029 – Impact Resistance of Flat, Rigid Plastic Specimens By Means of a Tup (Falling Weight).
 8. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold On the Surface of Interior Coatings in an Environmental Chamber.
 9. ASTM D3274 – Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films By Fungal or Algal Growth, or Soil and Dirt Accumulation.
 10. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 11. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. U.S. Department of Energy General Design Criteria Manual, DOE 6430.1A.
- E. International Organization for Standardization (ISO):
1. ISO 846 – Plastics - Evaluation of the Action of Micro-organisms, Procedure A (Molds) and C (Bacteria).
 2. ISO 2812-1 – Determination of Resistance to Liquids – Part 1: Immersion in Liquids Other Than Water.
 3. ISO 14644-1 – Cleanrooms and Associated Controlled Environments—Part 1: Classification of Air Cleanliness.
 4. ISO 16000-9 – Indoor Air - Part 9: Determination of the Emission of Volatile Organic Compounds From Building Products and Furnishing - Emission Test Chamber Method.
- 1.3 SUBMITTALS
- A. Submit under provisions of Division 01 Section "General Requirements."
 - B. Product Technical Data: For each type of product required.
 - C. LEED Submittal Documentation:
 1. Product Certificates and Laboratory Test Reports: For LEED Credit IEQ 4.1, for adhesives, sealants and wall panels, including a printed statement of VOC content.
 - D. Shop Drawings: Showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.
 - E. Samples: Selection and verification samples for finishes, colors and textures. Submit two samples of each type of panel and fastener.
 - F. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
 - G. Test and Evaluation Reports: Showing compliance with specified performance characteristics and physical properties.

- H. Qualifications Statements: For manufacturer and installer.
- I. Manufacturer's Instructions: Submit manufacturer's specifications and installation instructions.
- J. Prior to fabrication, provide complete shop, erection, installation, and assembly drawings for the Work, including anchor bolt setting plan, as required to assemble all parts, components and accessories. Drawings shall indicate the piece marks of all parts to be erected or assembled and clearly depict the methods and sequence of assembly and erection.
- K. Copies of shop drawings, including erection drawings, shall be submitted to the Owner and Architect for review before the start of fabrication. The Owner review is of a general nature only, and all responsibility for compliance with Drawings, specifications and dimensions shall remain with the Subcontractor. The Subcontractor shall verify all layout dimensions with the Drawings, and will notify the Architect of any discrepancy and/or omission. Do not fabricate any members until all dimensions have been verified and resolved.
- L. Following the manufacturer's final inspection submit the manufacturer's certification in accordance with Paragraph 3.3A.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For installed products including maintenance methods and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents required in this section.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. The manufacturer shall be experienced in the manufacture of Fiberglas® reinforced plastic structures of equivalent type, size, and complexity required by these Subcontract documents.
 - a. Manufacturer shall have a minimum of 5 years experience in fabrication of FRP structures.
 - b. Experience on at least five projects of similar size, type and complexity as this Project.
 - c. An employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated.
 - 2. The Subcontractor will certify in writing that materials have been tested in accordance with a certified quality assurance program, and have been proven to be satisfactory for the use intended by these Subcontract documents.
- B. Design Loads:
 - 1. Live Load: 125 pounds per square foot (minimum), 2000 pounds concentrated load with 1/4 inch or less deflection.

- C. Surface-Burning Characteristics: Class A as determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- D. Comply with USDA/FSIS requirements.
- E. Preinstallation Meetings: Conduct preinstallation meeting to clarify Project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to Project site.
- B. B. Storage and Handling: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels in a dry indoor location at Project site. Remove any foreign matter from face of panels by using a soft bristle brush, avoiding abrasive action.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP panels that fail within specified warranty period.
 - 1. Failures shall include, but not be limited to substantial defects in material and workmanship, rotting, rusting, corrosion, development of structural surface cracks, or requiring of painting or refinishing.
 - 2. Warranty Period: Ten years from date of Substantial Completion.
- B. Special Warranty: Installer's standard form in which installer agrees to repair or replace FRP panels that fail due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

- A. General: Obtain fiberglass reinforced panels and other accessories from a single manufacturer.
- B. Fiberglass reinforced plastic panels complying with ASTM D5319.
- C. Options:
 - 1. Color: 85 White.

2. Surface Finish: Smooth.
3. Nominal Thickness: 0.075 inch (1.9 mm).
4. Surface Protection: Manufacturer's surface protection film for fiberglass reinforced plastic (FRP) panels.

D. Performance Criteria:

1. 1. Flexural Strength: 14 x 10³ psi (97 MPa), ASTM D790.
2. 2. Flexural Modulus: 0.65 x 10⁶ psi (4482 MPa), ASTM D790.
3. 3. Tensile Strength: 7 x 10³ psi (48 MPa), ASTM D638.
4. 4. Tensile Modulus: 0.95 x 10⁶ psi (6550 MPa.), ASTM D638.
5. 5. Barcol Hardness: 55, when tested according to ASTM D2583.
6. 6. Izod Impact: 11.0 ft. lb./in. notched (0.58 J/mm), ASTM D256.
7. 7. Coefficient of Linear Thermal Expansion: 0.17x10⁻⁵ in./in./ deg F (31 μm/m/deg C), ASTM D696.
8. 8. Gardner Impact Strength: 40 in-lb (4.5 J) showing no visible damage on finish side, ASTM D3029.
9. 9. Water Absorption: 0.20 percent/24 hrs. at 77 deg F (0.20 percent/24 hrs.) at 25 deg C), ASTM D570.
10. 10. Surface Burning Characteristics: Class A, ASTM E84.
11. 11. Taber Abrasion Resistance: Tested using CS-17 abrasive wheels with 1000 g weight. Panels shall exhibit weight loss of no more than 0.038 percent after 25 cycles.

2.2 ACCESSORIES

- A. A. Panel Installation Adhesive: White, non-flammable water-based acrylic latex adhesive as recommended by FRP panel manufacturer for required substrates.
 1. 1. Basis-of-Design Product: Cleanroom Recommended FRP Adhesive.
 2. 2. Adhesive shall have a VOC content of [123] <Insert value> g/L or less.
- B. B. Panel Seam Sealant: Bright white, two-part urethane sealant as recommended by FRP panel manufacturer.
 1. 1. Basis-of-Design Product: Cleanroom Recommended Urethane Sealant (A-Resin, C-Curative, two-part urethane sealant).
 2. 2. Sealant shall have a VOC content of 0.0 g/L.
- C. Cove Transition: 304 stainless steel (S.S.)
- D. Fasteners and clips: 316 stainless steel (S.S.)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Comply with manufacturer's product data, including product technical bulletins, and installation instructions in product literature and on product packaging.

- B. Verify that substrates previously installed under other sections are acceptable for product installation in accordance with FRP manufacturer's instructions.
 - 1. Examine substrate surfaces to determine that corners are plumb and straight, that surfaces are smooth, sound and uniform, that nails or screw fasteners are countersunk, and that joints and cracks are filled flush and smooth with adjoining surfaces.
 - 2. Do not begin panel installation until substrate surfaces are in satisfactory condition.

3.2 INSTALLATION

- A. General: Comply with FRP panel manufacturer's Cleanroom Application Guide #7616. Install panels using the recommended installation methods and materials only.
- B. Cut panels with carbide tipped saw blades or with snips.
- C. Panel Installation Adhesive:
 - 1. Install panels with manufacturer's recommended expansion gaps for ceiling, floor, inside and outside corner joints, and adjacent panel edges.
 - 2. Install panels using a full spread of adhesive. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
 - 3. Roll entire panel surface or apply uniform pressure with a soft block of wood. Press firmly over entire surface, working from center to outer edges.
- D. Panel Seam Sealant:
 - 1. Mask panel edges in compliance with panel manufacturer's recommendations.
 - 2. Fill grooves in panel joints with specified seam sealant at a rate such that seam is completely filled with sealant, but completed within recommended open time for sealant.
 - 3. Proceed with seam sealant process as follows, in the order recommended by panel manufacturer:
 - a. Vertical flat panel seams.
 - b. Vertical outside corners.
 - c. Vertical inside corners.
 - d. Floor and/or ceiling joints.
 - 4. Smooth seam sealant beads flat with panel edges within recommended open time for sealant.
 - 5. After smoothing joint sealant, remove masking and any excess sealant.

3.3 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace any installed products that have been damaged.
- C. Clean installed panels in accordance with manufacturer's instructions prior to Owner's acceptance.
- D. Remove and lawfully dispose of construction debris from Project site.

- E. Upon completion of work contained in these specifications, leave all work and premises clean and in satisfactory condition.

3.4 PROTECTION

- A. Protect installed panels and finish surfaces from damage during construction.

END OF SECTION



BioSafe® Cleanroom FRP Wall Panel System

- The only Factory Mutual (FM) Class A cleanroom Fiber-Reinforced Plastic (FRP) wall panels tested and certified to meet ISO 5 – 8 cleanliness standards*
- Class C cleanroom panels also available without FM approval; see ordering information below.
- Unique advanced polymer non-outgassing adhesive allows installation on most standard wall surfaces, including gypsum wallboard and concrete
- Seam sealant provides trim-free seams, expands and contracts to accommodate temperature-induced dimensional changes without cracks or gaps
- Stainless steel coving of floor, corners and ceiling simplifies cleaning and sterilization, making this system ideal for sterile environments
- Patented surfacing technology seals panels uniformly to enhance durability, prevent particle emission and microbial growth
- Resists a broad range of chemicals, including cleaning and sterilizing agents



BioSafe Cleanroom FRP Wall Panel Specifications

Composition:	Random chopped fiberglass in a modified polyester copolymer resin mix, with smooth finish and proprietary surface seal
Thickness:	0.075" (1.9 mm)
Total VOC:	22.16 ppb (Methyl methacrylate); 1.66 ppb (ISO 16000-9) - FDA and USDA approved
Color:	White
Coving:	304 Stainless Steel

BioSafe Cleanroom FRP Class A Wall Panel Certifications

- Particle emission ISO Class 5 – 8 per ISO 14644-1
- Meets USDA/FSIS (US Dept of Agriculture/Food Safety Inspection Service) requirements
- Does not support mold or mildew (per ASTM D3273 and ASTM D3274)
- Meets minimum requirements of major model building codes for Class A interior wall and ceiling finishes of flame spread ≤ 25, smoke developed 450 or less (per ASTM E-84)
- Meets requirements of ASTM D5319 for Classification Class A / Grade 5 (refers to standard specifications for materials, workmanship and physical requirements)
- Factory Mutual (FM) Approved under FM Research Approved FRP, Class 1 Interior Finish Material in accordance with FM Research with Canada and the United States Approval Standard 4880
- Biological Resistance rating of 0 – Excellence per ISO 846



Ordering Information

This part number incorporates all components necessary to convert a standard room into a cleanroom, including ceiling grid, FRP wall panels, and required wall adhesive and seam treatment. Order lights, fan/filter units and grid panels separately. Wall-to-wall or floor-to-wall coved transitions in stainless steel or PVC are also sold separately.**

	Cat. #	Price
BioSafe Wall Panel Conversion Kit, FRP Panels Class A***	6601-87	Price
BioSafe Wall Panel Conversion Kit, FRP Panels Class C***	6601-88	Price

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.
- B. Fire Performance: UL 2079, ASTM E 814, and local regulations.

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:
 - 1. Manufacturers: Pecora, Sonneborn Building Products and Tremco.
- B. Interior Joints, Moisture and Mildew Resistant Silicone:
 - 1. Manufacturers: 3M, Dupont, Dow Corning, Lexan and GE.
 - 2. Materials: One-part mildew-resistant silicone sealant, ASTM C 920.
- 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 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hollow metal doors.
- B. Hollow metal pressed frames.

1.2 RELATED SECTIONS

- A. Division 08 Section "Door Hardware".

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A250.8 - Recommended Specification for Standard Steel Doors and Frames
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM D 1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - 3. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - 4. ASTM E 152 - Methods of Fire Tests of Door Assemblies.
- C. National Fire Protection Association (NFPA).
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. HMMA-860 - Guide Specifications for Hollow Metal Doors and Frames.
- E. Steel Door Institute (SDI):
 - 1. SDI-100 - Recommended Specifications for Standard Steel Doors and Frames
 - 2. SDI-111 - Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories.
 - 3. SDI-113 - Standard Practice for Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts or other data indicating details of construction, gauges of metals, dimensions, hardware preparation, core,

label compliance, profiles and specifications for shop priming.

- B. Shop Drawings: Submit shop drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- C. Provide schedule of doors and frames using same reference numbers for details and openings as those indicated on drawings.
- D. Templates: Secure templates from finish hardware supplier for specified hardware and mounting locations.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have five years of experience manufacturing and fabricating products of similar type and scope as those specified in this section.
- B. Installer Qualifications: Installer shall have five years of experience manufacturing and fabricating products of similar type and scope as those specified in this section.
- C. Provide doors and frames meeting the requirements of ANSI A250.8 (ANSI/SDI-100).
- D. Fire Rated Door Assemblies: Meet the requirements of California Code of Regulations (CCR) Title 24 Part 2, California Building Code, Chapter 7 - Fire Resistant Materials and Construction for the fire resistive ratings indicated, and which are labeled by Warnock Hershey International. Fire doors and frames to comply with UBC 7-2 (UL 10C) positive pressure.
 - 1. Temperature Rise Rating: At stairwell enclosures, provide doors which are labeled for a maximum transmitted temperature end point not to exceed 250 degrees F (121 degrees C) above the ambient at the end of 30 minutes of fire exposure.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Provide packaging such as cardboard corner guards or other means to protect surfaces of hollow metal doors. Provide temporary spreader bars fastened to the bottom of each welded frame.
- B. Inspection: Inspect doors and frames upon delivery. Minor damage may be repaired provided finish items are equal to new work and acceptable to the Architect; otherwise remove and replace damaged items as directed.
- C. Storage: Store doors and frames on platforms under cover. Store doors and frames in dry storage spaces with adequate ventilation, free from dust, and which permits easy access for inspection and handling. Avoid using

non-vented plastic or canvas shelters that create a humidity chamber. To promote air circulation, provide a 1/4 inch (6 mm) space between doors. Mark or tag each door and frame with the appropriate opening identification symbol.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Ceco Door Products.
 - 2. Curries.
 - 3. Pioneer Industries.
 - 4. Steelcraft.

2.2 DOOR CONSTRUCTION

- A. General: Fabricate doors in accordance with ANSI A250.8 (SDI-100) or HMMA-860 (NAAMM).
- B. Internal Construction: Fabricate doors with any of the internal construction methods specified herein and in accordance with ANSI A250.8 (SDI-100) except as specified below.
 - 1. Fire Rated Doors: Fabricate to the requirements of ASTM E 152 for the hourly ratings indicated. Fabricate labeled fire resistive doors at stairwells with mineral fiberboard composite core that will provide the specified maximum transmitted temperature end point.
- C. Clearances: Provide doors and frames with clearances in accordance with SDI-100.

2.3 FINISH

- A. Factory Primer: After fabrication, clean and spray coat all exposed surfaces of doors and frames with a rust inhibitive prime paint, of even consistency to provide a uniformly finished surface ready to receive finish paint.
- B. Finish field painting is specified in Section 09900.

2.4 DOORS

- A. Honeycomb Core Doors:
 - 1. Description: Economical, impact resistant, for interior or exterior usage with 1 inch (25 mm) hexcells for maximum strength, rigidity and flatness.
 - 2. Honeycomb Cells: 1 inch (25 mm) honeycomb cells permanently

bonded to both face sheets. Impact resistance - 45 PSI crushing strength of honeycomb.

3. Compliance: SDI-100.
4. R Factor: 2.4.
5. U Factor: 0.41.
6. Material: 18-gauge A60 galvanealed steel, heavy duty.
7. Material Compliance: ASTM A 653.
8. Top and Bottom Channels: 18-gauge top and bottom inverted channels spot welded to face sheets.
9. Construction: Standard, continuously welded vertical edges (seamless).
10. Hardware Reinforcement:
 - a. Closers: 12 gauge.
 - b. Locks: 10 gauge.
 - c. Hinges: 7 gauge, 3/16 inch.
11. Hardware Reinforcement: Custom, as selected by Architect.
12. Finish: Rust inhibitive prime coat ANSI/SDI 250.10.
13. Door Thickness: Standard, 1-3/4 inches (44.5 mm).
14. Door Undercut: Standard 3/4 inch maximum from finished floor.
15. Integral Louver/Lite Configuration: As per drawings and door schedule.
16. Fire Rating: As per drawings and door schedule.

2.5 FRAMES

- A. Fabricate frames in accordance with SDI-100 except as modified herein. Provide metal frames for doors, transoms, sidelites, borrowed lites and other openings, of types and styles indicated and scheduled. Conceal fastenings, unless otherwise indicated.
 1. Frames to have mitered corners, continuously welded, with welds ground smooth. Provide reinforcing at corners and hardware mounting locations. Provide stops a minimum of 5/8 inch (16 mm) deep.
- B. Door Frames:
 1. Frame Profiles: As per drawings and door schedule.
 2. Frame Elevations: As per drawings and door schedule.
- C. Anchors: Provide floor anchor and wall anchors welded into each jamb member; 16 gauge minimum. Loose anchors are not acceptable.
 1. Compliance: Wall anchors shall comply with SDI 111, of the type indicated for the specific wall conditions. Head anchors welded into head member as recommended by frame manufacturer.
 2. Anchoring System: As recommended by manufacturer for installation in existing 1-hour rated CMU walls.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect conditions of substrate and other conditions which may affect installation of signage.
- B. Do not begin installation until substrates are within manufacturer's specified

tolerances and have been prepared in accordance with manufacturer's instructions.

- C. If substrate preparation is the responsibility of another installer, do not proceed with installation. Notify Architect of unsatisfactory preparation immediately.
- D. Commencement of work is deemed as acceptance of installation conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set frames accurately in position and plumb, align and brace them securely until permanent anchors are set. Anchor the bottom of frames securely to floors with expansion bolts or with powder-driven fasteners.
- C. Build in or secure wall anchors to adjoining construction as indicated or required by adjoining construction. Where frames require ceiling struts or other structural overhead bracing, anchor such struts securely above, as required. Fill frames solid with Portland cement grout where indicated or required by fire rating of opening. Remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
- D. Install fire rated doors and frames, including hardware and operational characteristics, in accordance with the requirements of the listing agency, NFPA-80, and manufacturer's recommendations.
- E. Doors and finish hardware shall operate smoothly, quietly, and free from bind.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Provide door hardware.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Door and Door Frames".

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 for approval hardware schedule proposed for use based on Owner's requirements.

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. Hardware for Fire-Rated Openings: NFPA 80, and local requirements.
- C. Materials and Application: ANSI A156 series standards.
- D. Hardware shall comply with ADA requirements for handle and pull force.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Door Hardware: Provide door hardware as per building standard.
 - 1. Manufacturers:
 - a. Hinges: Hager Hinge, McKinney/Parker and Stanley Hardware.
 - b. Cylinder Locksets and Latchsets: Corbin/Ruswin (2000 Series), Best 7-K.
 - c. Exit Devices: Sargent Manufacturing and Von Duprin.
 - d. Closers: Corbin Ruswin Architectral Hardware, LCN and Norton

Door Control.

- e. Cylinder Locks and Deadbolts: Best (7A/9A Series) and Corbin/Ruswin Architectural Hardware.
 - f. Manual Flush Bolts: Glynn-Johnson.
 - g. Offline Electronic Lock: Schlage AD-250.
 - h. Accessories (Stops, coordinators, kick plates, etc.): Baldwin Hardware, Glynn-Johnson, Hager, Hiawatha, Ives, Rockwood Architectural.
- 2. Quality Level: Commercial.
 - 3. Locksets and Latchsets: Mortise type.
 - 4. Lock Cylinders: Interchangeable.
 - 5. Keying: Owner's requirements 7-pin (SFIC) small format interchangeable core.
 - 6. Hinges and Butts: Provide 3 steel hinges, full-mortise type at interior.
 - 7. Closer: Provide hydraulic door closer with hold open.
 - 8. Hardware Finishes: Satin stainless finish on exposed surfaces.
 - 9. Auxiliary Materials:
 - a. Stops and overhead door holders.
 - b. Soundstripping.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Follow guidelines of DHI 'Recommended Locations for Builder's Hardware and hardware manufacturers' instructions.
- B. Contractor to provide construction cores at all lockable locations prior to substantial completion. Wayne State University shall provide a core combination schedule and key quantity requirement to the contractor. The contractor shall provide and install permanent cores at the time of substantial completion.
- C. Adjust operation, clean and protect.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide gypsum board assemblies.

1.2 RELATED SECTIONS

- A. Division 09, Section "Non-structural Metal Framing".
- B. Division 09, Section "Resilient Base and Accessories".
- C. Division 09, Section "Paints".

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. 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. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Gypsum Board:
 - 1. Manufacturers:
 - a. CertainTeed Gypsum, Inc.
 - b. Lafarge North America Inc.
 - c. Clark Dietrich Building Systems
 - 2. Application: Interior walls, partitions and partial height wall with tape and joint compound finish.
 - 3. Material Standard: ASTM C1396.

4. Type: Board for tape and joint compound finish.
 - a. Type: Regular and fire-rated types as required.
 - b. Typical Thickness: 5/8 inch.
5. Joint Treatment: ASTM C474 and ASTM C840, 3-coat system, paper or fiberglass tape.
6. Auxiliary Materials:
 - a. Cornerbead, edge trim and control joints.
 - b. Gypsum board screws, ASTM C 1002.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Steel Framing: Install steel framing in compliance with ASTM C 754. Install with tolerances necessary to produce substrate for gypsum board assemblies with tolerances specified. Include wall reinforcing for casework, wall cabinets, wall mounted shelving and drying racks.
- B. Tape and Joint Compound: Install gypsum board for tape and 3-coat joint compound finish in compliance with ASTM C 840 and GA 216, Level 4 finish. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces.
- C. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.
- D. Where new partitions meet existing construction, remove existing cornerbeads to provide a smooth transition.
- E. Provide insulation full height and thickness in partitions where required.
- F. Provide siliconized acrylic sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints.
- G. Install trim in strict compliance with manufacturer's instructions and recommendations.
- H. At areas to be patched and repaired, prepare surface to sound substrate, apply bonding agent and patching materials in accordance with manufacturer's instructions.
- I. Clean adjacent surfaces soiled during installation. Touch-up damaged surfaces. Protect work from damage. Repair surface defects. Leave ready for finish painting or wall treatment.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide non-structural metal framing for gypsum board assemblies.
- 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.

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. Tolerances: Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.
- D. Comply with NFPA 101.
- E. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Framing for Walls and Partitions:
 - 1. Manufacturers: Brady Construction Corp., Chicago Metallic Corp., Clark Dietrich, MBA Metal Framing, Ruskin Corp.
 - 2. Material Standard: ASTM C645.
 - 3. Stud Thickness: 20 gauge (.0329 inch).
 - 4. Stud Depth, Typical: 3-5/8 inches.
 - 5. Auxiliary Framing Components: Furring brackets, resilient furring channels, Z-furring members, and non-corrosive fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.
- B. Where new partitions meet existing construction, remove existing cornerbeads to provide a smooth transition.
- C. Provide acoustical sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Provide acoustical ceilings and suspension systems:
 - 1. Acoustical ceiling panels.
 - 2. Exposed grid suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Section 09 21 16, "Gypsum Board Assemblies".
 - 2. Division 23 - Mechanical Work
 - 3. Division 26 - Electrical Work

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. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. Extra Stock: Submit extra stock equal to 2 percent of amount installed.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
 - a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Max Ceilings: HumiGuard Max's sag performance warranty extends to installations where the ceiling product is exposed to chemical fumes, extreme temperatures up to 120°F (49° C) (including steam up to 275°F (135° C)) and 100% RH, including standing water applications so long as the product is installed with either SS Prelude Plus, AL Prelude Plus or Prelude Plus XL Fire Guard suspension systems. For swimming pools, install only with AL Prelude Plus suspension system. For outdoor soffits, canopies, and parking garages install with Prelude XL for Exterior Applications (wind uplift should be considered).

The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer,

agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
2. Grid System: Rusting and manufacturer's defects
3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Warranty Period Humiguard:

1. Acoustical panels: Ten (10) years from date of substantial completion.
2. Grid: Ten (10) years from date of substantial completion.
3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Mineral Fiber Acoustical Ceilings:
 1. Manufacturers:
 - a. Armstrong World Industries.
 - b. USG.
 - c. Celotex.
 2. Design Standard: Ceramaguard Lay-in with a fine fissured texture.

B.Suspension Systems:

1. Manufacturers:
 - a. Chicago Metallic.
 - b. Armstrong World Industries.
 - c. USG.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type ACT-1:

1. Surface Texture: Medium
2. Composition: Mineral Fiber
3. Color: White
4. Size: 48in X 24in X 5/8in
5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 40
8. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264; Fire Resistive
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.82.
11. Dimensional Stability: HumiGuard Max - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning.
12. Antimicrobial Protection: Inherent - Resists the growth of mold/mildew and bacterial growth.
13. Acceptable Product: Ceramaguard Fine Fissured, 608 as manufactured by Armstrong World Industries.

2.3 SUSPENSION SYSTEMS

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 IN type exposed flange design. Exposed surfaces chemically cleansed,

capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).

1. Structural Classification: ASTM C 635 HD.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- E. Accessories
1" Flush "T" Act. to Drywall Transition Molding

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
 - 1. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide resilient wall base and accessories.
- B. Related Sections include the following:
 - 1. Division 09, Section "Gypsum Board Assemblies".
 - 2. Division 09, Section "High Performance Coatings".
 - 4. 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.
 3. Standard: ASTM F 1861.
 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

SECTION 09 65 16
VINYL SHEET FLOORING

PART 1 GENERAL

1.1 THIS SECTION INCLUDES

- A. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
- C. Submit the manufacturer's standard samples showing the required colors for flooring, welding rods, and applicable accessories.
- D. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.3 QUALITY ASSURANCE

- A. Select an installer who is competent in the installation of resilient sheet flooring using heat-welded seam using manufacturers installation and welding method.
- B. Provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
- C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
 - a. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
 - b. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Flooring material and adhesive shall be acclimated to the installation area for a minimum of 48 hours prior to installation.

1.5 PROJECT CONDITIONS

- A. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

1.2 WARRANTY

- A. Warranty Period: Manufacturer's standard warranty against manufacturing defects and wearing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - a. Armstrong.
 - b. Forbo.
 - c. Toli.
 - d. Tajima.
 - e. Lonseal.
 - f. Polyflor.
 - g. Tarkett.
- B. Substitutions: Subject to review and approval of the architect.

2.2 (VCS-1) MATERIALS: RESILIENT SHEET FLOORING

- A. Basis of Design: MEDINTECH™ Homogeneous Vinyl Sheet Flooring, nonlayered and nonbacked, manufactured by Armstrong World Industries, Inc. The polyurethane-coated wear surface shall be composed of polyvinyl chloride resin, plasticizers, stabilizers, fillers, and pigments comprising a through-grain vinyl chip visual with pattern and color uniformly dispersed throughout the entire thickness. The design shall merge subtle color accents with a detailed, terrazzo-like image providing a monolithic appearance. Vinyl sheet flooring shall meet ASTM F 1913, "Standard Specification for Vinyl Sheet Floor Covering Without Backing."
 - .1. Color: To be selected by Owner and Architect.
 - .2. Size: 72 in. (1.83 m) wide roll.
 - .3. Thickness: nominal total thickness of 0.080 in. (2.0 mm).
 - .4. Auxiliary Materials: Provide matching vinyl weld rod by same manufacturer and intended for heat welding of seams. Color shall be compatible with field color of flooring.

2.3 WALL BASE MATERIALS

- A. For integral flash cove base: Provide integral flash cove wall base by extending sheet flooring 4 in. up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer.

2.4 ADHESIVES

- A. Provide Armstrong, S-543 Premium Plus Commercial Sheet Flooring Adhesive, S-599 Premium Vinyl-Back Sheet Flooring Adhesive or S-240 High-Performance Epoxy Flooring Adhesive as required by the project conditions for field areas. Provide Armstrong S-580 Flash Cove Adhesive at flash coving as recommended by the flooring manufacturer.
- B. Provide Armstrong S-761 Seam Adhesive at seams as recommended by the resilient flooring manufacturer.

2.5 ACCESSORIES

- A. Provide top edge trim caps of plastic zero reducer for integral flash cove as approved by the Architect.
- B. Provide a fillet support strip for integral cove base with a minimum radius of 1 in. (2.54 cm) of wood or plastic
- C. Provide transition/reducing strips tapered to meet abutting materials.
- D. Provide threshold of thickness and width as shown on the drawings.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 PREPARATION

- A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong [S-183 Fast-Setting Cement-Based Underlayment][S-184 Fast-Setting Cement-Based Patch and Skim Coat][S-194 Fast-Setting Cement-Based Patch and Underlayment] as recommended by the flooring manufacturer.
- B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid

organic solvents.

- C. Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.
- D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 INSTALLATION OF SHEET FLOORING

- A. Install flooring in strict accordance with the latest edition of "Armstrong Guaranteed Installation System", F-5061.
- B. Install flooring wall to wall and extend flooring into toe spaces.
- C. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- D. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
- E. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.
- F. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- G. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.
- H. Provide integral flash cove wall base where shown on the drawings, including cove fillet support strip and top edge cap trim. Construct flash cove base in accordance with the flooring manufacturer's instructions.

3.4 INSTALLATION OF ACCESSORIES

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 MAINTENANCE

- A. Comply with manufacturer's instructions for proper cleaning and maintenance of the products.

END OF SECTION

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 08, Section "Hollow Metal Door and Door Frames".
 - 2. 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.
 3. Primary Paint Systems: Primer plus two finish coats.
 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 and Frames:
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

SECTION 09 96 00

HIGH PERFORMANCE COATINGS

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 09, 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

A. Dur-A-Flex, Inc, Dur-A-Gard, Epoxy-Based seamless flooring system (Design Standard)

1. System Materials:
 - a. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 WB resin and hardener.
 - b. Base Coat: Dur-A-Flex, Inc, Dur-A-Gard resin and hardener.
 - c. Topcoat: Dur-A-Flex, Inc. Armor Top resin, hardener and grit.
 - d. Cove Base: Dur-a-Glaze #4 Cove-Rez
 - c. Cove Base: Plastic Adhesive Cove strip
1. Patch Materials
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze Rapid-Patch.
 - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A-Crete.

2.2 MANUFACTURERS

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

2.3 PRODUCT REQUIREMENTS

- A. Primer
- a. 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. Base Coat

Dur-A-Gard

1. Percent Solids	100 %
2. VOC	3.45 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. Flammability, ASTM D 635	Self Extinguishing
9. Impact Resistance MIL D-3134	0.025 inch Max
10. Water Absorption. MIL D-3134	0.04 %
11. Potlife @ 70 F	20-25 minutes

C. Topcoat

Armor Top

1. Percent Solids	95 %
2. VOC	0 g/L
3. Tensile Strength, ASTM D 2370	7,000 psi
4. Adhesion, ASTM 4541	Substrate Failure
5. Hardness, ASTM D 3363	4H
6. 60° Gloss ASTM D 523	70
7. Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss Satin 4 8 mg loss with grit 10 12 mg loss without grit
8. Pot Life, 70 F, 50% RH	2 Hours
9. Full Chemical Resistance	7 days

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, laitance, friable matter, dirt, and bituminous products.
2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in 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 four distinct steps as listed below:
 - a. Substrate preparation
 - b. Priming
 - c. Base coat application.
 - d. 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 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 200-250 sf/gal to yield a dry film thickness of 4 mils.

C. Base Coat

1. The base coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer.
2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The base coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 100 sf/gal to yield a dry film thickness of 16 mils.

D. 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, hardener and grit that is mixed per the manufacturer's instructions.
3. The finish floor will have a nominal thickness of 23 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 10 21 23.13
LIGHTPROOF CURTAINS

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. Curtains, tracks, curtain carriers, and suspension system for lightproof curtains.

1.3 PERFORMANCE REQUIREMENTS

- A. Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Fabrics are flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of applicable testing and inspecting agency.

1.4 SUBMITTALS

- A. Product Data: Include durability, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.
 - 1. Include data on each type of applied curtain treatment.
- B. Shop Drawings: Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 1. Include details on suspension system above ceiling.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members.

2. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
- D. Cubicle Schedule: Use same room designations as indicated on Drawings.
- E. Samples for Initial Selection: For the type of curtain fabric indicated.
- F. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.
- G. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.5 WARRANTY

- A. Warrant that the curtain and hardware shall be free of defects in workmanship and material for one (1) year from the date of installation acceptance.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install cubicles until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where cubicles are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Deliver of the blackout or laser curtains to the site after plaster, concrete, masonry are dry and the building has reached the average prevailing relative humidity of the locality. Protect finished surfaces of equipment from soiling and damage during delivery, storage, and handling.

PART 2-PRODUCTS

2.1 GENERAL

- A. The following list of equipment components represents the primary equipment components required under this section. Certain minor items may be required to complete the work of this section, and it is the responsibility of the contractor to supply such items, even though they may not be specifically listed. Refer to the contract drawings for quantities and sizes and coordinate the locations for the equipment listed.
- B. Curtain with all necessary grommets, reinforcing, and hems.

- C. Track single or double as called out for on the drawing with necessary 12" radiuses where indicated.
- D. Valances and Velcro attachment system as indicated. All valances shall be double to assure a total light barrier.
- E. Hangers as required and in accordance with specifications.
- F. End stops and end hangers to allow for a secure installation and easy removal of carriers without removing track.
- G. All Velcro necessary for wall and overlap securing.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Photo Lab Fabrications, New York.

2.3 CURTAIN TRACKS

- A. Provide complete track assembly including the suspension system, and all required valance support channels, curtain tracks, curtain carriers, end caps, connectors, fittings, and fasteners.
- B. The track is constructed of satin anodized aluminum designed for surface mounting, to the underside of the ceiling or other mounting substrate. The track is extruded aluminum box-channel 1-1/4" x 7/8" slotted on the underside to receive two-wheeled carriers.
- C. The track also serves as an integral part of the valance assembly. Fastening should be made not more than 18" on centers. Corners, where required, are supplied as one piece, 12" radius 90-degree track sections.
- D. Tracks are supplied, as required, with hook carriers, end caps, snap-outs, and connectors, of the sleeve type. The hooks are formed of rustproof wire attached to a carrier with non-wearing nylon wheels.

2.4 CURTAINS

- A. Curtains shall be of 100% cotton fabric backed with 100% vinyl. Curtains used in an imaging lab for light control.
 - 1. Color: Black.
- B. Total length of curtain shall be supplied with a light trap valance made of same blackout material as curtains and fastened to valance support channel on each side of curtain.

- C. Vertical edges of curtain shall have hook and loop type fastener strips to facilitate "light trap and curtain" overlaps and for attachment to walls.
- D. Top, bottom and side edges shall be overlapped, hemmed and heat sealed.
- E. Provide rustproof grommets in curtain top hem spaced at 8" on center and at ends.
- F. Provide weights in bottom hem to hold curtain to floor.
- G. Curtains shall be of width to provide full required width plus 35% additional.
- H. Height of curtains as detailed on drawings. Extend height of curtain to allow a 3" overlap on floor.

PART 3-EXECUTION

3.1 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions. Provide track fabricated from one continuous length up to 16 feet (4.9 m).
 - 1. Curtain Track Mounting: As indicated on Drawings.
- B. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches (610 mm). Fasten support at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 - 1. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
- C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- D. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along the full length of the curtain plus an additional carrier.
- E. Curtains: Hang curtains on each curtain track.

3.2 CLEAN-UP AND PROTECTION

- A. Repair, or remove and replace, any defective work or materials, as directed after completion of installation.
- B. Clean all visible surfaces. Use only manufacturer recommended or approved cleaning methods and materials.
- C. Protection: Advise contractor of procedures and precautions for protection of materials, surfaces, and equipment, from damage from the elements or work of other trades.

END OF SECTION

SECTION 10 44 00

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers

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. 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 "Painted Metal Laboratory Casework".
 - 3. Divisions 20, 22, 23, and 26 for connecting service utilities at indicated point and final connections to Building Services.
 - 4. Division 23, Section "Heating Ventilating and Air Conditioning" for furnishing fume hood controls.
 - 5. Division 26, 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 Division 12, 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:
- | Face Velocity | Measured S.P.L. (W.G.) |
|---------------|------------------------|
| 100 F.P.M. | .30 inches |
- E. 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.
- H. 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.
- I. 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.
 2. Air Master Systems.
 3. BMC National Products.
 4. Fisher-Hamilton Scientific Inc.
 5. Kewaunee Scientific Corporation.

2.1 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.
 - 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".
 - 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".
 - 7. Fasteners: Stainless steel.

2.2 FUME HOOD COMPONENTS

- A. Fabricate laboratory fume hoods from components specified herein and as indicated on drawings.
- B. Bypass Grilles: Low resistant type, 18 gauge steel, upward directional louvers.
- C. Sash Cables: Stainless steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- D. Sash Guides: Corrosion resistant poly-vinyl chloride.
- E. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tired-not acceptable).

- F. Sash Pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- G. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.
- H. 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.
- I. Piping: All fume hood piping and insulation materials, and construction methods are to conform to the Mechanical Specifications, Division 15.
- J. 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 gasketed 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.
- K. Fume Hood Face Velocity Sensors and Safety Monitor Alarms:
 - 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. General VAV Fume Hood Control System Requirements
 - 1) Airflow sensors and quick response (three seconds or less) pressure independent valves shall be installed in each exhaust duct, desirably at roof level, to maintain face velocity and to prevent backflow or air volume fluctuations.
 - 3. 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.
 - 4. 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.
 - 5. Airflow Sensor: Thermally compensated glass-beaded thermistor, factory connected to a side-wall port on the interior of the fume hood.
 - 6. 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.
7. Provide test circuit to verify proper Safety Monitor operation.
 8. Electrical Rating: Maximum 12 VDC, and maximum current rating of 200MA.
- L. 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

- M. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes.
- N. Service Fittings: Comply with requirements of Division 11, "Laboratory Service Fittings and Fixtures".
 - 1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on coating.

2.3 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 air foil, 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. Ends: 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 1/4" thick material, screwed together with cleats or steel angles to form a completely rigid assembly to which exterior cold-roller 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 sidepanels 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 access panels in face of hood to permit relamping of light fixtures.

- H. Working Surface: Unless otherwise specified, provide a working surface (counter) of epoxy resin. All working surfaces shall be provided with a 1/4" thick raised edge across front, sides, and rear of hood, to make a watertight retaining ledge.
- I. Rear Baffle: Provide baffle at rear of hood for normal or average operation.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. 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.

- O. 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.
- P. 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.
- Q. Holes: Provide holes as indicated and as required for passage of piping, ducts, and conduit, and for fixtures furnished under other Division-12 sections.
- R. Fasteners: Provide stainless steel for fasteners wherever exposed to fumes in hood.
- S. Cup Sink: Furnish for each hood having water supply, provide of same material as hood working surface, size and configuration as indicated.
- T. 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.
- U. 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.
- V. 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.

2.4 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. Accessible: Accessible fume hoods shall be designed to accommodate physically handicapped users. The hood shall comply with the criteria of the Americans with Disabilities Act and the code requirements of the applicable local or state accessibility codes.

2.5 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. Variable Air Volume: Provide fume hoods that maintain a constant face velocity as the sash height changes. It shall be capable of varying the exhaust air volume in proportion to the hood face opening by either changing the speed of the exhaust blower or by adjusting a damper in the exhaust duct for general laboratory fume hood operations.

PART 3 - EXECUTION

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

SECTION 11 53 33

LABORATORY SAFETY EQUIPMENT

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.
 - 2.

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.
- F.

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. 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.
- b. Brushed Stainless Steel with Clear Epoxy Coating: Emergency Shower.

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

- ~~○ 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



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.

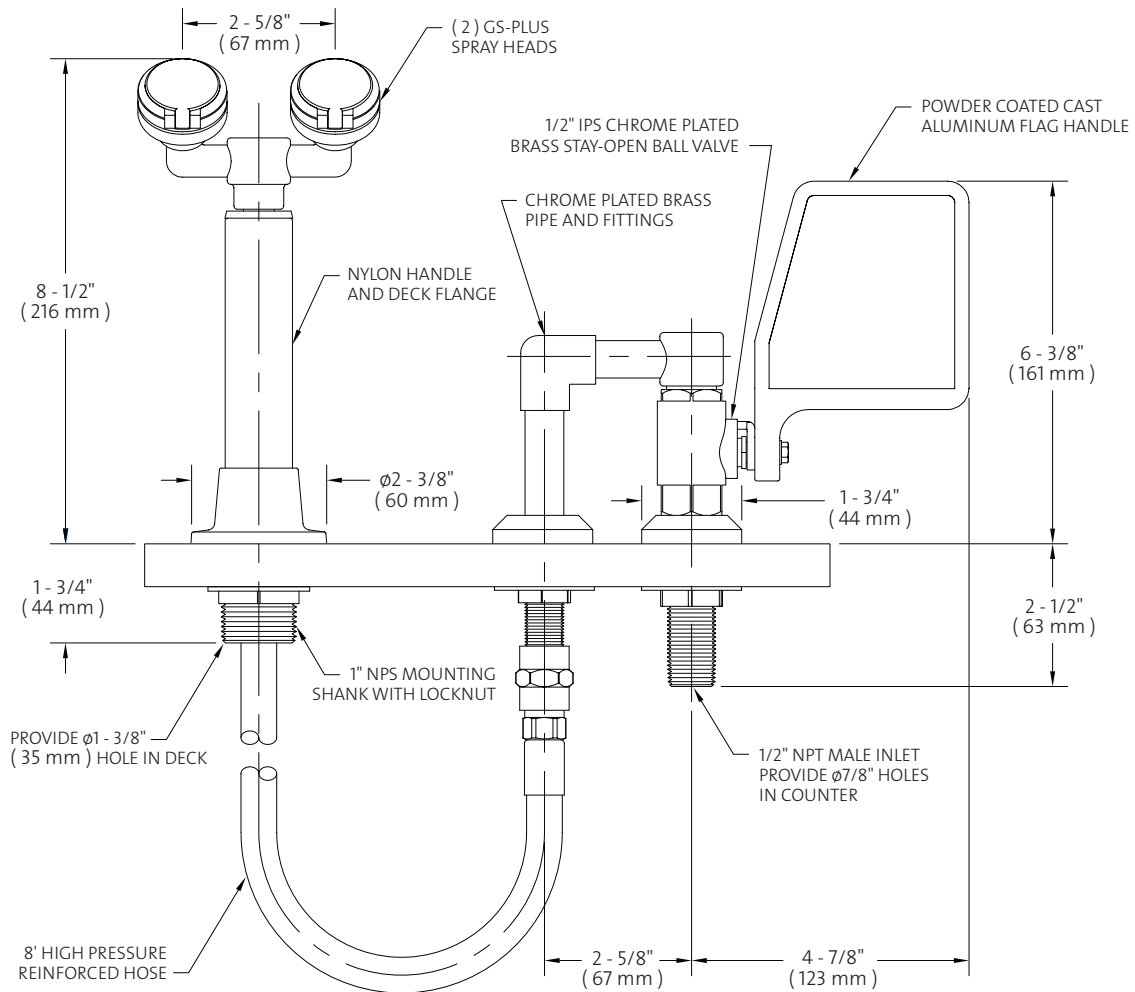
SIGN: ANSI-compliant identification sign.

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

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.

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Sign Included



○ FEBF735FDP Swing-Down Eye/Face Wash with Drain Pan, Recess Mounted, Daylight Drain

Application: Wall mounted barrier-free swing-down eye/face wash with drain pan. Stainless steel cover provides attractive appearance and protects unit when not in use. When activated, cover serves as pan to collect waste water and return it into unit for drainage. Rather than connecting to building drainage system, unit has 1-1/2" O.D. drain connection on front of unit for waste water. Front drain provides for less costly installation while facilitating regular testing of unit.

ADA Compliance: When installed at recommended mounting height, unit complies with ADA requirements for accessibility by handicapped persons.

Spray Head Assembly: Two FS-Plus™ spray heads mounted on supply arms. Each spray head has individually adjustable flow control and filter to remove impurities from water.

Cover/Drain Pan: 16 gauge stainless steel combination cover and drain pan. Grasping "panic bar" handle and opening cover pulls spray head assembly down from vertical to horizontal position, activating water flow. While unit is in operation, waste water is collected in drain pan and returned into cabinet for drainage. Unit remains in operation until cover is returned to closed position.

Valve: 1/2" IPS brass plug-type valve with O-ring seals. Furnished with in-line strainer to protect valve and spray heads from debris and foreign matter.

Mounting: 16 gauge stainless steel cabinet with flanged rim for recessed mounting in wall. Unit fits in standard 3-5/8" deep wall.

Supply: 1/2" NPT female inlet.

Waste: 1-1/2" O.D. tailpiece on front of unit with hinged stainless steel cover.

Sign: ANSI-compliant identification sign.

Quality Assurance: Unit is completely assembled and water tested prior to shipment

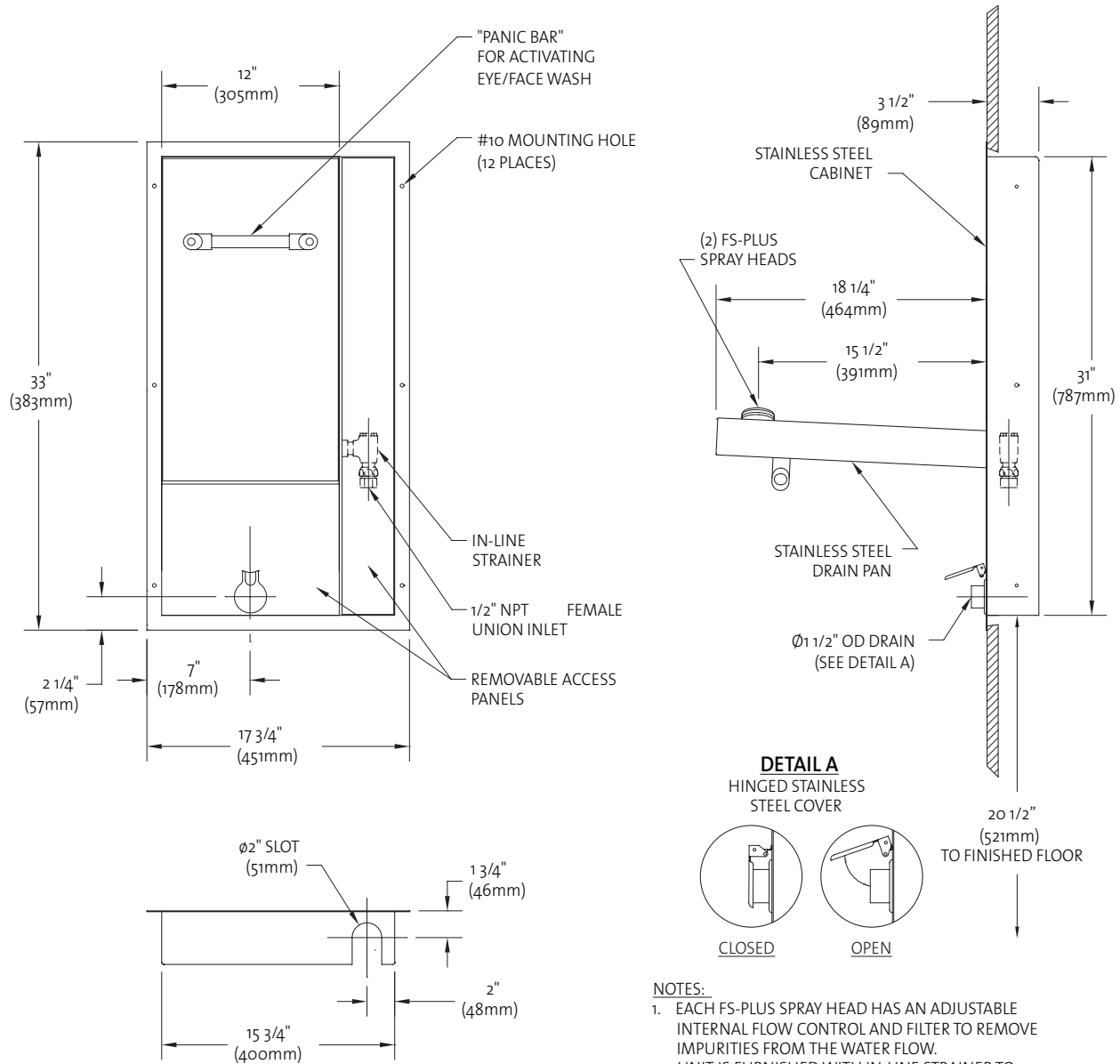
Available Options

- **AP250-064 Test Kit**
Removable fitting with elbow and drain tube installs in daylight drain for testing unit.
- **AP280-235 Electric Light and Alarm Horn**
Flashing light/alarm horn unit is recess mounted in finished wall. Light is illuminated and horn sounds when shower is activated. Includes additional leads for remote monitoring.
- **TMV AP3600** thermostatic mixing valve precisely blends hot and cold water to deliver tepid water as required by ANSI Z358.1-2009.



Note: Shown with optional AP280-235 electric light and alarm horn unit (sold separately).

○ **FEBF735FDP** Swing-Down Eye/Face Wash with Drain Pan, Recess Mounted, Daylight Drain



- NOTES:**
1. EACH FS-PLUS SPRAY HEAD HAS AN ADJUSTABLE INTERNAL FLOW CONTROL AND FILTER TO REMOVE IMPURITIES FROM THE WATER FLOW.
 2. UNIT IS FURNISHED WITH IN-LINE STRAINER TO PROTECT SPRAY HEADS AND VALVE COMPONENTS FROM DEBRIS IN WATER LINE.
 3. INLET CAN BE POSITIONED TO SUPPLY UNIT FROM TOP OR BOTTOM.

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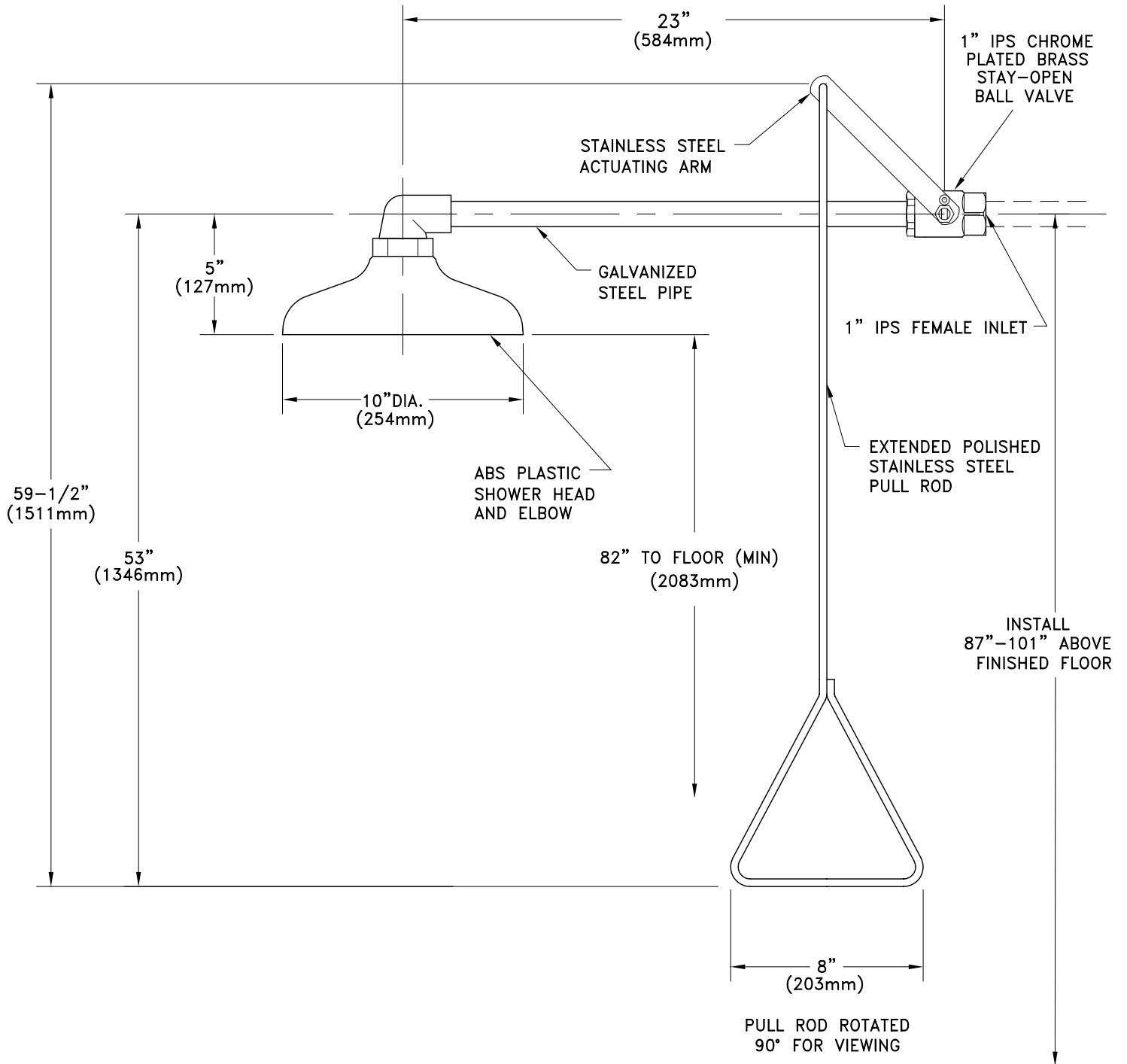
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Sign Included



ESBF643

BARRIER-FREE HORIZONTALLY MOUNTED EMERGENCY SHOWER WITH STAY-OPEN BALL VALVE AND PULL ROD



MEASUREMENTS MAY VARY ±1/4".

Drawing Number: _____

Revision Number: 100703-DWC



○ **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.

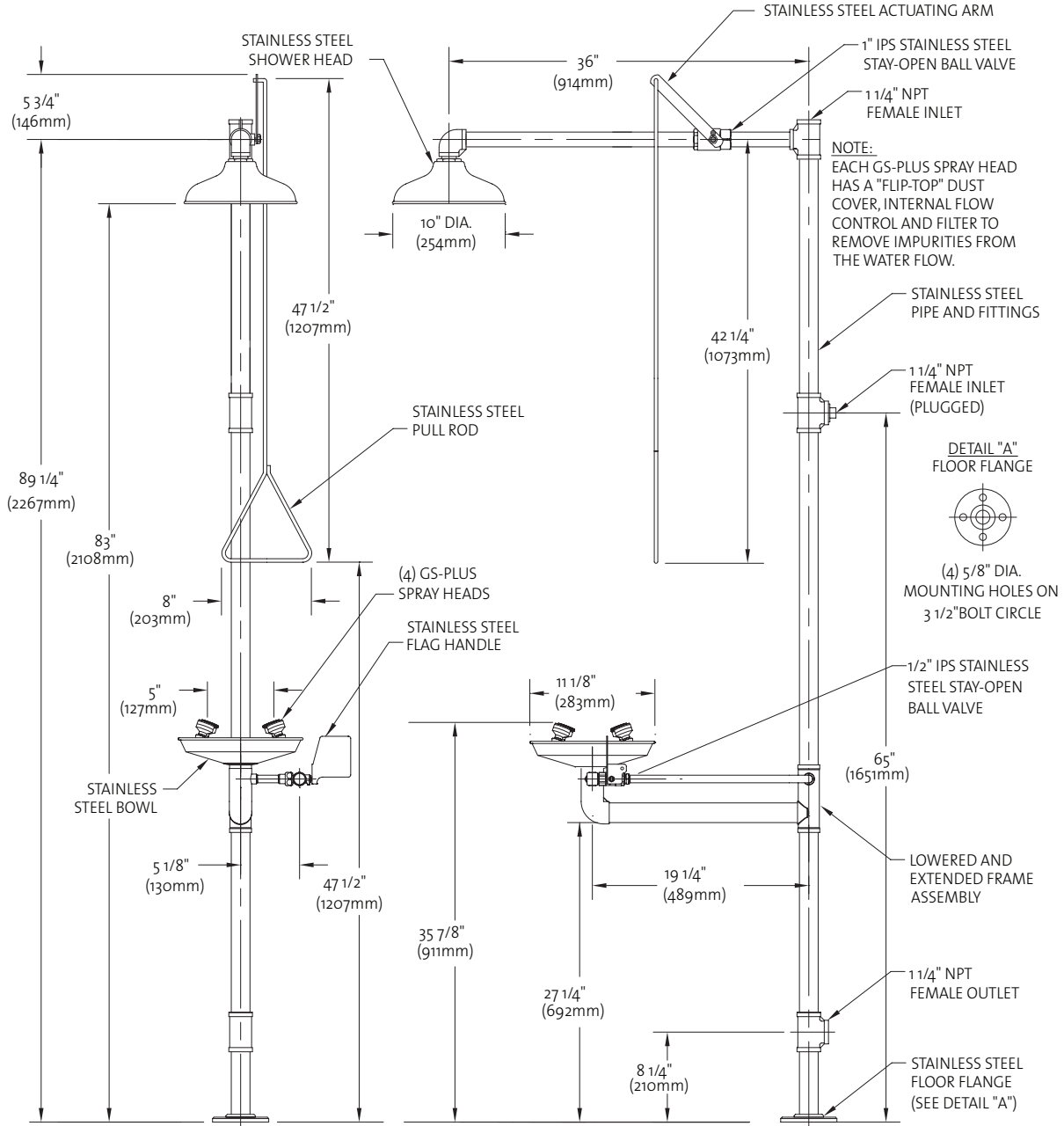
Quality Assurance: Valve and spray head assemblies are factory assembled and water tested prior to shipment.

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



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SECTION 11 53 43

LABORATORY SERVICE FITTINGS AND FIXTURES

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 be 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.

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

3. Adhesion Test: Corrosion resistant finishes shall meet the standards set forth in "Standard Test Methods for Measuring Adhesion by Tape Test", ASTM D3359-02, "Standard Test Method for Mandrel Bend Test of Attached Organic Coatings", ASTM D522-93a and "Standard Test Method for Chipping Resistance of Coatings", ASTM D3170-03.
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

inch-pounds. 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 compressed 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 B.125.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 (CLR 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:

Basic Air & Water Indexing	Index Color	Letter Color	Symbol
Purified Air	Orange	Black	PAir
Air	Orange	Black	Air
Compressed Air	Orange	Black	CA
Lab Air	Orange	Black	LA
Cold Water	Dk. Green	White	CW
Chilled Water Supply	Dk. Green	White	CWS
Chilled Water Return	Dk. Green	White	CWR
Industrial Cold Water	Dk. Green	White	ICW
Hot Water	Red	White	HW
Industrial Hot Water	Red	Red	IHW
Steam	Black	White	STM
Tempered Water	Green	White	TW
Glycol Supply	Lt. Green	Black	GYLS
Glycol Return	Lt. Green	Black	GYLR
Process Water Supply	Green	White	PCWS
Process Water Return	Green	White	PCWR
Deionized Water	White	Black	DI
Distilled Water	White	Black	DW
Purified Water	White	Black	PW
Reverse Osmosis	White	Black	RO
High Vacuum	Yellow	Black	HVAC
Low Vacuum	Yellow	Black	LVAC
Vacuum	Yellow	Black	VAC
Gas	Dk. Blue	White	G
Natural Gas	Dk. Blue	White	NG

Acetylene	Violet	White	C2H2
Butane	Lt. Blue	Black	BUT
Isobutene	Silver	Black	ISO
Methane	Lt. Blue	Black	CH4
Propane	Pink	Black	PRO

Gas Indexing	Index Color	Letter Color	Symbol
Ammonia	Lt. Green	Black	NH3
Argon	Violet	White	Ar
Carbon Monoxide	Silver	Black	CO
Carbon Dioxide	Pink	Black	CO2
Helium	Black	White	He
Hydrogen	Pink	Black	H2
Hydrogen Sulphite	Black	White	H2S
Nitrogen	Brown	White	N2
Nitrogen, Dewar	Brown	White	N2d
Nitrous Oxide	Lt.Green	Black	N2O
Oxygen	Lt. Green	Black	O2
Phosphorus	Tan	Black	P
Special Gas	Lt. Blue	Black	SG
Sulphur Dioxide	Tan	Black	SO2

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.

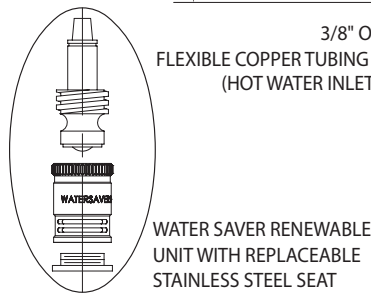
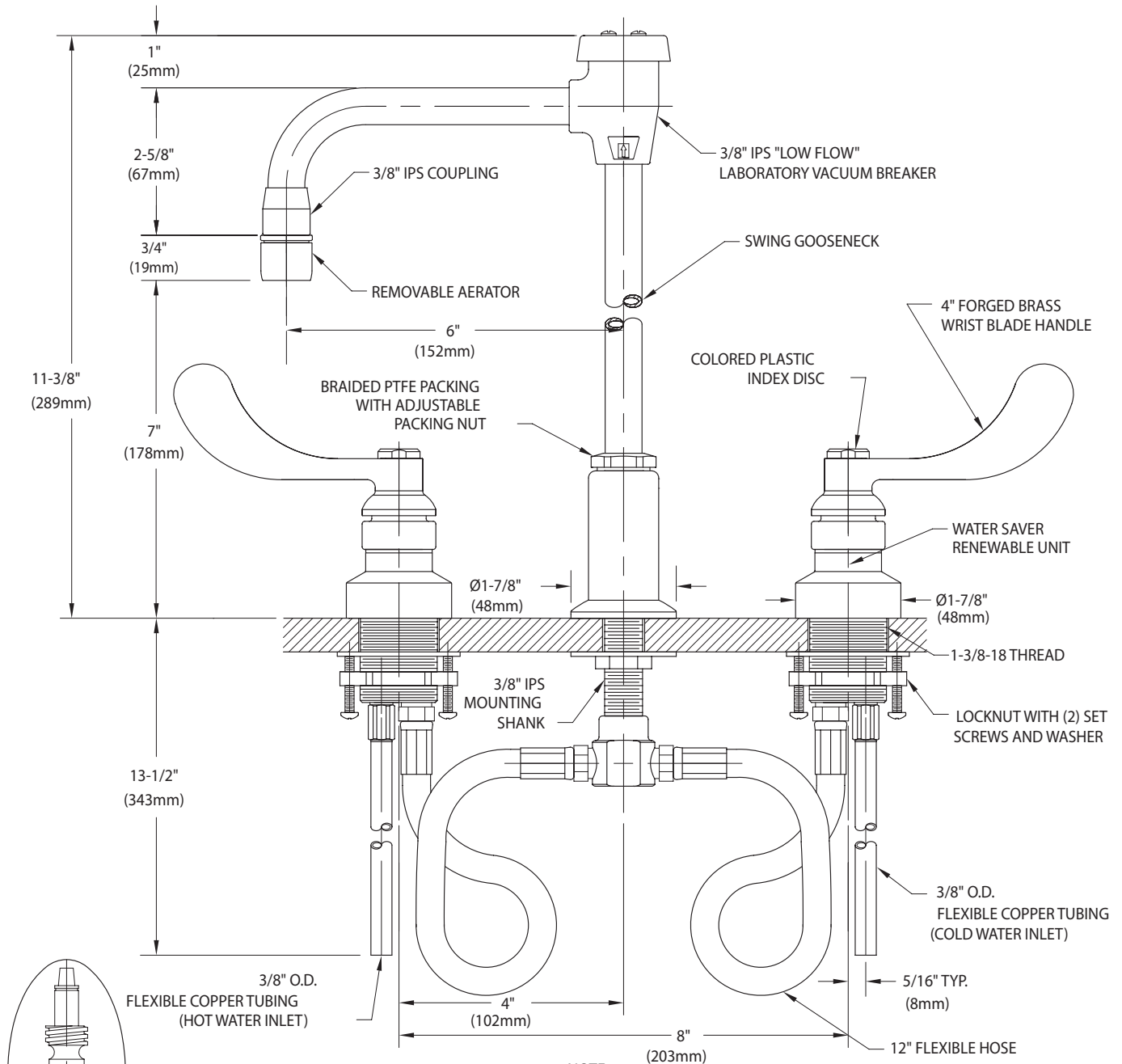
3.2 REPAIRING, CLEANING, AND PROTECTION

- 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



- ~~○ L2221VB Laboratory Mixing Faucet, Deck Mounted, 6" Rigid Vacuum Breaker Gooseneck, Aerator, Wrist Blade Handles~~
- ~~○ L2222VB Same as Above Except with 6" Swing Vacuum Breaker Gooseneck~~
- L2224VB Same as Above Except with 6" Rigid/Swing Vacuum Breaker Gooseneck



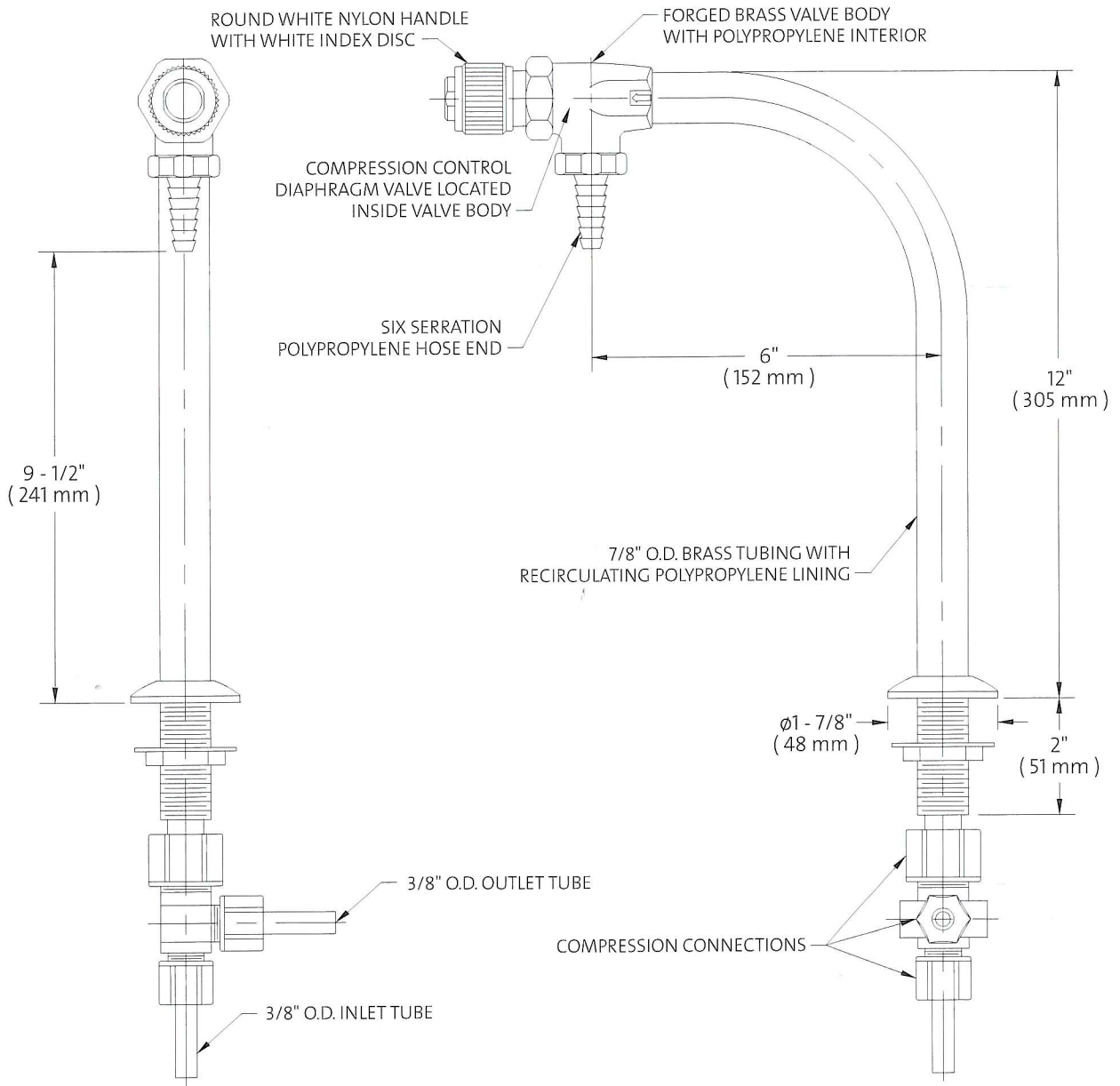
- NOTE:**
1. FIXTURE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ASME A112.18.1M AND CSA B125.1.
 2. VALVES AND GOOSENECK FITTING ARE FULLY ASSEMBLED AND FACTORY TESTED PRIOR TO SHIPMENT.
 3. VACUUM BREAKER IS CERTIFIED TO COMPLY WITH ASSE 1001.
 4. FIXTURE HAS A POLISHED CHROME PLATED FINISH.

Measurements may vary ± 1/4".



○ **L7837** Recirculating Pure Water Faucet, Polypropylene-Lined, Deck Mounted, Manual Control

○ ~~L7837PVDF~~ Same as Above Except with PVDF Interior Lining



NOTES:

1. FIXTURE HAS FULLY RECIRCULATING CONFIGURATION. IT IS DESIGNED TO BE USED IN PARALLEL OR DUAL LOOP RECIRCULATING PURE WATER SYSTEMS.
2. MAXIMUM WORKING PRESSURE IS 100 PSI.
3. ALL COMPONENTS IN CONTACT WITH PURE WATER ARE INERT POLYPROPYLENE OR PVDF, AS SPECIFIED.
4. MAXIMUM COUNTER THICKNESS IS 1-1/4".
5. PROVIDE Ø1 HOLE FOR MOUNTING.

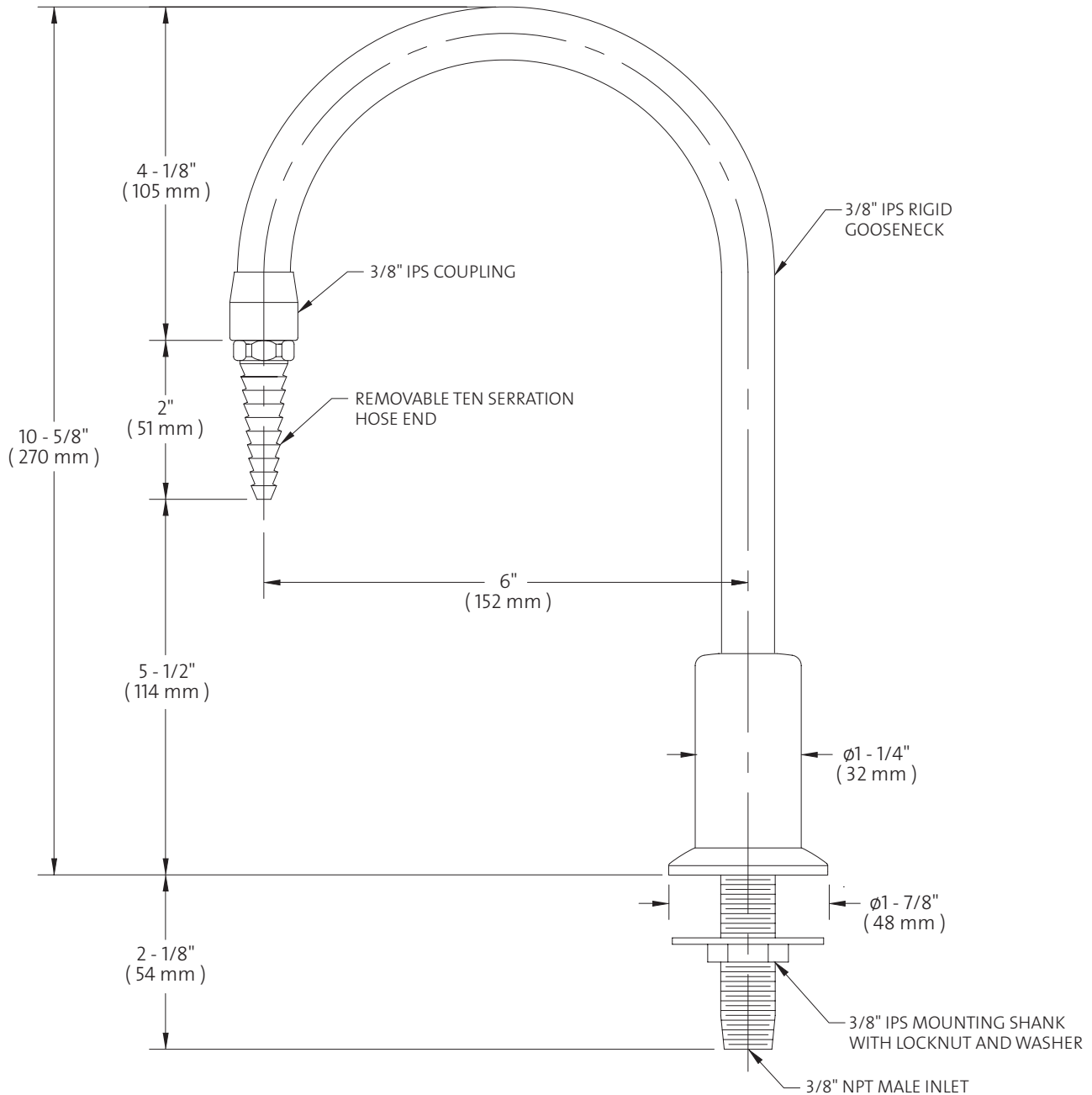
Measurements may vary ± 1/4".



~~○ L081WSA~~ Gooseneck Outlet Fitting, Deck Mounted, 6" Rigid Gooseneck

~~○ L082WSA~~ Same as Above Except with Swing Gooseneck

○ L084WSA Same as Above Except with Rigid/Swing Gooseneck



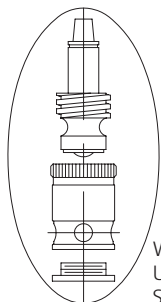
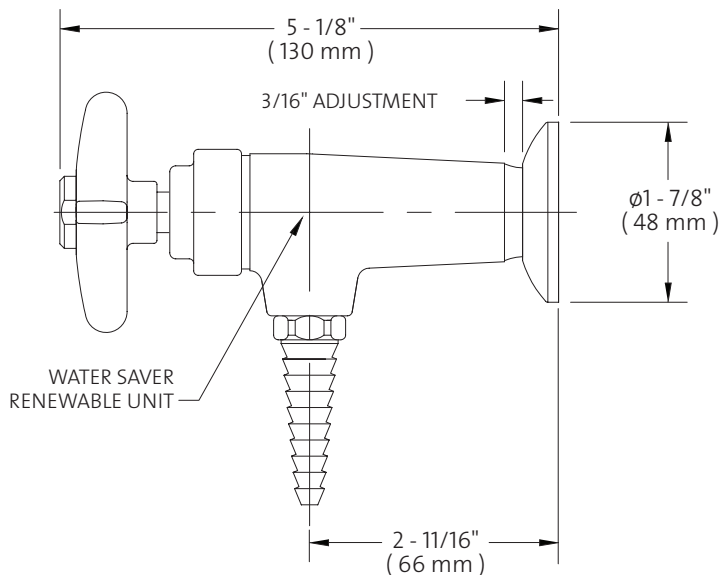
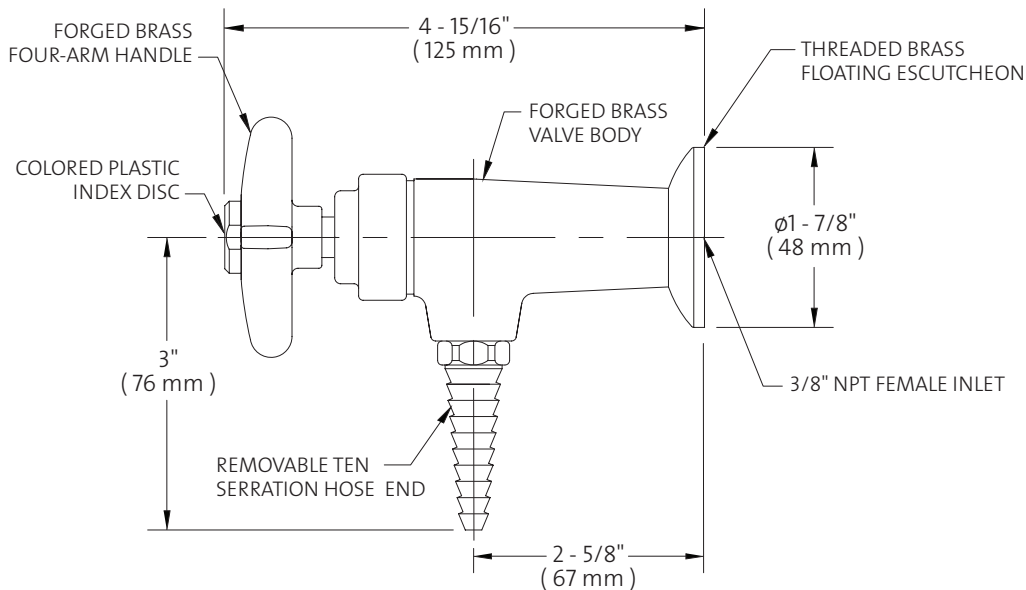
NOTES:

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

Measurements may vary ± 1/4".

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- ~~○ L5100FT-325 Laboratory Water Valve Assembly, Wall Mounted, Floating Escutcheon~~
- L5100FT-110-325 Same as Above Except with L110 Vacuum Breaker



WATER SAVER RENEWABLE UNIT WITH REPLACEABLE STAINLESS STEEL SEAT



NOTES:

1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ASME A112.18.1M AND CSA B125.1.
2. VALVE HAS FEMALE INLET FOR CONNECTION TO SUPPLY. FLOATING ESCUTCHEON IS THREADED TO WALL TO CONCEAL ANY GAP BETWEEN VALVE AND WALL.

Measurements may vary ± 1/4".

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(SF-7) DECK MOUNTED GAS VALVE

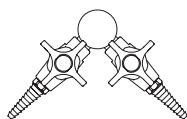


Needle Valves

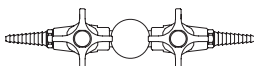
L2880-131WSA Needle Valve Assembly, Deck Mounted Single



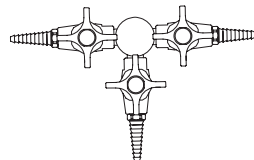
L2880-131WSA
Single



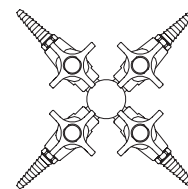
L2880-132AWSA
90° Double



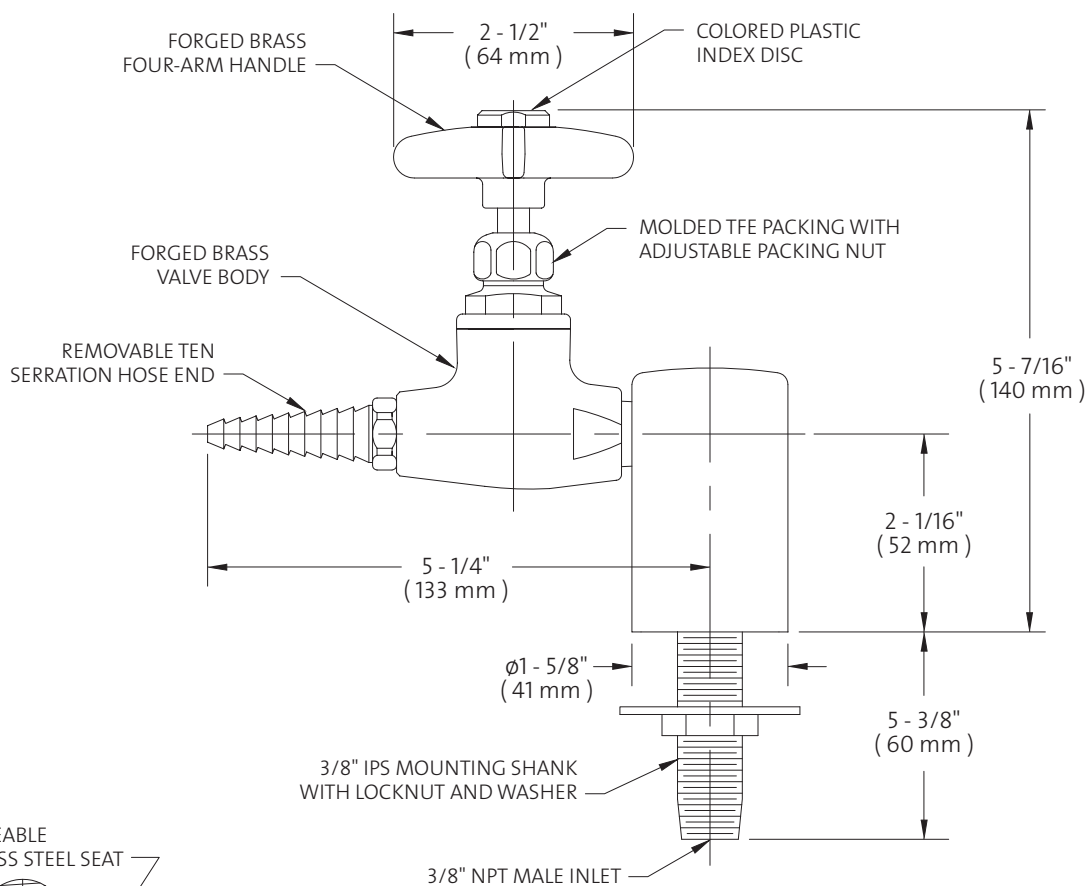
L2880-132SWSA
180° Double



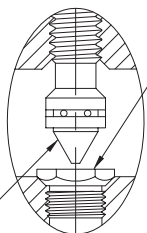
L2880-133WSA
3-Way



L2880-134WSA
4-Way



REPLACEABLE STAINLESS STEEL SEAT



REPLACEABLE STAINLESS STEEL FLOATING NEEDLE



NOTES:

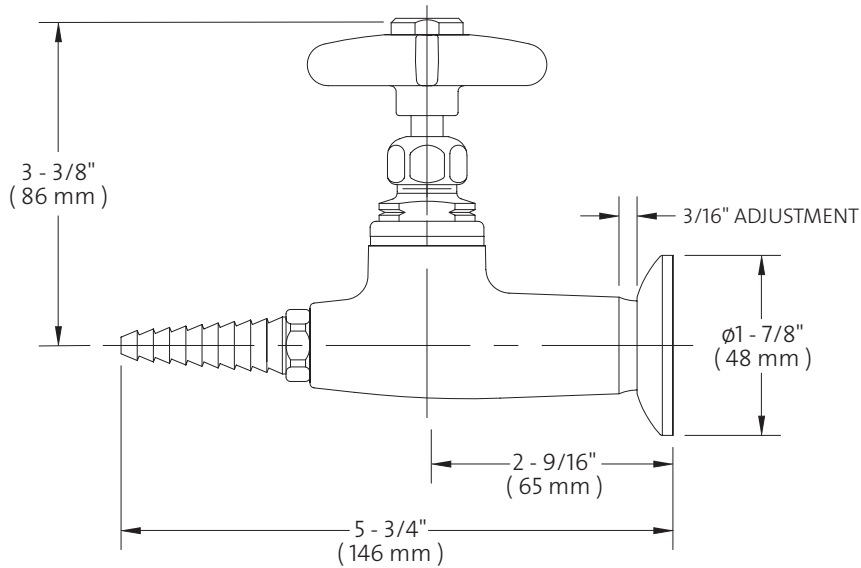
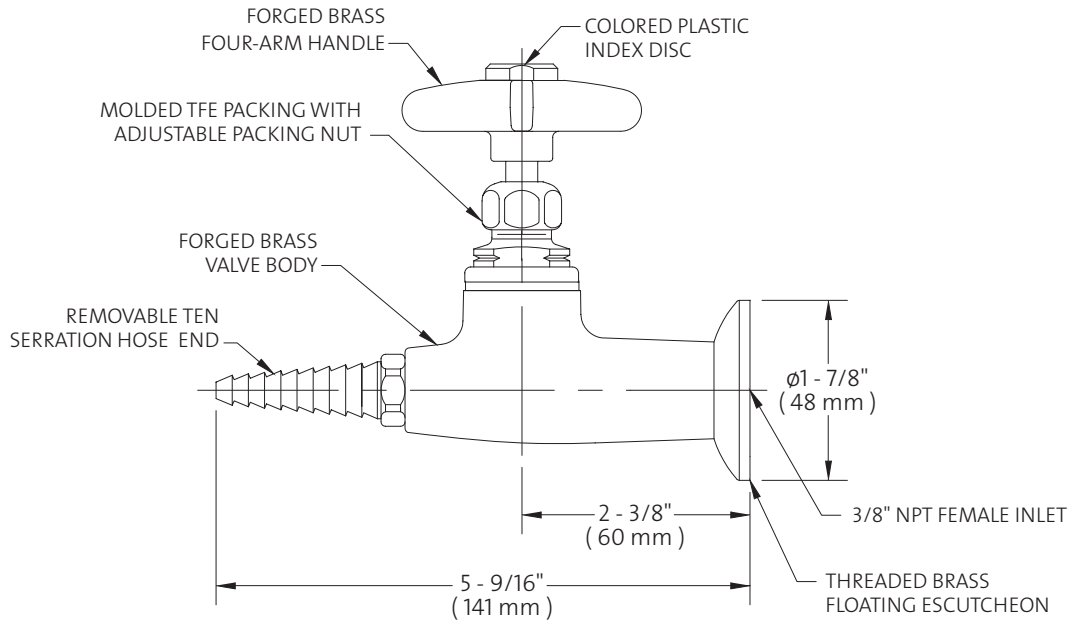
1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ANSI 21.12 AND CGA 9.1.
2. FIXTURE IS FULLY ASSEMBLED AND FACTORY TESTED AT 225 PSI NITROGEN PRESSURE. MAXIMUM WORKING PRESSURE IS 150 PSI.
3. SPECIFY IF CLEANING FOR OXYGEN AND HIGH PURITY GASES IS REQUIRED.

Measurements may vary ± 1/4".

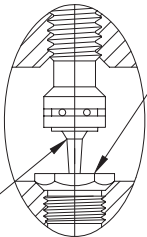
© 2008 / WaterSaver Faucet Co.



L4870FT-325 Fine Control Needle Valve Assembly, Wall Mounted, Floating Escutcheon



REPLACEABLE STAINLESS STEEL SEAT



REPLACEABLE FINE METERING STAINLESS STEEL FLOATING NEEDLE

NOTES:

1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ANSI 21.12 AND CGA 9.1.
2. VALVE HAS FEMALE INLET FOR CONNECTION TO SUPPLY. FLOATING ESCUTCHEON IS THREADED TO WALL TO CONCEAL ANY GAP BETWEEN VALVE AND WALL.
3. FIXTURE IS FULLY ASSEMBLED AND FACTORY TESTED AT 375 PSI NITROGEN PRESSURE. MAXIMUM WORKING PRESSURE IS 250 PSI.
4. VALVE IS CLEANED, DEGREASED AND PACKED FOR HIGH PURITY GAS SERVICE.



Measurements may vary ± 1/4".

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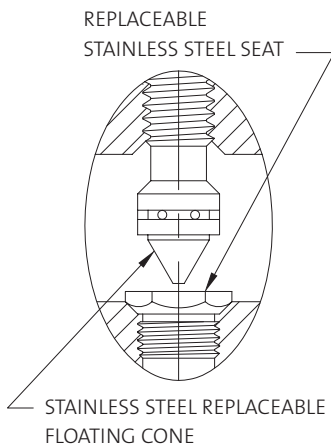
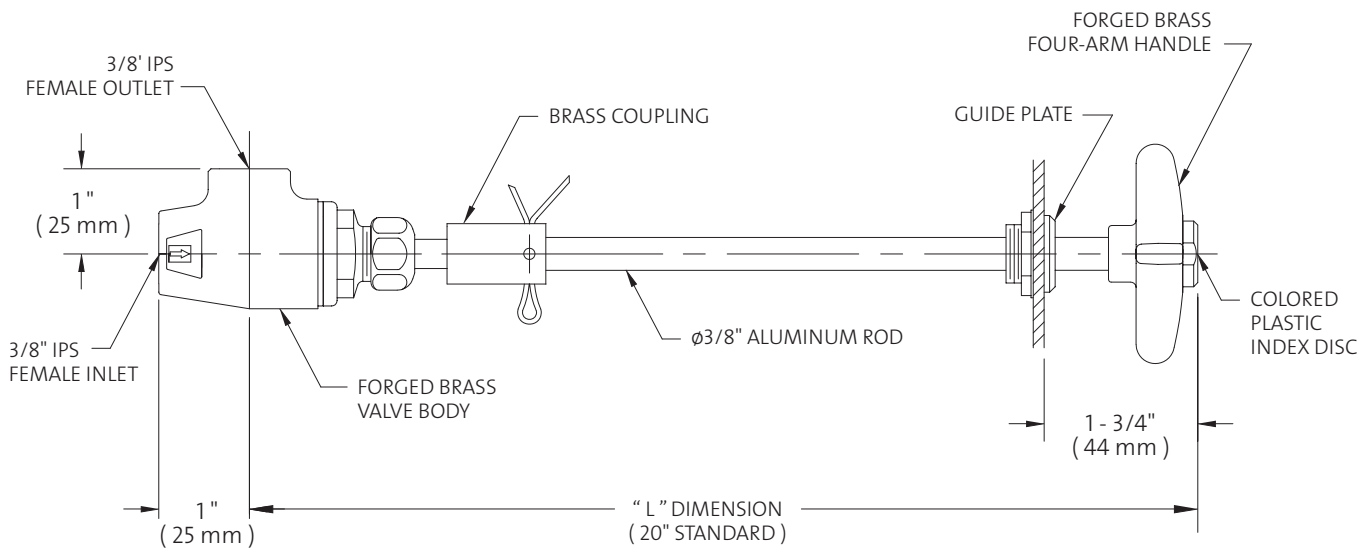
(SF-12) FUME HOOD REMOTE CONTROL COLD WATER VALVE
 (SF-14) FUME HOOD REMOTE CONTROL GAS VALVE



WaterSaver

Remote Control Fittings

○ **L3185N** Remote Control Needle Valve, Angle Pattern with Guide Plate, Rod and Handle



NOTES:

1. VALVE IS FACTORY ASSEMBLED AND TESTED AT 225 PSI. MAXIMUM WORKING PRESSURE IS 150 PSI.
2. REMOTE CONTROL VALVE IS FURNISHED COMPLETE WITH GUIDE PLATE, ROD AND HANDLE WHEN ORDERING, SPECIFY TYPE OF GUIDE PLATE DESIRED, "L" DIMENSION AND SERVICE.

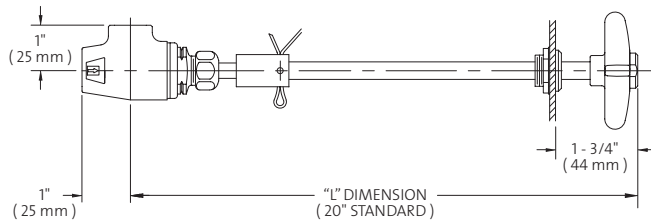
Measurements may vary $\pm 1/4"$.

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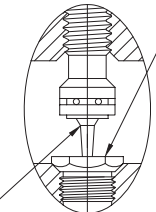
○ L3185 REMOTE CONTROL VALVES

FINE CONTROL NEEDLE VALVE CONSTRUCTION

- **L3185FCN** Remote Control Fine Control Needle Valve, Rod-Type, Angle Pattern



REPLACEABLE STAINLESS STEEL SEAT



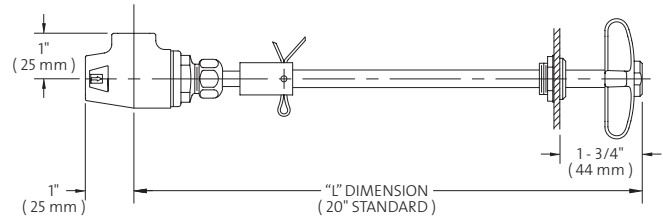
RENEWABLE FINE METERING STAINLESS STEEL FLOATING CONE

NOTES:

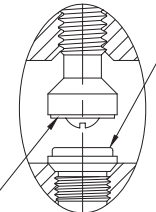
1. FIXTURE IS CLEANED, DEGREASED AND PACKED FOR PURE GAS SERVICE.
2. VALVE IS FACTORY ASSEMBLED AND TESTED AT 375 PSI NITROGEN. MAXIMUM WORKING PRESSURE IS 250 PSI.

STEAM VALVE CONSTRUCTION

- **L3185S** Remote Control Steam Valve, Rod-Type, Angle Pattern



REPLACEABLE STAINLESS STEEL SEAT



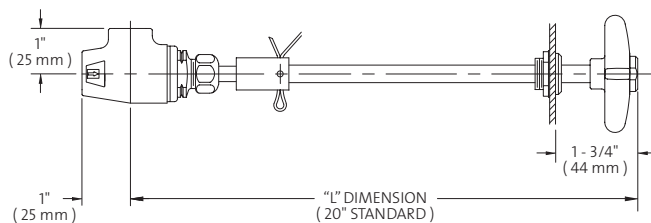
RENEWABLE GLASS & CARBON FILLED TEFLON VALVE DISC

NOTE:

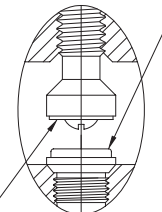
1. VALVE IS FACTORY ASSEMBLED AND TESTED AT 100 PSI. MAXIMUM WORKING PRESSURE IS 20 PSI STEAM.

WATER VALVE CONSTRUCTION

- **L3185W** Remote Control Water Valve, Rod-Type, Angle Pattern



REPLACEABLE STAINLESS STEEL SEAT



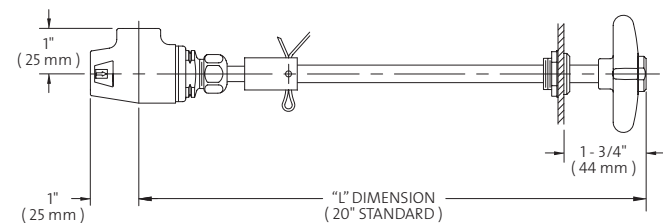
RENEWABLE NEOPRENE VALVE DISC

NOTES:

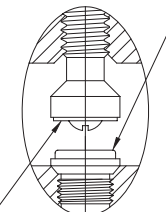
1. VALVE IS FACTORY ASSEMBLED AND TESTED AT 80 PSI. MAXIMUM WORKING PRESSURE IS 80 PSI.
2. CSA CERTIFIED UNDER CAN/CSA B125.M89. COMPLIES WITH ANSI/ASME A112.18.1M.

TIN-LINED WATER VALVE CONSTRUCTION

- **L3185WTL** Remote Control Pure Water Valve, Rod-Type, Angle Pattern



REPLACEABLE STAINLESS STEEL SEAT



RENEWABLE NEOPRENE VALVE DISC

NOTES:

1. VALVE IS FACTORY ASSEMBLED AND TESTED AT 80 PSI. MAXIMUM WORKING PRESSURE IS 80 PSI.
2. VALVE HAS INTERIOR LINING OF PURE TIN.

Measurements may vary $\pm 1/4"$.

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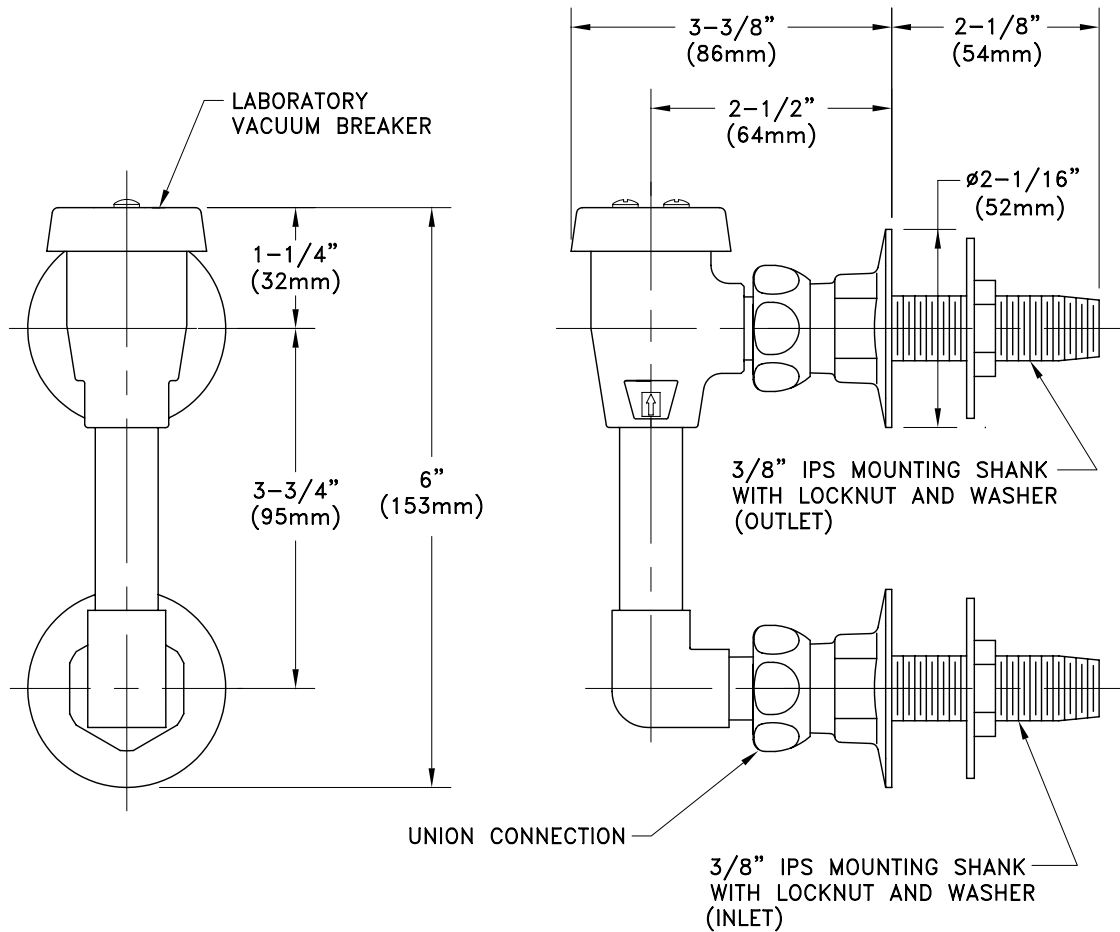
(SF-13) Atmospheric Vacuum Breaker, Panel Mounted

WaterSaver Faucet Co.
Innovative Products for Research

701 West Erie Street Phone 312 666 5500
Chicago, Illinois 60610 Fax 312 666 8597

L112WSA

PANEL MOUNTED ATMOSPHERIC VACUUM BREAKER WITH 3/8" IPS MOUNTING SHANKS



MEASUREMENTS MAY VARY ±1/4".



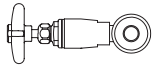
NOTE:

ASSE CERTIFIED UNDER STANDARD 1001.
CSA CERTIFIED UNDER CAN/CSA B64.

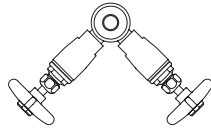
Drawing Number: _____

Revision Number: 012298-KJS _____

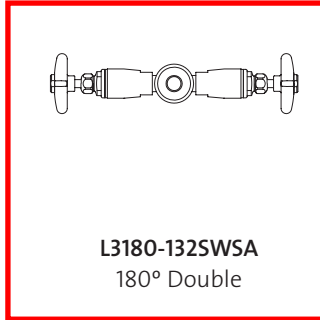
L3180-131WSA Needle Valve Assembly, Overhead Mounted Single



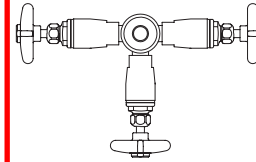
L3180-131WSA
Single



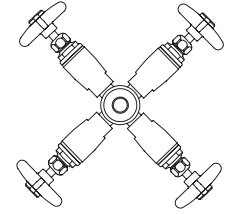
L3180-132AWSA
90° Double



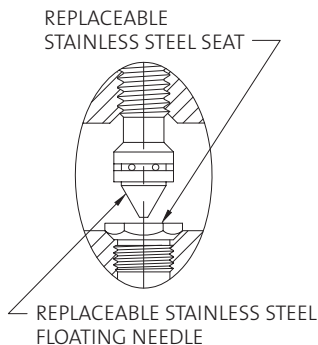
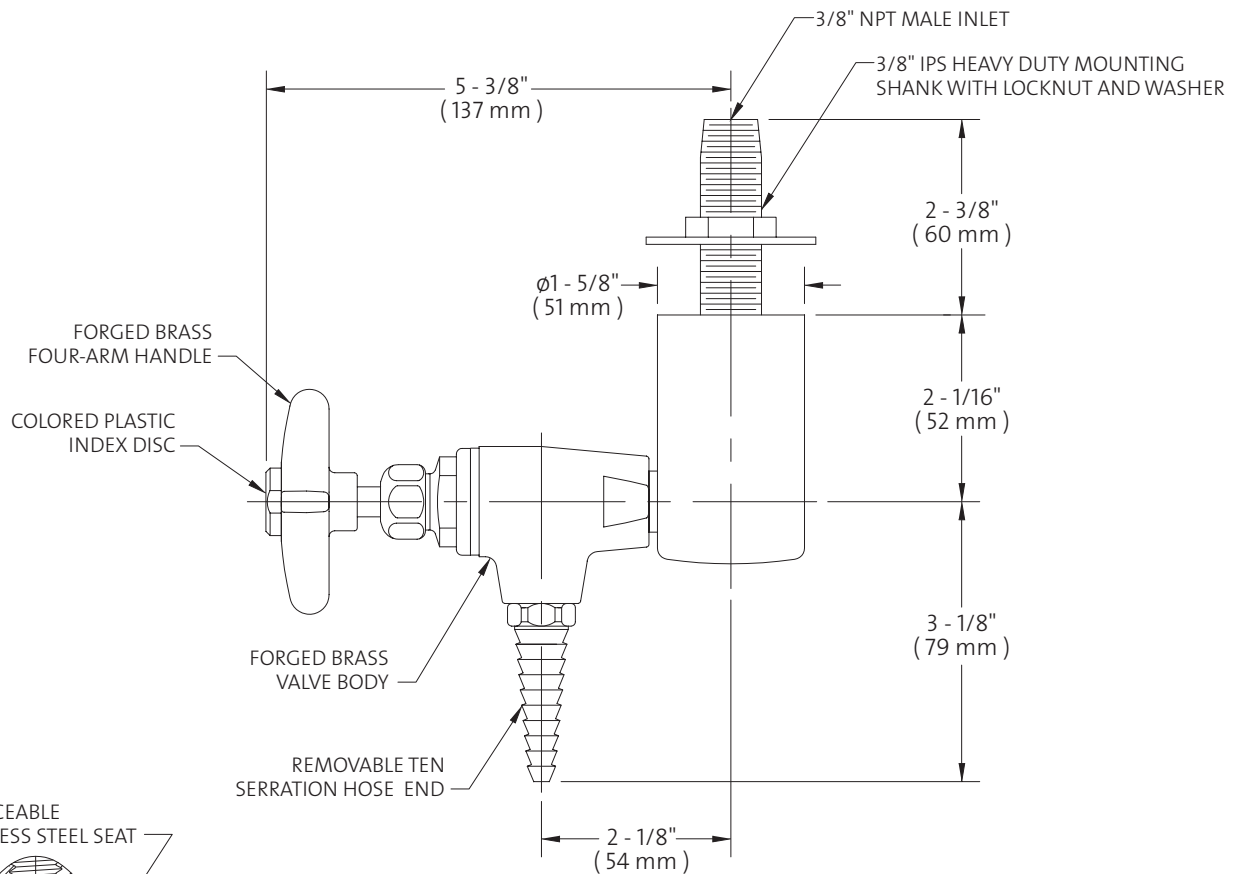
L3180-132SWSA
180° Double



L3180-133WSA
3-Way



L3180-134WSA
4-Way



NOTES:

1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ANSI 21.12 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.

Measurements may vary ± 1/4".

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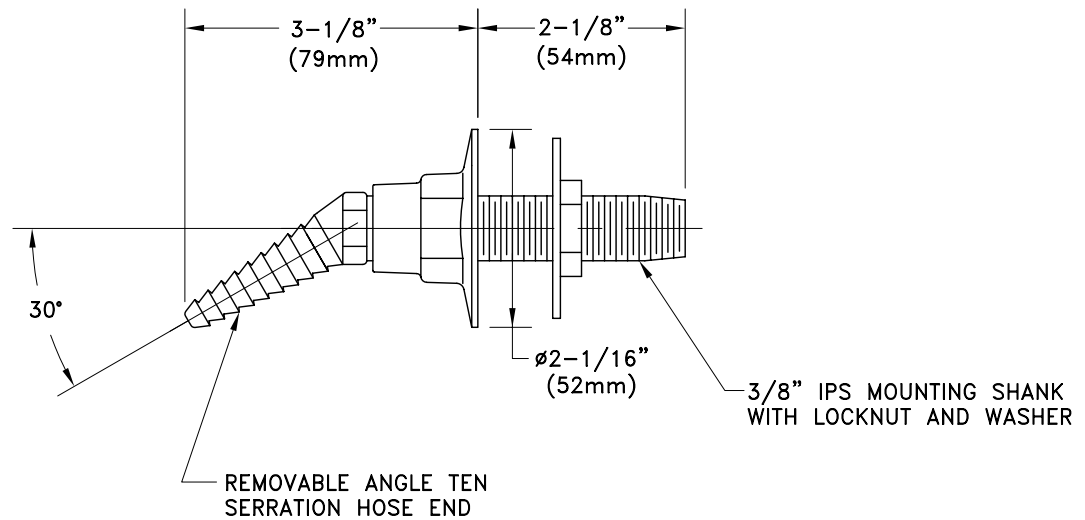
(SF-20) FUME HOOD GAS OUTLET

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L122WSA

PANEL MOUNTED FLANGE WITH ANGLE SERRATED HOSE END AND MOUNTING SHANK



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. Glass drying racks.
4. Laboratory adjustable wall shelving.
5. Service chases.
6. Overhead Service Carrier.
7. Miscellaneous Unistrut framing.
8. Gas cylinder restraint straps and racks.
9. Keyboard tray.
10. CPU holder.
11. Cable Management.
12. Coat Rack, Shelf and Hooks.
13. Clean Room Gowning Bench.
14. Clean Room Table.
15. Wet Process Bench – Acid.
16. Wet Process Bench – Solvent.
17. Task Light.
18. Fume Extractor.

- 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. Laboratory adjustable wall shelving.
 - 3. Glass drying racks.
 - 4. Service drops.
 - 5. Overhead service carriers.
 - 6. Miscellaneous Unistrut framing.
 - 7. Gas cylinder restraint straps and racks.
 - 8. Keyboard tray.
 - 9. CPU holder.
 - 10. Cable Management.
- 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. Benctop 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 1/2" 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: 2×10^6
 5. Density: 2.03 g/cc
 6. Hardness (Rockwell M): 100.
 7. Water Absorption (24 hours): 0.02 % (maximum).
 8. Heat Distortion Point: 350 deg F (177 deg C).
 9. Thermal-shock Resistance: Highly restraint.
- 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:

	<u>CHEMICAL - ACIDS</u>	<u>RATING</u>
1.	Hydrochloric Acid, 20%	No Effect
2.	Hydrochloric Acid, 37%	No Effect
3.	Nitric Acid, 20%	Excellent
4.	Nitric Acid, 70%	Good
5.	Sulfuric Acid, 30%	No Effect
6.	Sulfuric Acid, 77%	No Effect
7.	Sulfuric Acid, 96%	Poor
8.	Phosphoric Acid, 85%	No Effect
9.	Perchloric Acid, 60%	No Effect
10.	Aqua Regia	No Effect
11.	Chromic Acid, 60%	Good
12.	Acetic Acid, 98%	No Effect
13.	Formic Acid, 90%	No Effect
14.	Boric Acid, Sat.	No Effect
15.	Citric Acid, Sat.	No Effect
16.	Oxalic Acid, Sat.	No Effect
17.	Hydrobromic Acid, 48%	No Effect
18.	Hydroflouric Acid, 48%	Good
19.	Vinegar	No Effect
	<u>CHEMICAL - BASES</u>	
20.	Ammonium Hydroxide, 28%	No Effect
21.	Sodium Hydroxide, 10%	No Effect
22.	Sodium Hydroxide, 40%	No Effect
23.	Sodium Hydroxide, Flake	No Effect
24.	Potassium Hydroxide, 10%	No Effect
	<u>CHEMICAL - SALTS</u>	
25.	Zinc Chloride, Sat.	No Effect
26.	Calcium Hypochlorite, Sat.	No Effect
27.	Clorox Bleach	No Effect
28.	Silver Nitrate, 10%	No Effect
29.	Sodium Sulfide, Sat.	No Effect

30.	Sodium Chloride, Sat.	No Effect
31.	Iodine, Tincture	No Effect
32.	Hydrogen Peroxide	No Effect
33.	Phenol, 80%	No Effect
34.	Cresol	No Effect
35.	Formaldehyde, 40%	No Effect
36.	Mineral Oil, 100%	No Effect
37.	Glycerin, 100%	No Effect

CHEMICAL - SOLVENTS

38.	Methyl Alcohol, 100%	No Effect
39.	Ethyl Alcohol, 100%	No Effect
40.	Buty Alcohol, 100%	No Effect
41.	Naphtha, 100%	No Effect
42.	Turpentine, 100%	No Effect
43.	Kerosine, 100%	No Effect
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.	Trichlorethylene, 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 Carmen, 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 (P-#) PHENOLIC RESIN:

A. Phenolic Resin tops are 1" thick, composed of a cellulose fiber reinforced with resins to form a core with a highly crosslinked polyurethane copolymer surface. The top shall have a black core and a matte surface finish.

B. Physical Properties:

<u>PROPERTY</u>	<u>ASTM</u>	<u>PSI</u>	<u>MKPa</u>	<u>PSI</u>	<u>MKPa</u>
1. Compressive Strength:	D685	M.D. 31,000	193	C.D. 25,000	172
2. Flexural Strength:	D790	M.D. 23,000	159	C.D. 15,000	103
3. Tensile Strength:	D638	M.D. 22,000	152	C.D. 16,000	110
4. Rockwell Hardness:	D785	M Scale 95-115			
5. Water Absorption:	D570	1" (25.4 mm)	0.35%		
6. Specific Gravity:	Approx weight	1.40 - 1.52			

C. Chemical Resistance: The following according to the testing methods established by the American National Standards Institute/ National Electrical Manufacturers Association (ANSI/NEMA) LD3-1995:

<u>TEST METHOD TYPICAL</u>	<u>TEST RESULT</u>
3.1 - APPEARANCE	NO DEFECTS, COMPLIES
3.3 - LIGHT RESISTANCE	SLIGHT EFFECT
3.4 - CLEANABILITY (cycles)	10
STAIN RESISTANCE	
REAGENTS 1-10	NO EFFECT
REAGENTS 11-15	NO EFFECT
3.5 BOILING WATER RESISTANCE	NO EFFECT
3.6 HIGH TEMPERATURE RESISTANCE	NO EFFECT
3.8 BALL IMPACT RESISTANCE	>78" (1981 mm)
3.13 WEAR RESISTANT	(cycles) >700

D. Joints: Joints are to be strong level, strong and easy to clean. Do not locate joints at sinks or above equipment and knee openings. Provide tight joints with spline and sealant appropriate to clinical laboratories.

E. Edges: Provide radius edge with drip groove that is free from saw marks, jagged edges and polished.

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

1. Duratop, Resistop
2. Trespa, Top Lab
3. Colors: Color to be selected from manufacturers' standard by laboratory architect.

2.6 (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, 1/2" minimum.
 2. Plastic Sinks: Rugged, molded, seamless, polypropylene with integral threaded tailpiece outlet, integral top flange, and stainless steel mounting ring.
- 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.

2.7 (PB-#) GLASS DRYING RACKS

- A. Provide and install Glass Drying Racks as described here and as indicated on drawings. Unless otherwise indicated on drawings the size shall be:

30" W x 24" H.
- B. Glass drying rack assemblies shall include the following components:
 1. Front Panel: 1" thick epoxy resin or 1" stainless steel with No. 4 finish.

2. Glassware Pegs: Replaceable stainless steel or solid white polypropylene with glassware protector bases.
3. Drip Trough: Stainless steel drip trough with PVC drainage hose.
4. Finished Back Panels: Matching finish and material at front panel.
5. Provide all fittings, fasteners, bracing, brackets, etc., for installation illustrated on drawings. Coordinate all reinforcing requirements for wall, frame or service drop mounting.

2.8 (ALS#-#) LABORATORY ADJUSTABLE WALL SHELVING

- A. Fabricate and install adjustable wall shelving as described here and as indicated on drawings. The maximum length of shelving shall be 36". Shelves shall be fabricated and installed to typical common lengths to facilitate interchangeability by the Owner from lab to lab.
- B. Provide the following types of adjustable shelving, in locations as indicated on drawings.
 1. (ALS#-#) Adjustable Laboratory Shelving: Shelves supported by 6" high end closure shelf brackets bolted to wall mounted vertical Unistrut P3300 channels.
 - a. Shelf End Brackets:
 - 1) 6" high end bracket with angled edge and flange with bolt holes.
- C. Finish: Standards and shelf brackets to be steel with epoxy powder-coated finish. Color as identified on the finish schedule on the laboratory equipment drawings.
- D. Shelves:
 1. Phenolic Resin Shelving: Shelves are 1" thick phenolic resin meeting the requirements above for benchtops of the same material. Provide a polished radiused edge. A front edge seismic lip of 1/4" plexiglass when indicated on the lab equipment drawings.
 2. Steel Shelving: Shelves are 16 gauge steel, formed down 1" then returned back and up into a channel formation. Shelves of 12" depth and greater are further reinforced with a 20 gauge hat channel welded to the underside. Steel shelves are available with a steel front edge seismic lip when specified by model number or indicated on the drawings.
 3. Color, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed shelf surfaces, as listed on the finish schedule on the laboratory equipment drawings.
- E. Preparation: Examine areas, with Installer present, for compliance with requirements for installation tolerances, locations of reinforcement, and other conditions affecting performance of adjustable shelving installation.
- F. Installation: Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

2.9 (SC-#) SERVICE CHASES

- A. Fabrication: Fabricate and install painted sheet metal service chases in configurations as detailed on drawings consisting of removable and fixed panels.
 - 1. Removable and fixed service chase panels are to fit together flush showing a minimum joint where they join.
 - 2. Removable access panels are to have concealed-to-view pins, catches, clips, strikes, etc., that allow removal of panel with an upward motion.
 - 3. Fabricate and install service chase 1" lower than the bottom of light fixture line or ceiling if applicable to facilitate removal of access panel in an upward motion.
 - 4. All panels are to interlock with benchtop backsplashes so as the face of the backsplash and service chase panel are flush, unless otherwise detailed on laboratory equipment drawings.
 - 5. Fixed service chase panels shall be fastened to the wall or support unistrut -- whichever is applicable. Fixed panels shall be fitted with internal horizontal unistrut spaced vertically at 24 in on center to facilitate the internal fastening and support of mechanical piping and ductwork.
 - 6. Welds shall be continuous, ground smooth, and finished to match adjacent surfaces.
- B. 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.
- C. Installation: Install service chases plumb, level and true.

2.10 (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.

2.11 (CR-#) GAS CYLINDER RESTRAINT RACKS AND STRAPS

- A. Fabrication: Fabricate and install gas cylinder storage racks in locations as indicated and detailed on laboratory equipment drawings. Fabricate and install with Unistrut components complete with all nuts, bolts, fittings, and accessories indicated and required.
- B. Finish: Racks shall be shop prime painted with corrosion resisting primer and receive shop applied finish coatings. Provide color as listed in the Laboratory Component Finish Schedule.
- C. Manufacturer: The design standard for cylinder restraint straps and buckles are:
 1. Straps - McMaster Carr #9499 R11.
 2. Quick Disconnect Buckles - McMaster Carr #9499 R14.
- D. Installation: Install cylinder restraint racks plumb, level and square to walls unless otherwise indicated on drawings. Brace rack assemblies to walls to prevent sway.

2.12 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.

2.13 (CA-1) Keyboard Tray

- A. Provide under-bench mounted keyboard trays as indicated on laboratory equipment plans at computer stations.
- B. Manufacturer: Human Scale, 5G Mechanism Standard Platform with 8" Swivel Mouse and gel support as the design standard.
1. Adjustable up, down, sideways and tilt.
 2. Built in mouse pad, reversible right or left hand.
 3. Finished in Black.

2.14 (CA-2) CPU HOLDER

- A. Provide under-bench mounted CPU holder as indicated on laboratory equipment plans at computer stations.
- B. Human Scale model CPU 600 as the design standard.
1. Provide protection from dirt, dust, bumps and accidental spills.
 2. CPU holder offers 360-degree swivel and horizontal glides.
 3. Mounted on a track under the work surface
 4. Finished in Black.

2.15 (CA-4) J-MOLD CABLE MANAGEMENT

- A. Mockett "J" molding model #WM2A.
- B. Finished in black.
- C. Provide J-molding along the full length of the rear support rail of all tables.

2.16 (LC-1) COAT RACK, SHELF AND HOOKS

- A. Manufacturer: The design standard for the lab coat racks is Glaro Modular Racks, solid rustproof aluminum construction, 36" wide Glaro for wall mounted shelf and coat rack.
- B. Finish: Racks shall be manufacturer's standard satin aluminum finish.
- C. Installation: Install coat racks plumb, level and square to walls unless otherwise indicated on drawings. Brace rack assemblies to walls to prevent sway. Fabricate and install with all components for a complete assembly.
- D. Accessories: Hangers.

2.2 (SSTL-1) GOWNING BENCH

- A. The design standard for this project is TerraUniversal.
 - 1. 304 stainless steel.
 - 2. Perforated top.
 - 3. Size: 4-Foot Long.
 - 4. Model: #1560-31-2.

2.3 (SSTL-2) CLEAN ROOM TABLES

- A. The design standard for this project is TerraUniversal.
 - 1. Heavy duty, 800 lbs.
 - 2. 304 stainless steel.
 - 3. Style "C" base.
 - 4. Perforated top.
 - 5. Size: As per drawings.
 - 6. Model: #9604-##.

2.4 (WPC-1) WET PROCESSING STATION – ACID.

- A. The design standard for this project is TerraUniversal.
 - 1. 6-foot hood.
 - 2. Polypropylene.
 - 3. Acid storage below bench.
 - 4. Pre-wired.
 - 5. Pre-plumbed.
 - 6. Services as per drawings.
 - 7. Baths, Rinsers and Tank Accessories as per attached cut sheet.
- B.

2.5 (WPC-2) WET PROCESSING STATION – SOLVENT.

- A. The design standard for this project is TerraUniversal.
 - 1. 6-foot hood.
 - 2. 304 stainless steel.
 - 3. Solvent storage below bench.
 - 4. Pre-wired.

5. Pre-plumbed.
6. Services as per drawings.
7. Baths, Rinsers and Tank Accessories as per attached cut sheet.

2.6 (TL-1) MAGNETIC TASK LIGHT

- A. The design standard for this project is the Reed fixture by Light Corp.
 1. 18", 6 LED's, 10 watts and 3500K.

2.13 (FED-#) FUME EXTRACTOR DEVICE

- A. Provide and install benchtop mounted fume extractors as specified herein and as indicated on the drawings.
- B. Secure benchtop extractors to benchtops and connect them to exhaust ductwork supplied by other trades. Provide complete assemblies with all necessary fasteners and parts. Provide all holes in overhead service carrier wing to facilitate mounting and connection to exhaust ductwork.
- C. The design standard for this project is the TURFU local fume extractor. The following list is to be used as the minimum design standards.
 1. 3" diameter PVC 3-Joint model.
 - a. Model T1500-75-PP.
 - b. Model T2000-75-PP.
 2. Accessories:
 - a. Ceiling Bracket: TIM-1500.
 - b. Hood: Dome.

PART 3 - EXECUTION

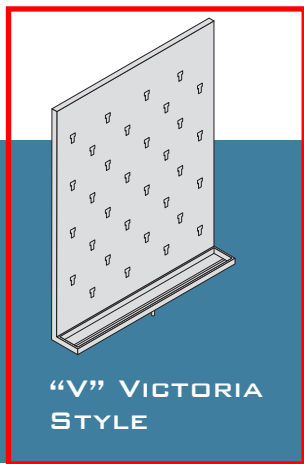
3.1 INSTALLATION AND CLEANING

- 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.

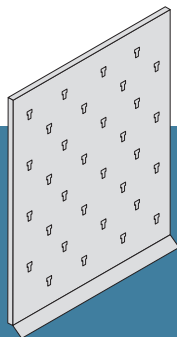
END OF SECTION

(PB-1) Peg Board Glass Drying Rack

MOD-RACK™ PEGBOARDS: VICTORIA AND BARON STYLE



**"V" VICTORIA
STYLE**



**"B" BARON
STYLE**

The Victoria or "V" pegboard is constructed of lightweight stainless steel, offered in a range of sizes and variety of mounting options. Along the bottom is a drip trough that funnels water away to a drain, allowing equipment to dry quickly and remain sanitized. Each "V" style pegboard includes an integral drip trough, wall bracket, standard 6" white pegs and 3 ft. of clear plastic drain hose.

The "B" Baron is also made of lightweight stainless steel. It is offered in three sizes and a variety of mounting options. A drip deflector at the bottom diverts water away from walls and directs it to a sink or drain. Each "B" style pegboard includes a wall bracket and standard 6" white pegs.

"V" VICTORIA STYLE PEGBOARDS



MODEL NO.	SIZE WxH	NO. OF PEGS	SHIPPING WT.
V1824	18" x 24"	15	13 lbs.
V2418	24" x 18"	16	13 lbs.
V2424	24" x 24"	20	16 lbs.
V2430	24" x 30"	32	23 lbs.
V2436	24" x 36"	40	25 lbs.
V3024	30" x 24"	25	23 lbs.
V3030	30" x 30"	50	24 lbs.
V3036	30" x 36"	40	23 lbs.
V3624	36" x 24"	30	25 lbs.
V3630	36" x 30"	60	23 lbs.
V3636	36" x 36"	66	25 lbs.
V4824	48" x 24"	40	24 lbs.
V4830	48" x 30"	48	28 lbs.
V4836	48" x 36"	88	31 lbs.

"B" BARON STYLE PEGBOARDS



MODEL NO.	SIZE WxH	NO. OF PEGS	SHIPPING WT.
B2430	24" x 30"	32	14 lbs.
B3030	30" x 30"	50	17 lbs.
B3630	36" x 30"	50	21 lbs.

(CR-1) Cylinder Restraint

Wall Mount



E



F

Wall mount holders attach to any wall; fasteners are not included. The base of **style H** must rest on the floor in addition to being secured to the wall.



G



H

Holds No. of Cylinders	Cylinder Dia. Range	Overall Size			Mounting Holes		Each
		Wd.	Ht.	Dp.	No.	Dia.	
Steel with Steel Chain—Zinc-Plated Finish							
E 1	7"-9"	10 1/2"	1 1/4"	3"	2	3/8"	2283T1• \$14.67
E 1	9"-16"	19 1/2"	1 1/4"	6"	2	3/8"	2283T3• 21.58
E 2	9 1/4"-12 7/8"	23"	3"	6"	3	5/8"	2283T7‡° 70.68
Steel with 1 1/2" Wide Polypropylene Strap—Light Gray							
F 1	4"-12"	8"	4 1/4"	2 1/4"	2	13/32"	2283T22 26.12
F 2	4"-12"	24"	4 1/4"	2 1/4"	4	13/32"	2283T72 52.96
F 3	4"-12"	36"	4 1/4"	2 1/4"	4	3/8"	2283T17 72.60
F 4	4"-12"	48"	4 1/4"	2 1/4"	8	3/8"	2283T18 99.64

• Made of 3/32" thick steel channel.

‡ Made of 3/16" thick steel channel. Color is green.

° One side holds a cylinder up to 9 1/4" dia.; the other side holds a cylinder up to 12 7/8" dia.

Holds No. of Cylinders	Cylinder Dia. Range	Overall Size			Mounting Holes		Each
		Wd.	Ht.	Dp.	No.	Dia.	
Type 304 Stainless Steel with 1 1/2" Wide Polypropylene Strap							
F 1	4"-12"	8"	4 1/4"	2 1/4"	2	13/32"	2283T61 \$57.70
F 2	4"-12"	24"	4 1/4"	2 1/4"	4	13/32"	2283T63 108.90
Polypropylene with 1 1/2" Wide Polypropylene Strap and Steel Chain—Red							
G 1	4"-14"	9"	4"	2"	2	5/16"	2283T11 24.49
G 2	4"-12"	24"	4 1/2"	2"	4	5/16"	2283T67 53.54
Polyethylene with 1" Wide Nylon Strap—Yellow							
H 2	3"-12 3/8"	28"	30"	14"	4	3/4"	2283T95 146.55

(CA-1) Keyboard Tray

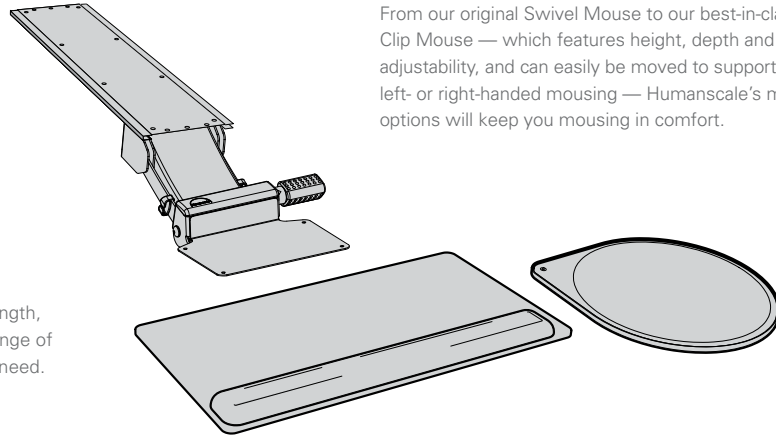
Keyboard Components

Mechanisms

Humanscale offers nine award-winning, negative-tilt mechanism options, from our original standard-bearer, the 2G, to our latest 5G, which combines easy dial-a-tilt and height adjustability with the strongest, most stable arm on the market. All of our mechanisms encourage low-risk typing postures and feature easy and intuitive adjustability.

Keyboard Platforms

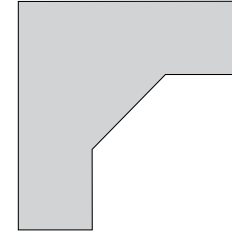
Made of 1/4" phenolic resin, which combines strength, durability and a slim profile, Humanscale's wide range of keyboard platform options will accommodate any need. Available with Technogel or foam palm supports.



Mouse Platforms

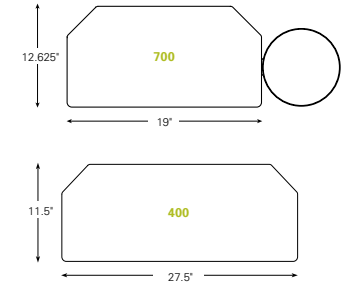
From our original Swivel Mouse to our best-in-class Clip Mouse — which features height, depth and lateral adjustability, and can easily be moved to support left- or right-handed mousing — Humanscale's mouse options will keep you mousing in comfort.

Diagonal Desk Configuration

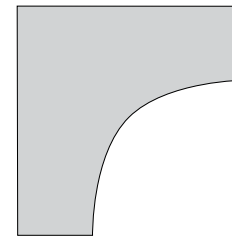


Recommended Platforms

- 700 Diagonal keyboard platform with Clip Mouse *shown*
- 400 Diagonal Big keyboard platform *shown*
- 900 Standard keyboard platform with Clip Mouse
- 950 Standard Compact keyboard platform with Clip Mouse

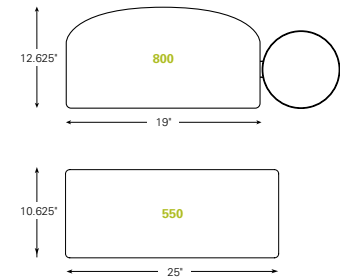


Radiused Desk Configuration



Recommended Platforms

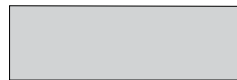
- 800 Radiused keyboard platform with Clip Mouse *shown*
- 550 Big Compact keyboard platform *shown*
- 900 Standard keyboard platform with Clip Mouse
- 950 Standard Compact keyboard platform with Clip Mouse



Desk Configuration Compatibility Guide

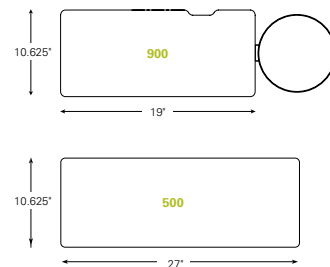
Humanscale Keyboard Systems offer mix-and-match components for a custom solution to virtually any desk situation. Here are a few recommended platform options for some of the most common desk configurations. Consult your Humanscale rep for the Keyboard System solution that's right for you.

Straight Desk Configuration

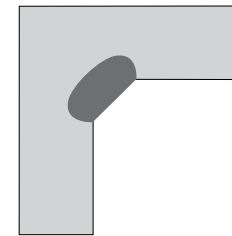


Recommended Platforms

- 900 Standard keyboard platform with Clip Mouse *shown*
- 500 Big keyboard platform *shown*
- 950 Standard Compact keyboard platform with Clip Mouse
- 550 Big Compact keyboard platform

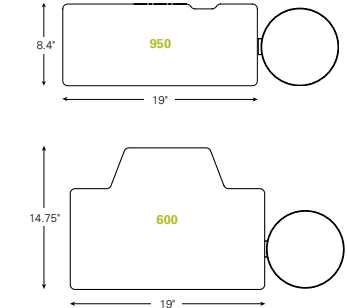


90-Degree Desk with DE200 Corner Sleeve Configuration



Recommended Platforms

- 950 Standard Compact keyboard platform with Clip Mouse *shown*
- 600 Extender keyboard platform with Clip Mouse *shown*
- 700 Diagonal keyboard platform with Clip Mouse
- 900 Standard keyboard platform with Clip Mouse



(CA-2) CPU Holder

CPU555

The CPU555 is the sturdiest CPU holder on the market. While its heavy-duty construction will easily accommodate oversized CPUs, it is equally at home protecting mini units from workplace hazards. A security option protects CPUs from theft or tampering.



CPU450

The CPU450 offers a unique storage solution for the variety of CPUs found in today's workplace. Its clever and flexible design accommodates horizontal and vertical CPUs of most any size, and it can either be direct- or track-mounted to horizontal or vertical surfaces.



CPU300

Offering all the protection and features of the heavy-duty CPU555, the value-priced CPU300 is perfect for most small and mid-sized CPUs.



CPU Dolly

This clever design automatically adjusts to CPUs of different sizes. And the optional Pull Handle makes moving hardware from one location to another a snap. The CPU Dolly is the perfect choice for a stand-alone CPU holder.



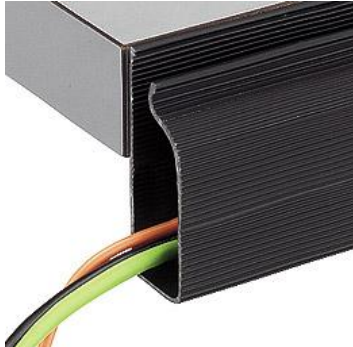
FEATURES AND SPECIFICATIONS

	CPU600	CPU555	CPU450	CPU300	CPU Dolly
FEATURES AND SPECIFICATIONS	<ul style="list-style-type: none"> Adjusts to fit CPUs 3.5" to 9" wide and 12" to 20" tall Designed to easily support CPUs weighing up to 30 lbs. Slides smoothly on nylon glides in 16" track Rotates a full 360° for complete access to cables and ports Fast and simple tool-free installation via Quick Lock technology 	<ul style="list-style-type: none"> Adjusts to fit CPUs 3" to 9.5" wide and 12" to 22" tall Designed to easily support CPUs weighing up to 70 lbs. Slides easily and smoothly on nylon glides in 16" track Rotates a full 360° for complete access to cables and ports Easy-grasp handle facilitates access 	<ul style="list-style-type: none"> Adjusts to fit CPUs 4" to 8" wide and 11.5" to 20" tall Designed to easily support CPUs weighing up to 40 lbs. Supports both vertical (towers) and horizontal CPUs Can be mounted directly to underside of desk, wall or on 16" track with 360° swivel for complete access to cables and ports Easy-to-install wrap-around design 	<ul style="list-style-type: none"> Adjusts to fit CPUs 3.25" to 9" wide and 10.5" to 18" tall Designed to easily support CPUs weighing up to 40 lbs. Slides smoothly on nylon glides in 16" track Rotates a full 360° for complete access to cables and ports Easy-grasp handle facilitates access 	<ul style="list-style-type: none"> Automatically adjusts to support CPUs up to 9" wide Adjustable base handle accommodates CPUs of any depth Rolls easily on four 2" double-wheel casters to facilitate access to cables, ports and drives Optional Pull Handle simplifies transportation of CPU from one location to another for servicing
DIMENSIONS	<ul style="list-style-type: none"> Height: CPU height + 3.6" Width: 7" or CPU width + 1.7" (whichever is greater) 	<ul style="list-style-type: none"> Height: CPU height + 4.5" Width: CPU width + 3.5" 	<ul style="list-style-type: none"> Height: CPU height + 3.75" Width: CPU width + 2.5" 	<ul style="list-style-type: none"> Height: CPU height + 3" Width: CPU width + 1.5" 	<ul style="list-style-type: none"> Height: CPU height + 3.75" Base: 8.5" x 15" x 3.75" Arm Height: 6.25"
MATERIALS	Aluminum and cold-rolled, powder-coated steel	Cold-rolled, powder-coated steel	Cold-rolled, powder-coated steel	Cold-rolled, powder-coated steel	Cold-rolled, powder-coated steel
RECYCLABILITY	100% Recyclable	99% Recyclable	99% Recyclable	99% Recyclable	99% Recyclable
RECYCLED CONTENT	34% Post-Consumer 17% Pre-Consumer	21% Post-Consumer 9% Pre-Consumer	21% Post-Consumer 9% Pre-Consumer	21% Post-Consumer 9% Pre-Consumer	21% Post-Consumer 9% Pre-Consumer
COLOR	Black/Brushed Aluminum	Black	Black	Black	Black
WARRANTY	Humanscale extends a lifetime warranty on all CPU holders				

(CA-4) WIRE MANAGEMENT



WM2A - Large 1 Piece J-Shape Wire Manager



[MORE VIEWS](#)



[Click Here for Technical Drawing](#)

DESCRIPTION

The larger version of our popular WM2, WM2A is ideal for operations where cords must be moved often, or have to be kept neatly out of harm's way. The WM2A is a clean design, modern in appearance, easy to install and use on a daily basis. Secures to the back or sides of desk or work surface with optional double-sided tape or staples. Easy to use, too. Just open the top of the "J" a bit and slip wires inside. Sold in one foot lengths up to six feet. Custom lengths available.

Size: 3 1/4" high by 1" wide; 1 to 6 ft long.

[Contact us](#) to order any custom cut length up to 12 ft. Maximum length for ground freight is 8 ft. Larger lengths from 8 ft - 12 ft require special freight.

Optional double-sided tape factory installed or sold by the roll (216').

Patent 295,521.

Note: Colors: Black, Walnut Brown and Light Grey.

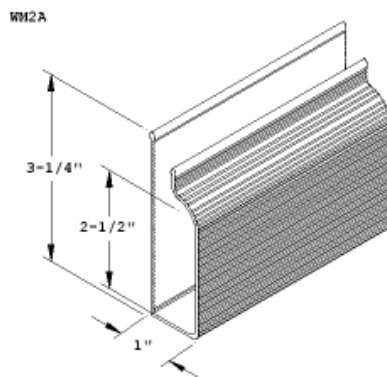
Surcharges:

- 25 per box maximum.
- Oversize Package Charge: \$6.50 per box for 1 to 4 ft lengths, \$20.00 per box for 5' and 6' lengths.

COLOR

Black (90)

Technical Drawing



[Click to Enlarge](#)

(LC-1) Part 1: Coat Rack with Shelf

Glaro Professional Strength, Modular Wall Mounted Coat Rack with Shelf

— **Including Solid Aluminum Hangers** —

SATIN ALUMINUM or **ANODIZED BRASS**



For those who demand the best, these wall mounted coat racks are superior to all other coat racks at any price.

Glaro all satin aluminum, professional strength clothing / coat racks are visually appealing so that they can be used in places that are not enclosed. Any length can be created easily. These standard coat racks are supplied in 24", 30", and 36" sections to construct one continuous rack. There is no limit to the overall length that can be created and the **interlocking modular design** makes the longest lengths just as sturdy and strong as our shortest 24" model. The convenient top shelf adds extra storage space and its tubular design prevents items from becoming air locked, discouraging mold or mites from forming in enclosed areas. All racks extend approximately 13 inches from the wall and the solid aluminum wall brackets are approximately 10 inches tall. Glaro wall racks are designed to mount on any type of wall surface. Standard lengths are 24", 30", 36", 48" and 6" increments there after. Please call us for any size not listed below.

Glaro Solid Aluminum, Riveted **Coat Hangers ARE included** with Open Loops unless Closed Loops are otherwise specified (at no additional cost). All racks can hold up to 6 coats per foot, so additional hangers are **available with open or closed loops here.**

Glaro Solid Aluminum Hangers and the extremely durable wall mounted coat racks will lasts for many years under constant use. You've seen them everywhere from your Doctor's Office, your Favorite Restaurants, your place of Worship and the Hotels or Motels you may have visited. **Busy places like these can't be bothered hanging up new coat racks each year ... Can you?**

MORE CHOICES BELOW!

**Glaro Satin Aluminum Modular Coat Racks with
Tubular Top Shelf and Solid Aluminum Hangers**

30" Wall Mounted Coat Rack
Including 6 Solid Aluminum Hangers
List Price \$215.00
SALE PRICE \$157.00

[Add to Cart](#)

36" Wall Mounted Coat Rack
Including 6 Solid Aluminum Hangers
List Price \$234.00
SALE PRICE \$172.00

[Add to Cart](#)

48" Wall Mounted Coat Rack
Including 8 Solid Aluminum Hangers
List Price \$301.00
SALE PRICE \$221.00

[Add to Cart](#)

60" Wall Mounted Coat Rack
Including 10 Solid Aluminum Hangers
List Price \$357.00
SALE PRICE \$261.50

[Add to Cart](#)

72" Wall Mounted Coat Rack
Including 12 Solid Aluminum Hangers
List Price \$396.00
SALE PRICE \$289.50

[Add to Cart](#)

84" Wall Mounted Coat Rack
Including 14 Solid Aluminum Hangers
List Price \$468.00
SALE PRICE \$342.00

[Add to Cart](#)

96" Wall Mounted Coat Rack
Including 16 Solid Aluminum Hangers
List Price \$494.00
SALE PRICE \$361.00

[Add to Cart](#)

108" Wall Mounted Coat Rack
Including 18 Solid Aluminum Hangers
List Price \$557.00
SALE PRICE \$407.00

[Add to Cart](#)

(LC-1) Part 2: Coat Hooks for Coats and Backpacks



To Place Your Order by Phone, Call:
1-832-476-4560



**Glaro Coat Trees and
Glaro Coat Hooks
Rugged All Aluminum
Coat Hanging Products**

[View Product Details](#)
[Glaro Products Home Page](#)
[Main Menu](#)



Model	Finish	Length	Description	List Price	Our Price	Buy
302 SA	Satin Aluminum		Glaro Coat Tree, 8 Hooks - 69" Tall with 20 lb. 14" Base	\$181.00	\$140.00	Add to Cart
351 BE	Satin Brass		Glaro Coat Tree, 8 Hooks - 69" Tall with 25 lb. 14" Base	\$225.00	\$164.00	Add to Cart
351 SA	Satin Aluminum		Glaro Coat Tree, 8 Hooks - 69" Tall with 25 lb. 14" Base	\$225.00	\$164.00	Add to Cart
AL3 SA	Satin Aluminum	12 inches	Glaro Wall Mounted Coat Hooks, 3 Double Hooks	\$67.00	\$52.00	Add to Cart
SH3 SA	Satin Aluminum	12 inches	Glaro Wall Mounted Coat Hook - 3 Hooks	\$55.00	\$43.00	Add to Cart
D1 BE	Satin Brass	3.5 inches	Glaro Wall Mounted Coat Hook - 1 Hook	\$35.00	\$27.00	Add to Cart
D1 SA	Satin Aluminum	3.5 inches	Glaro Wall Mounted Coat Hook - 1 Hook	\$35.00	\$27.00	Add to Cart
D2 BE	Satin Brass	8.5 inches	Glaro Wall Mounted Coat Hook - 2 Hooks	\$66.00	\$51.00	Add to Cart
D2 SA	Satin Aluminum	8.5 inches	Glaro Wall Mounted Coat Hook - 2 Hooks	\$66.00	\$51.00	Add to Cart
D3 BE	Satin Brass	16 inches	Glaro Wall Mounted Coat Hook - 3 Hooks	\$95.00	\$74.00	Add to Cart
D3 SA	Satin Aluminum	16 inches	Glaro Wall Mounted Coat Hook - 3 Hooks	\$95.00	\$74.00	Add to Cart
224 SA	Satin Aluminum	24 inches	Glaro Wall Mounted Coat Hooks, 8 Hooks	\$52.00	\$41.00	Add to Cart
230 SA	Satin Aluminum	30 inches	Glaro Wall Mounted Coat Hooks, 10 Hooks	\$56.00	\$44.00	Add to Cart
236 SA	Satin Aluminum	36 inches	Glaro Wall Mounted Coat Hooks, 12 Hooks	\$60.00	\$47.00	Add to Cart

Bootie Rack for Gowning Bench; UltraClean SS, Perf-Top 15Slots

Part #: 1560-31-2

Manufacturer: TERRA UNIVERSAL, INC

U.S. orders include packaging.

Product URL: <https://www.terrauniversal.com/product/1560-31-2>

Perforated-top bootie rack, shown with gowning bench.

Adds organization of shoes when added to square-tube gowning bench

- For gowning bench with dimensions: 48"L x 16"W x 18"H (1219 mm x 406 mm x 457 mm)
- Materials: Electropolished 304 stainless steel
- Provides organized racking area for booties and shoes
- Designed to fit beneath square tube gowning benches
- UltraClean™ electropolished stainless steel finish ensures optimal cleanliness and durability and class 1 compatibility.
- Cost effective gowning area accessory

Package Type: Crate

Packaged Weight: 0 lbs

Product Dimensions, in. 43.875 W, 10.875 D, 12 H

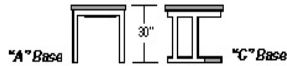
Package Dimensions, in. 47 W, 16 D, 15 H

The price and ship time shown may have changed since this document was printed or saved.
Current product information can be found on the [TerraUniversal.com](https://www.terrauniversal.com) website or by calling Terra at 714-578-6000.

Ordering: Benches with Square Tube Bases

To Order —

1. Select [304 stainless steel models](#) or [316 stainless steel models](#)
2. Select Heavy or Light Duty Base: [heavy-duty bases support loads up to 800 lbs. \(363 kg\)](#) without bowing. Light-duty bases support loads up to 200 lbs. (91 kg) without bowing.
3. Select a Top Style: Either solid, rod (QuietTop™), [or perforated \(OpenTop™\)](#).
4. Select "A" Base or "C" Base: For heavy-duty designs, "A" base has 1.5" (38 mm) square tubes; ["C" base has 2" x 1" \(51 mm x 25 mm\) tubes.](#) For light-duty designs, both base types are 1" square tubes.



5. Select Optional Accessories: [See below for over-top and under-top shelves](#)

304 Stainless Steel Work Stations

HEAVY-DUTY All-Electropolished 304 Stainless Steel Work Stations*— 800-lb. (363 kg) load capacity, "A" base has 1.5" (38 mm) square tubes; "C" base has 2" x 1" (51 mm x 25 mm) tubes

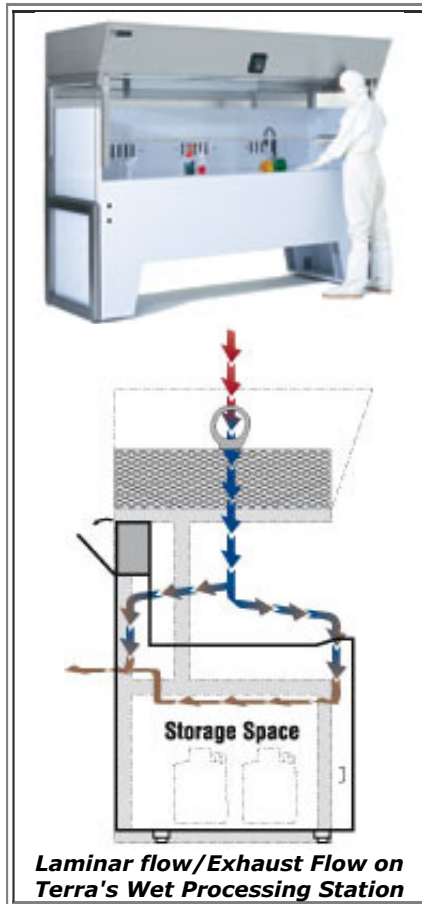
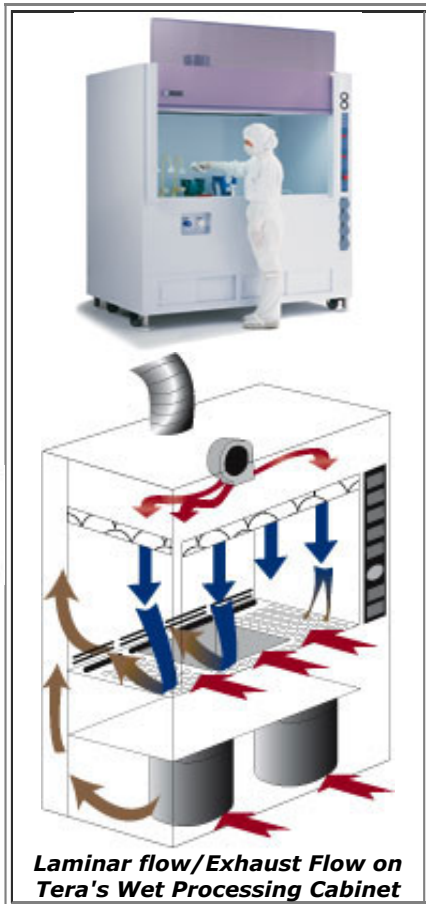
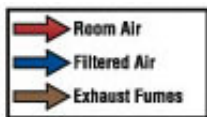
All-Electropolished 304 Stainless Steel Work Stations*—800-lb. (363 kg) load capacity, "A" base has 1.5" (38 mm) square tubes; "C" base has 2" x 1" (51 mm x 25 mm) tubes								
Bench Size* W" x D" (mm)	QuietTop™ Rods with Full Bullnose .25" (6 mm) ø rods on 1" (25 mm) centers		OpenTop™ Perforated with ErgoEdge™ Rounded Front .25" (6 mm) ø holes		316 Stainless Steel Models Available!			
	"A" BASE		"C" BASE		"A" BASE		"C" BASE	
	Cat. #	Price	Cat. #	Price	Cat. #	Price	Cat. #	Price
24 x 24 (610 x 610)	9601-01	Price	9601-02	Price	9604-51	Price	9604-72	Price
36 x 24 (914 x 610)	9601-03	Price	9601-04	Price	9604-52	Price	9604-73	Price
48 x 24 (1219 x 610)	9601-05	Price	9601-06	Price	9604-53	Price	9604-74	Price
60 x 24 (1524 x 610)	9601-07	Price	9601-08	Price	9604-54	Price	9604-75	Price
72 x 24 (1829 x 610)	9601-09	Price	9601-10	Price	9604-55	Price	9604-76	Price
84 x 24 (2134 x 610)	9601-11	Price	9601-12	Price	9604-56	Price	9604-77	Price
96 x 24 (2438 x 610)	9601-13	Price	9601-14	Price	9604-57	Price	9604-78	Price
24 x 30 (610 x 762)	9601-15	Price	9601-16	Price	9604-58	Price	9604-79	Price
36 x 30 (914 x 762)	9601-17	Price	9601-18	Price	9604-59	Price	9604-80	Price
48 x 30 (1219 x 762)	9601-19	Price	9601-20	Price	9604-60	Price	9604-81	Price
60 x 30 (1524 x 762)	9601-21	Price	9601-22	Price	9604-61	Price	9604-82	Price
72 x 30 (1829 x 762)	9601-23	Price	9601-24	Price	9604-62	Price	9604-83	Price
84 x 30 (2134 x 762)	9601-25	Price	9601-26	Price	9604-63	Price	9604-84	Price
96 x 30 (2438 x 762)	9601-27	Price	9601-28	Price	9604-64	Price	9604-85	Price
24 x 36 (610 x 914)	9601-29	Price	9601-30	Price	9604-65	Price	9604-86	Price
36 x 36 (914 x 914)	9601-31	Price	9601-32	Price	9604-66	Price	9604-87	Price
48 x 36 (1219 x 914)	9601-33	Price	9601-34	Price	9604-67	Price	9604-88	Price
60 x 36 (1524 x 914)	9601-35	Price	9601-36	Price	9604-68	Price	9604-89	Price
72 x 36 (1829 x 914)	9601-37	Price	9601-38	Price	9604-69	Price	9604-90	Price
84 x 36 (2134 x 914)	9601-39	Price	9601-40	Price	9604-70	Price	9604-91	Price
96 x 36 (2438 x 914)	9601-41	Price	9601-42	Price	9604-71	Price	9604-92	Price
All-Electropolished 304 Stainless Steel Work Stations*—800-lb. (363 kg) load capacity, "A" base has 1.5" (38 mm) square tubes; "C" base has 2" x 1" (51 mm x 25mm) tubes								
	OpenTop™ Perforated with ErgoEdge™ Rounded Front ø .75" (19 mm) holes				Solid Tops with ErgoEdge™ Rounded Front			

Wet Processing Station Planner

Please provide as much information as possible about your application. A Terra Design Specialist will call to clarify your requirements and prepare a detailed quotation. If you wish to discuss your application with a Sales Associate prior to submitting a form, please call 714-578-6000.

Air Flow Control

- Exhaust Control Only
- Laminar Flow Only
- Laminar Flow and Exhaust



Material

- Polypropylene (for processes requiring acid)
- 304 Stainless Steel (for processes requiring solvents)

General Processing Requirements

Tell us about your application. To ensure a safe, effective system, please provide information on —

- Chemicals*
- Temperature
- Chemical concentration
- Deck size and layout
- Exhaust fume ventilation
- Product size type and size (e.g.. 8" [203 mm] wafers)
- Other facility requirements

*Acid processes require a polypropylene station. Solvent processes require a 304 stainless steel station

H2SO4, HCl, HF, FeCl3, NH4, H3PO4, KOH, TMAH

Available Process Baths and Rinsers

Qty

Wafer Dump Rinser (DR Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 105/125VAC, single phase, 50/60Hz)

Tank Material

Polypropylene PVDF

Fittings Material

Polypropylene Fittings Teflon Fittings

Qty

Quartz Constant Temperature Bath (Qa Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Aspirator (Dilution) Valve

Option

Magnetic Stirrer Option

Qty

Stripper Bath (C Series)

Size

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power: Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Magnetic Stirrer Option

Qty

Silicon Nitride Etch Bath (Nb Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Aspirator (Dilution) Valve

Option

Qty

Constant Temperature Bath (A Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Tank Material

Polypropylene PVDF

Qty

Subambient Filtered Etch Bath (F Series)

Capacity* (Deck Area)

1 ea., 4in-6in wafer (11.9in x 17.1in)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Bath Material

Polypropylene PVDF

Liquid Flow Sensor Kit

Qty

Recirculating Heater/Chiller

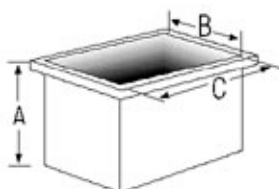
Material

Polypropylene

Voltage

115VAC 230VAC

Custom Tanks and Sinks



Internal Tank Dimensions

A B C

Desired Material

PVDF 304 Stainless Steel

Polypropylene Other

What is you process chemistry?

Other Features

- Dump valve
- Fill sensor
- Overflow sensor
- Nitrogen bubbler
- PLC Control
- Spray bars
- Lid
- Submersible ultra-sonic transducer
- Condensing coil
- Submersible heater
- Aspirator
- Overflow catch basin

Please specify dimensions and options for additional sinks in a multi-sink station.

Other Options

Qty

[Gooseneck Faucet](#)

1 [N₂ Spray Gun](#)

1 [DI Water Spray Gun](#)

Qty

1 [Hot Plate](#)

3 Power Outlets 115 VAC

Power Outlets 230 VAC

1 [Venturi-style Aspirator Drain](#)

Vacuum Facility

1 [Glove Rinser](#)

Compressed Air Facility

[Fire Detection](#)

DI Water Purification System

Chemical Collection/Reclamation Carboy

[Chemical Carts and Cabinets](#)

Certification/Safety/Compliance Requirements

Tell us about your application

Compliance Testing/Certification. Specify pertinent agency listing (UL, ETL, CSA, OSHA, etc.)

Seismic Constraints

Provide Contact Information

Contact Information

***=Required Fields**

User Name:*
(E-mail Address)

Retype E-mail*

Address as: Dr Mr Ms Unspecified

Name: First* Middle Last*

Mail Stop:

Company:*

Address 1:*

Address 2:

City:*

State (US only):* or **Province:**

Zip/Mail:*

Country:*

Phone:* **Country Code** **Phone*** **FAX**

Industry:*

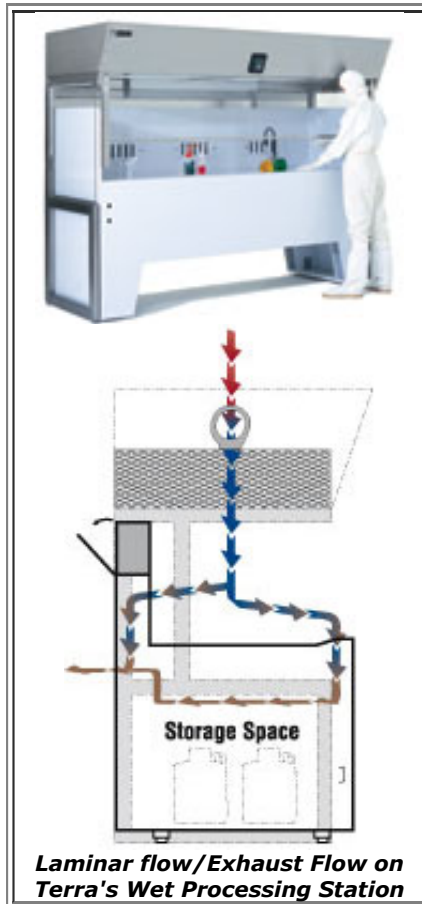
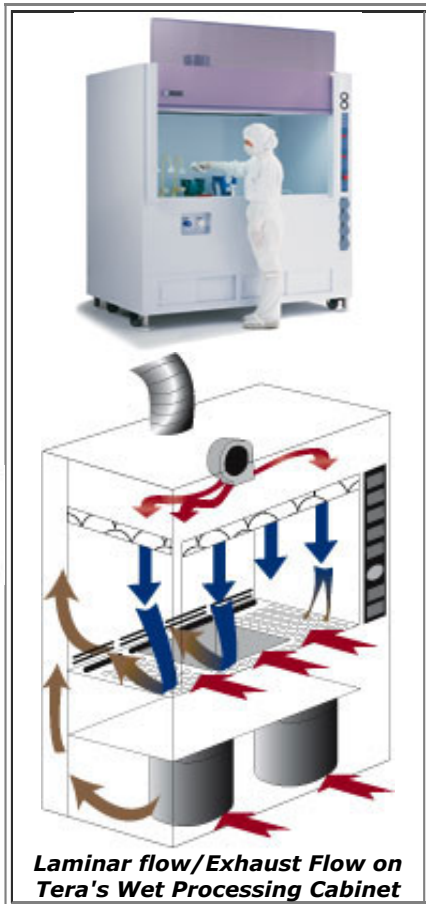
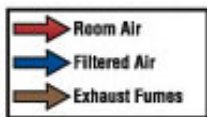
[Privacy Statement](#)

Wet Processing Station Planner

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Air Flow Control

- Exhaust Control Only
- Laminar Flow Only
- Laminar Flow and Exhaust



Material

- Polypropylene (for processes requiring acid)
- 304 Stainless Steel (for processes requiring solvents)

General Processing Requirements

Tell us about your application. To ensure a safe, effective system, please provide information on —

- Chemicals*
- Temperature
- Chemical concentration
- Deck size and layout
- Exhaust fume ventilation
- Product size type and size (e.g.. 8" [203 mm] wafers)
- Other facility requirements

*Acid processes require a polypropylene station. Solvent processes require a 304 stainless steel station

PR developer, Acetion, IPA, Toluent

Available Process Baths and Rinsers

Qty

Wafer Dump Rinser (DR Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 105/125VAC, single phase, 50/60Hz)

Tank Material

Polypropylene PVDF

Fittings Material

Polypropylene Fittings Teflon Fittings

Qty

Quartz Constant Temperature Bath (Qa Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Aspirator (Dilution) Valve

Option

Magnetic Stirrer Option

Qty

Stripper Bath (C Series)

Size

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power: Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Magnetic Stirrer Option

Qty

Silicon Nitride Etch Bath (Nb Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Drain Type

Gravity Drain Valve Pneumatic

Drain Size

.5" (13 mm) .75" (19 mm)

Aspirator (Dilution) Valve

Option

Qty

Constant Temperature Bath (A Series)

Capacity* (Deck Area)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Tank Material

Polypropylene PVDF

Qty

Subambient Filtered Etch Bath (F Series)

Capacity* (Deck Area)

1 ea., 4in-6in wafer (11.9in x 17.1in)

*Standard cassette(s) for specified wafer size.

(Power Voltage: 208/240VAC, single phase, 50/60Hz)

Bath Material

Polypropylene PVDF

Liquid Flow Sensor Kit

Qty

Recirculating Heater/Chiller

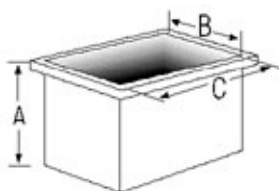
Material

Polypropylene

Voltage

115VAC 230VAC

Custom Tanks and Sinks



Internal Tank Dimensions

A B C

Desired Material

PVDF 304 Stainless Steel

Polypropylene Other

What is you process chemistry?

Other Features

- Dump valve
- Fill sensor
- Overflow sensor
- Nitrogen bubbler
- PLC Control
- Spray bars
- Lid
- Submersible ultra-sonic transducer
- Condensing coil
- Submersible heater
- Aspirator
- Overflow catch basin

Please specify dimensions and options for additional sinks in a multi-sink station.

Other Options

Qty

[Gooseneck Faucet](#)

1 [N₂ Spray Gun](#)

1 [DI Water Spray Gun](#)

Qty

1 [Hot Plate](#)

3 Power Outlets 115 VAC

Power Outlets 230 VAC

- [Venturi-style Aspirator Drain](#)
- [Vacuum Facility](#)
- [Glove Rinsers](#)
- [Compressed Air Facility](#)
- [Fire Detection](#)
- [DI Water Purification System](#)
- [Chemical Collection/Reclamation Carboy](#)
- [Chemical Carts and Cabinets](#)

Certification/Safety/Compliance Requirements

Tell us about your application

Compliance Testing/Certification. Specify pertinent agency listing (UL, ETL, CSA, OSHA, etc.)

Seismic Constraints

Provide Contact Information

Contact Information

***=Required Fields**

User Name:*
(E-mail Address)

Retype E-mail*

Address as: Dr Mr Ms Unspecified

Name: First* Middle Last*

Mail Stop:

Company:*

Address 1:*

Address 2:

City:*

State (US only):* or **Province:**

Zip/Mail:*

Country:*

Phone:* **Country Code** **Phone*** **FAX**

Industry:*

[Privacy Statement](#)

Reed
[SRD LED]

(TL-1) MAGNETIC TASK LIGHT



Specifications

Lengths

6", 19" or 37"

Lamp

3500K LEDs, CRI 80

Lens

Diffuser lens

Reflector

Metal trough reflector with diffuser

Switch

Instant on; fade to off; dimming

Cord

9-12' cord, molded straight plug

Cord Color

Black

Power supply

15W wall transformer power supply
or 60W power supply

Housing

Clear anodized aluminum with flint color
endcaps

Mounting (must specify)

Magnetic
Screw

Certifications

UL, cUL

Recyclability

100% Recyclable

Additional Options

Direct connect (DC) cords to link reed
fixtures (8", 30", or 54")
End caps for cord management -
case good application

ENERGY SAVING FEATURES

Dimming

Hold on/off switch to cycle from 100%
to 15% and back, release to achieve
desired state. On/Off cycle returns to
last state.

Sensors

Optional remote mounted occupancy
sensor connects to 60 watt power
supply. (See remote occ. sensor spec
sheet for specifications).
Optional Isolé eight outlet power strip
with remote occupancy sensor control of
six outlets, LED grounding indication, and
on/off switching. (See Isolé cut sheet for
specifications).

Auto Turn Off

Select products can automatically turn
off after 10 hours (± 15 minutes).

*See back for available product offering



The Reed SRD LED task light is a low-profile linear solution for overhead bins and shelves. Offered in three sizes—6", 19", or 37"—Reed can be used by itself or connected together. Its energy-efficient LED technology and infinite dimming capability let you keep energy costs down. Gain up to 4 points towards LEED credibility. Warranted for 5 years.

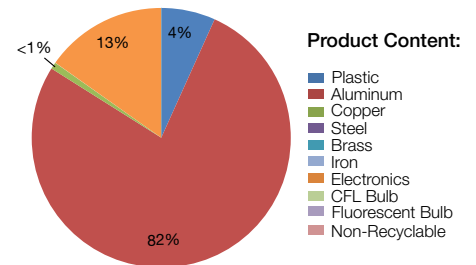
Base Model No.	Suggested Shelf Size	Actual Length	# of LEDs	Fixture Wattage	System Wattage	Description
SRD 6 5W	< 24"	6.3"	3	5	5.8	5 watt LED task light; 1 set of 3 LEDs; 3500K
SRD19 5W	24"-36"	18.4"	3	5	5.8	5 watt LED task light; 3 sets of 1 LED; 3500K
*SRD19 10W	24"-36"	18.4"	6	10	10.9	10 watt LED task light; 3 sets of 2 LEDs; 3500K
*SRD19 15W	24"-36"	18.4"	9	15	16.3	15 watt LED task light; 3 sets of 3 LEDs; 3500K
SRD37 10W	42"-72"	37.4"	6	10	11.7	10 watt LED task light; 6 sets of 1 LED; 3500K
*SRD37 20W	42"-72"	37.4"	12	20	21.9	20 watt LED task light; 6 sets of 2 LEDs; 3500K
*SRD37 30W	42"-72"	37.4"	18	30	32.6	30 watt LED task light; 6 sets of 3 LEDs; 3500K

*Auto turn off feature available

Note: When interconnecting fixtures, the accumulated system wattage must never exceed the total wattage of the power supply.

SRD 6 5W

	CL	3"	6"	9"	12"	15"
CL	46	44	36	27	19	12
3"	42	40	32	25	17	12
6"	32	29	24	20	14	10
9"	24	22	19	15	11	8
12"	17	16	14	11	8	6



Footcandles measured at 18"

SRD 19 5W

	CL	3"	6"	9"	12"	15"	18"
CL	39	37	33	28	21	13	9
3"	35	34	30	25	19	13	9
6"	29	27	25	20	16	11	8
9"	21	20	18	15	12	9	6
12"	15	14	13	11	9	7	4

SRD 19 10W

	CL	3"	6"	9"	12"	15"	18"
CL	74	71	63	52	39	28	19
3"	67	66	59	48	36	27	18
6"	55	53	48	40	31	23	16
9"	41	39	36	31	24	20	14
12"	28	28	25	22	18	14	10

SRD 19 15W

	CL	3"	6"	9"	12"	15"	18"
CL	109	104	92	76	57	42	28
3"	100	97	86	70	54	40	27
6"	82	79	71	60	46	34	24
9"	59	57	52	44	35	27	19
12"	40	40	37	32	24	21	15

SRD 37 10W

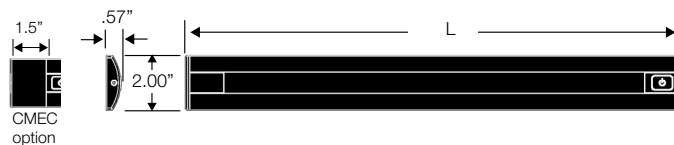
	CL	3"	6"	9"	12"	15"	18"
CL	56	55	52	50	44	37	29
3"	52	51	50	46	41	33	26
6"	44	43	41	38	34	28	22
9"	33	31	32	29	26	21	17
12"	24	25	23	20	19	16	12

SRD 37 20W

	CL	3"	6"	9"	12"	15"	18"
CL	101	100	95	90	82	70	57
3"	94	91	87	82	75	64	52
6"	76	75	71	67	61	52	42
9"	59	58	55	50	46	40	33
12"	43	42	38	36	32	28	23

SRD 37 30W

	CL	3"	6"	9"	12"	15"	18"
CL	146	143	139	131	116	100	82
3"	134	133	129	121	109	95	79
6"	110	110	108	102	93	81	66
9"	83	82	80	77	70	62	51
12"	56	56	55	53	49	44	36



(FED-2) FUME EXTRACTION DEVICE

TERFU polypropylene (PP) design



The TERFU polypropylene (PP) design is suitable for extraction of very aggressive highly concentrated compounds in e.g. laboratories, the pharmaceutical and chemical industry. The TERFU polypropylene (PP) design means that all pipes and joints are made of polypropylene and all metal components in contact with the air flow are made of stainless steel.



TERFU polypropylene design, with diameter Ø3":
- 3-joint design available in 40", 51", 60" and 80" lengths.



Various models in our product range:

~~Table mounting
2-joint arm
Ø3" dia. with
suction nozzle~~

~~Wall mounting
3-joint arm
Ø3" dia. with
flat screen hood~~

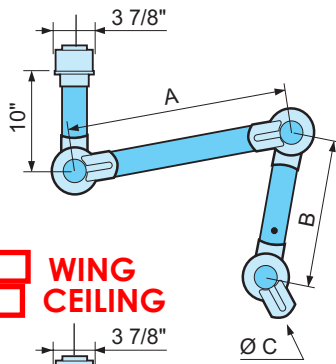
~~Wall mounting
3-joint arm
Ø3" dia. with
dome hood~~

Ceiling mounting
3-joint arm
Ø3" dia. with
suction nozzle

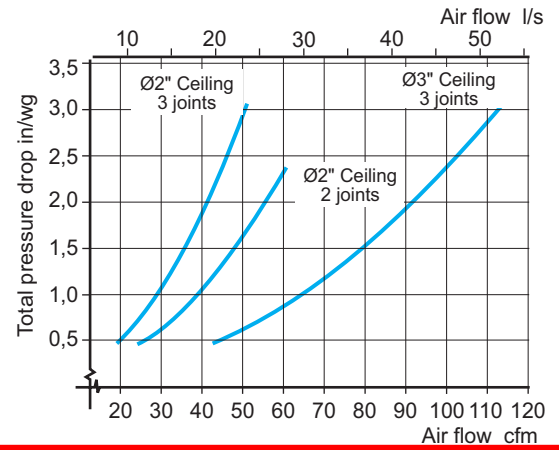
TERFU for ceiling mounting

3 joints

Part	Measure inch			Max radius		
	Standard	PP	ESD			
T 1000-50	-	ESD	16"	12"	2"	40"
T 1300-50	-	ESD	22"	18"	2"	51"
T 1500-50	-	ESD	30"	18"	2"	60"
T 1000-75	PP	ESD	16"	12"	3"	40"
T 1300-75	PP	ESD	22"	18"	3"	51"
T 1500-75	PP	ESD	30"	18"	3"	60"
T 2000-75	PP	ESD	40"	26"	3"	80"

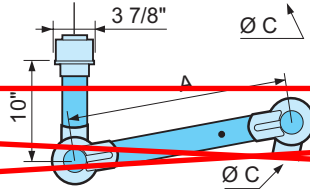


WING CEILING



2 joints

Part	Measure inch			Max radius
	Standard	ESD	ESD	
T 650-50	ESD	12"	2"	28"
T 750-50	ESD	18"	2"	34"



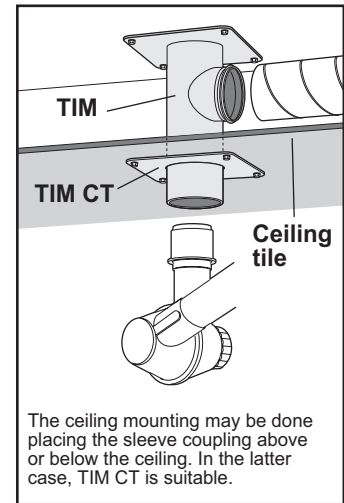
Delivery design

Assembled without hood or suction nozzle.
Ceiling bracket is ordered separately, see below.

Ceiling bracket TIM

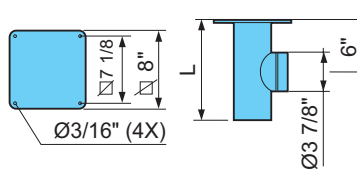
Designed for ceiling mounting, suitable for Ø2" and Ø3" arm, 5 standard lengths with side connection to duct Ø4". Standard design: powder-coated sheet steel. Also available in ESD-design and stainless steel. Adapted lengths and duct connections available on request.

Part	Measure		
	Standard	Stainless	ESD
TIM 250	RF	ESD	10"
TIM 500	RF	ESD	20"
TIM 750	RF	ESD	30"
TIM 1000	RF	ESD	40"
TIM 1500	RF	ESD	60"



Other information

Material Powder-coated sheet steel, white or stainless sheet steel 304 grade
Weight 4,4-7 lb
Connection Ø4"



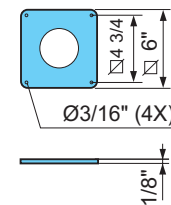
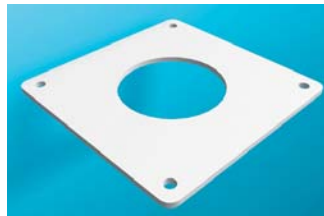
Escutcheon plate TIM CT

Escutcheon plate, used with ceiling mounting TIM for stability and to cover the ceiling tile hole. Made of polypropylene.

Part TIM CT

Other information

Material white polypropylene
Weight 1,5 oz



PROVIDE FOR CEILING MOUNTED FUME EXTRACTORS

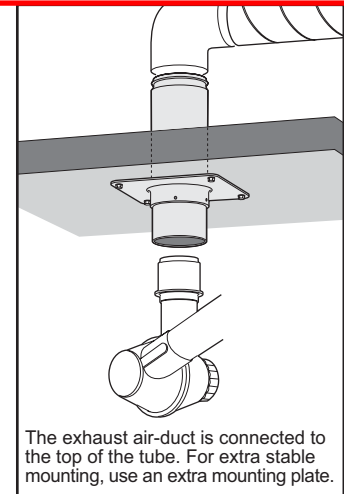
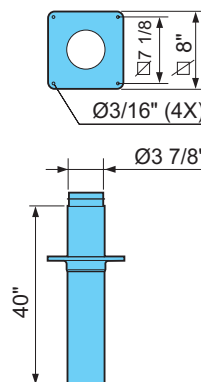
Ceiling bracket TIF 1000

Designed for ceiling mounting, suitable for Ø2" and Ø3" arm, for extracting exhaust air vertically. Mounting plate and pipes delivered unassembled to facilitate adjusting final assembly height. Standard design: powder-coated sheet steel. Also available in ESD-design and stainless steel.

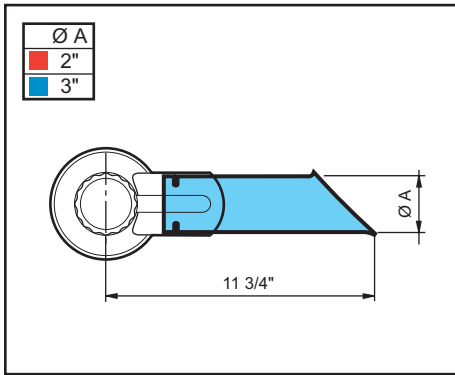
Part	Measure		
	Standard	Stainless	ESD
TIF 1000	RF	ESD	

Other information

Material Powder-coated sheet steel, white or stainless sheet steel 304 grade
Weight 6,5 lb
Connection Ø4"



TERFU hoods and accessories



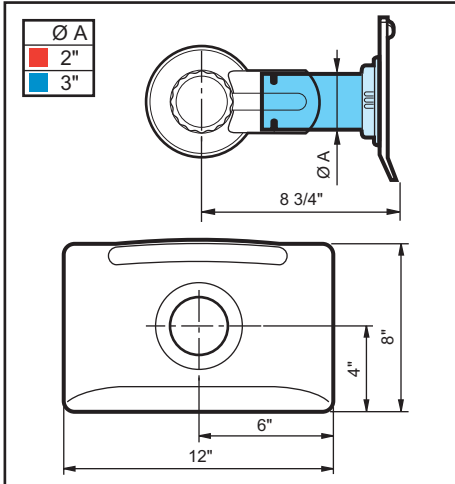
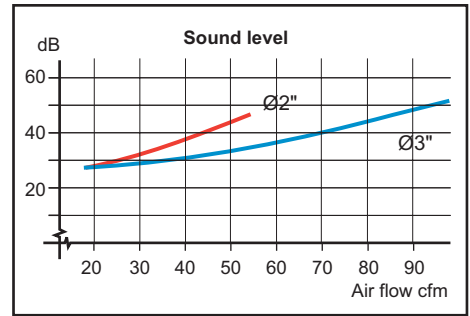
SUCTION NOZZLE

Used for work in highly corrosive environments. You can get close to the source of pollution without obscuring the vision of the workpiece.

Part	Standard	ESD	PP
S 300-50	ESD	ESD	PP
S 300-75	ESD	ESD	PP

Material

Standard... Aluminum
ESD Aluminum
PP Polypropylene
Temp. range 5°F to 175°F
Weight 4 and 5 oz



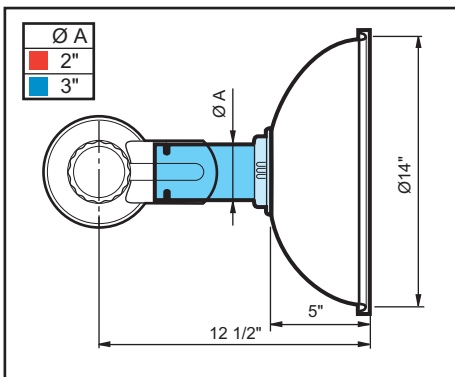
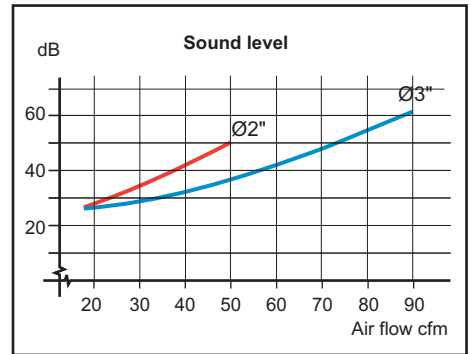
FLAT SCREEN HOOD

Designed to maximise the working radius without obscuring the vision of the workpiece. Offers the best extraction efficiency at table and bench work.

Part	Standard	ESD	PP
PH 300-50	ESD	ESD	PP
PH 300-75	ESD	ESD	PP

Material

Standard... PMMA (HIP) transp
ESD PEEL black
PP Polypropylene, opaque
Temp. range 5°F to 175°F
Weight 11 and 13 oz



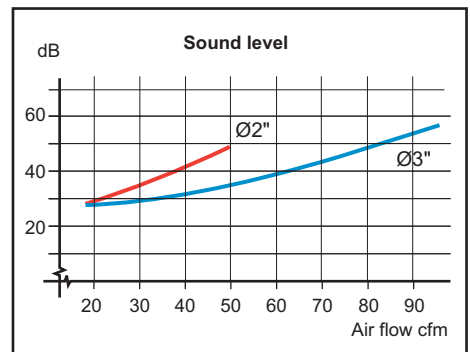
DOME HOOD

Used to get close to the source of pollution and screen off the sides, without obscuring the vision of the workpiece.

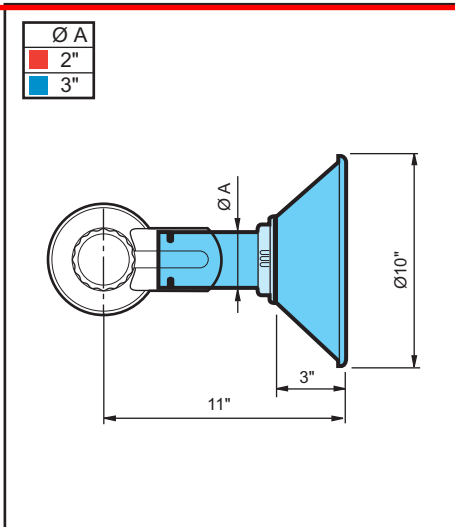
Part	Standard	ESD	PP
K 350-50	ESD	ESD	PP
K 350-75	ESD	ESD	PP

Material

Standard... PMMA (HIP) transp
ESD PEEL black
PP Polypropylene, opaque
Temp. range 5°F to 175°F
Weight 14 and 16 oz



ACCESSORY (FED-3-D)



METAL HOOD

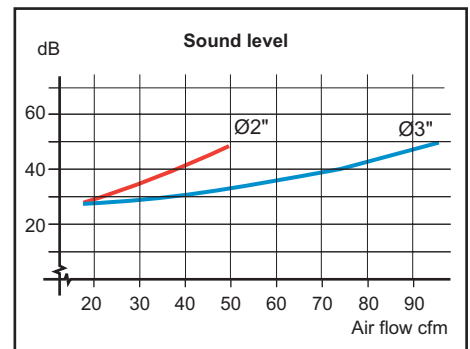
The aluminum hood is used for work in tough environments, to catch hot gases, dust concentrations etc. The hood may be equipped with a halogen light.

Part	Standard	ESD
M 250-50	ESD	ESD
M 250-75	ESD	ESD
MB 250-50*		
MB 250-75*		

* with halogen light

Material

Standard ... Powder-coated aluminum
ESD Aluminum
Temp. range..... 5°F to 175°F
Weight 10 and 11 oz
Accessory..... Light rated at 50 W 12 VAC



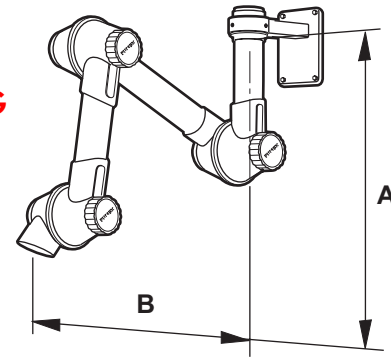
Project advice for **TERFU**

Recommended mounting height and side displacement for mounting of wall and ceiling TERFU model.		
Length	Height from bench A mm	Side displacement from workplace centre B mm
40"	28" - 40"	12" - 24"
51"	38" - 48"	16" - 28"
60"	44" - 52"	20" - 32"
80"	48" - 68"	28" - 40"

Practice values			
Activity	Air flow		Diameter Ø inch
	Cfm	l/s	
Soldering – electronics	42 Cfm	20 l/s	2"
Laboratories, basic value	90 Cfm	40 l/s	3"
Schools – chemistry institution	90 Cfm	40 l/s	3"
Hairdresser's	37 Cfm	17 l/s	2"

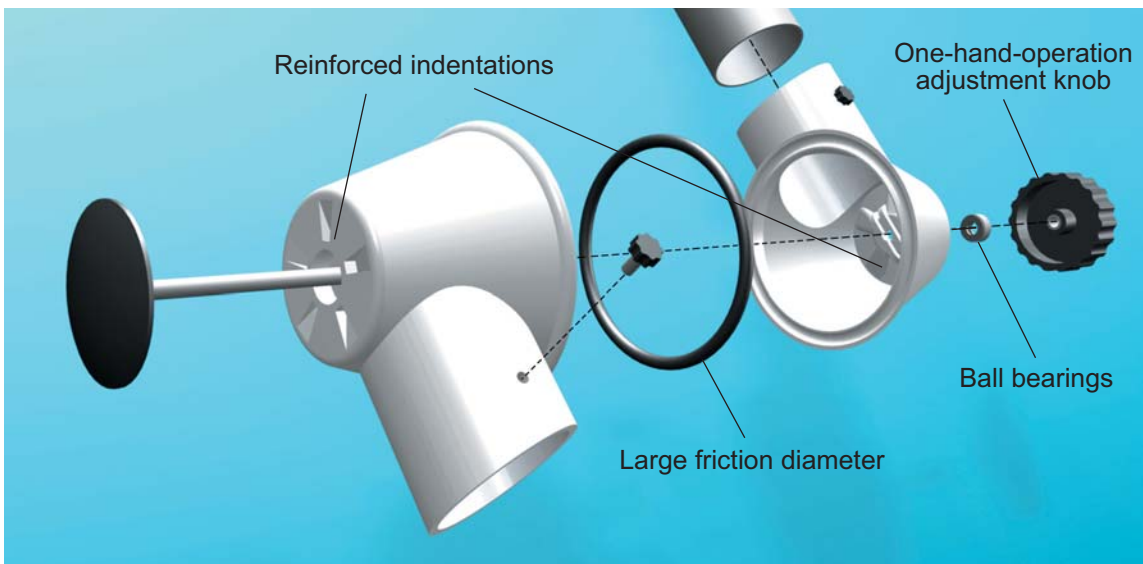
Recommended placement for wall and ceiling mounting

**WING
CEILING**

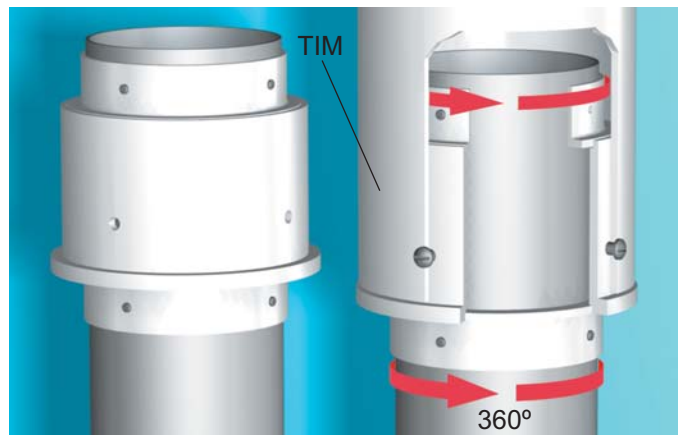


Technology Design Function **TERFU**

The TERFU-joint. The large friction diameter and the one-hand-operation of the adjustment knob offer very flexible function with a stable joint that stays in position. No great force needs to be applied, no tools are required. The joint has reinforced indentations which prevents deformation that would cause the "O" ring to slip or the joint to crack. Ball bearings insulate the set friction, which facilitates to move the arm up and down without jamming the joint or losing stability and function.



The TERFU extraction arm is always mounted with a complete swivel that may be rotated at 360°. In addition, the mounting swivel is adapted to connection with a standard Spiral duct Ø 4". This applies to arms with Ø2" and Ø3". Fit the wall or ceiling bracket with short screws supplied with the arm. When connecting to other dimensions, use standard reducers down to 3 1/8", 3" and 2".



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Dealer:

SECTION 11 53 63

COMPRESSED GAS CYLINDER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Compressed gas cylinder cabinets as indicated on Drawings.
- B. Related Sections include the following:
 - 1. Division 15, Section "Laboratory Gas Piping".

1.3 PERFORMANCE REQUIREMENTS

- A. 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.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions and cleaning procedures.
- B. Shop Drawings: Submit shop drawings showing locations, materials, connections and all details of construction and installation.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements and wiring diagrams for power supply wiring to units.
- D. Maintenance Data: Submit maintenance data and parts lists. Include product data, shop drawings, record drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.
- 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.

1.5 QUALITY ASSURANCE

- A. Coordinate the interface of the cylinder cabinets with the laboratory casework and accessories. Verify and coordinate all requirements for cutouts, attachments, reinforcing, piping, electrical devices, sizes and locations with laboratory casework and other laboratory items.
- B. CGA Compliance: Fabricate and install compressed gas cylinder cabinets in accordance with CGA Standards (Compressed Gas Association).
- C. UL Compliance: Provide electrical components which are UL listed and have UL label affixed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver compressed gas cylinder cabinets on factory-installed shipping skids; accessories packaged in factory-fabricated fiberboard containers; and pipe/tube with plastic end-cap protectors to prevent pipe-end damage and to eliminate dirt and moisture from entering interior of pipe/tube.
- B. Handle compressed gas cylinder cabinets carefully to avoid damage to components; enclosures and finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.
- C. Store equipment indoors and protect from weather and construction traffic.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cylinder cabinets 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.

1.8 COORDINATION

- A. Coordinate layout and installation of compressed gas cylinder cabinets with other trades, laboratory casework and accessories.

1.9 EXTRA MATERIALS

- A. Furnish complete touchup paint kit. Include fillers, primers, paints, fabric patches, and other materials necessary to perform permanent repairs to damaged items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Scott Specialty Gases.
 - 2. Matheson Gas Products.
 - 3. Air Liquide America Corporation.

2.2 COMPRESSED GAS CYLINDER CABINETS

- A. Provide and install compressed gas cylinder cabinets as indicated on drawings and specified herein.
- B. Cylinder cabinets shall provide the following functions:
 - 1. Storage Use:
 - a. Containment of hazardous gas in the event of leakage.
 - 2. Valved and Piped Gas Supply System:
 - a. Containment of hazardous gas in the event of leakage.
 - b. Maintenance of gas integrity.
 - c. Automatic shut-off in the event of catastrophic failure.
 - d. Effective control of residual gas during cylinder changeout.
 - e. Continuous gas supply system.
- C. Provide compressed gas cylinder cabinets constructed of minimum 11 gauge, all welded polyurethane painted steel including the following:
 - 1. Self closing, self latching, hinged and gasketed door. The door shall include a filtered louvers opening located in the lower area to allow air to enter the cabinet and a sliding 1/4" thick wired glass window and integral face shield, at the top of the door to provide visual and physical access to the valve manifolds.
 - 2. U.L approved beeswax coated sprinkler head in flammable gas cabinets.
 - 3. An opening at the top for the connection of exhaust ductwork. A gas cabinet for a single cylinder shall be provided with a 6" exhaust opening and shall be rated for an exhaust flow rate of 100 cfm. Gas cabinets for two cylinders shall also have a 6" exhaust opening and be rated for an exhaust flow rate of 260 cfm.
 - 4. One cast aluminum cylinder bracket(s) including chain and polypropylene safety strap, per cylinder location.
 - 5. A filtered louvered opening in the lower rear of the cabinet.
 - 6. 120V surface mounted control panel capable of interfacing with gas detection, building energy management system and shutting off cylinder gas as indicated in Contract Documents.

2.3 COMPRESSED GAS VALVE MANIFOLD SYSTEMS

- A. Provide compressed gas valve manifold systems of either the three or five valve configuration, completely preassembled and mounted on a common backboard, installed in the compressed gas cylinder cabinet. Valve manifold systems shall be modular in design and shall include the following components, provided in materials as specified for the respective piping systems.
- B. Provide Three Valve Manifold System for Hydrogen, Methane and Oxygen.
- C. Three valve manifolds shall include:
 - 1. Purge gas inlet check and isolation valves with inlet piping extended to a fitting at the top of the cabinet.
 - 2. High pressure .5 micron stainless steel filter.
 - 3. High pressure isolation valve.
 - 4. High pressure vent check and isolation valve with vent piping extended to a fitting at the top of the cabinet.
 - 5. Regulator with bonnet vent and pressure relief valve with piping extended to a fitting at the top of the cabinet.
 - 6. Pigtail with appropriate CGA fitting.
- D. Provide Five Valve Manifold System for Ammonia.
- E. Five valve manifolds shall include:
 - 1. Purge gas inlet check and isolation valve with inlet piping extended to a fitting at the top of the cabinet.
 - 2. Excess flow valve.
 - 3. Pneumatically operated, emergency shut off valve, operated from the gas monitoring system.
 - 4. High pressure .5 micron stainless steel filter.
 - 5. High pressure isolation valve.
 - 6. High pressure vent check and isolation valve with vent piping extended to a fitting at the top of the cabinet.
 - 7. Low pressure regulator with bonnet vent and pressure relief valve with piping extended to a fitting at the top of the cabinet.
 - 8. Pigtail with appropriate CGA fitting.
- F. Auto-switchover: Provide a continuous, uninterrupted supply of gas. Control gas delivery from cylinders within a centralized distribution system providing safe delivery of gas with the flexibility to address customized applications.

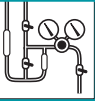
- G. Emergency System Shut Down Controller: Provide a electronic control station with sensors and solenoid valve that activates two pneumatic gas valves.
- H. Gas Detection: Provide detection scanner capable of scanning for flammable and toxic gases.

PART 3 - EXECUTION

3.1 INSTALLATION AND CLEANING

- A. General: Install compressed gas cylinder cabinets in accordance with manufacturer's instructions, at locations indicated on contract drawings. Connect piping and vent lines to cabinet. Connect and balance exhaust air flow rates. Connect sprinkler heads.
- B. General: Install all items plumb, level, properly aligned, rigid, and securely anchored to building.
- 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



Gas Cylinder Cabinets Model 1170 Series

Matheson Model 1170 is our standard gas cabinet series with a flat top design. The new construction is optimized for economy, without compromising safety or quality.

- **Automatic door closure** to ensure containment of leaks
- **Modular U-Channel Supports** make installation of gas control panels, cylinder supports, shelving, and other equipment easy.
- **Lockable access panel and wire reinforced safety glass viewing window** have steel frames and are fully gasketed.
- **Non-protruding paddle type latch** prevents accidental opening and snagging. It slams and latches at three points and is fitted with a lock for security.
- **Neoprene gaskets** fit snugly around door to ensure a positive seal
- **Standard inlet air louver or optional diffuser plate** fitted with an inlet filter (p/n VEN-0101-XX) lets air into the cabinet.
- **Flat-top design** with exhaust stack.
- **Fire sprinkler head**, for extra protection with a fuse rating of 155°F.
- **Cylinder restraints** to ensure that all cylinders are held securely in place during storage and operation
- **Rugged exterior construction** of 12-gauge cold rolled steel with welding seams.
- Interior and exterior is finished with gray **2-part polyurethane paint**.
- **Low profile, one-inch reinforced threshold** makes cylinder installation and removal easy.

Specifications for Model 1170 Series and Hard Hat Series (Meet or exceed Article 80 UFC requirements)

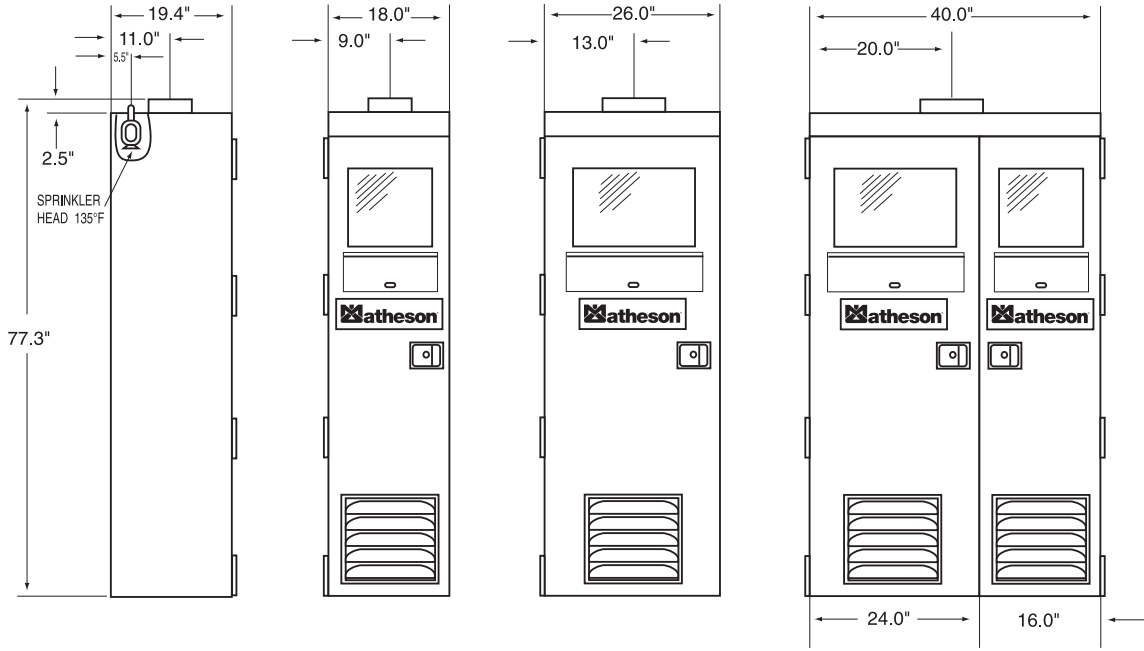
Cabinet:	12 gauge cold rolled steel
Gaskets:	Neoprene with oil resistant adhesive
Window:	1/4" wire reinforced safety glass
Paint:	2-part polyurethane; interior and exterior – light gray
Cabinet Floor:	Zinc-plated steel
Doors:	1 and 2 cylinder cabinets – one door with left hand hinge 3 cylinder cabinet – double door with off-center post
Integral Sprinkler:	Fuse rating of 155°F and flow capacity of 35 GPM @ 40 psi
Water Pipe Connection:	1/2" NPT Female



Model No.	Cabinet Type	Overall Height	Depth	Width	Exhaust Flow Required (SCFM)	Exhaust Stack Diameter	Shipping Weight lbs
1177F	1 Cylinder	79"	19"	18"	175	4"	300
1178F	2 Cylinder	79"	19"	26"	250	6"	380
1179F	3 Cylinder	79"	19"	40"	450	8"	540



Gas Cabinet Dimensions and Options
 Model 1170 Series



Gas Cabinet Options

- **Adjustable Cylinder Shelf (see table for part number)** – mounted on the U-Channel tracks. The shelf provides a convenient means of installing small cylinders. Perforations in the shelf allow cabinet air to sweep around the entire cylinder.
- **Fusible Link (see table for part numbers)** – installed in the center of the cabinet door. Offers immediate response in the event of a fire. Once the heat melts the fusible link, a guillotine damper blocks the inlet air supply.
- **Cylinder Scales** – recommended for use with all liquefied gases. Provides the weight of contents remaining in the cylinders. Manual and electronic cylinder scale models are available. (See pages 431 - 432)

Model No.	Description
1190-S	Adjustable cylinder shelf
1177F-6	Fusible link for Model 1177F
1178F-6	Fusible link for Model 1178F
1179F-6	Fusible link for Model 1179F
VEN-0101-XX	Optional diffuser plate with inlet air filter



PAN-5000 Series Analytical Grade Gas Distribution Panels *(continued)*

O₂ - OXYGEN

H₂ - HYDROGEN

NH₃ - AMMONIA

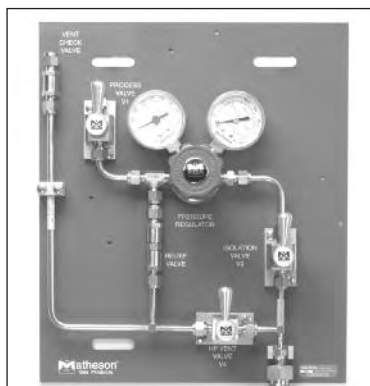
CH₄ - METHANE

1-Valve Panel Model PAN-5100



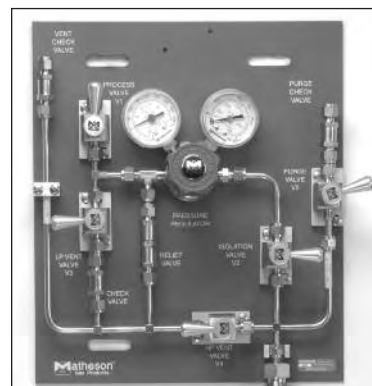
This most basic panel design offers a pressure regulator and process on/off control valve. Connection to the gas supply is conveniently made using a standard stainless steel flexible hose. This panel is recommended when using inert gases with processes that do not require purge capability. Available with CGA 320, 326, 346, 540, 580 or 590. Each CGA contains an integral check valve.

3-Valve Panel Model PAN-5300



The 3-valve panel provides a pressure regulator with both a process on/off control valve and a high pressure vent valve, allowing total isolation of the regulator, as well as the ability to purge contaminants that may have been introduced by changing cylinders. The vent line is protected from back flow by a check valve downstream of the vent valve. This panel is recommended when using non-toxic, non-corrosive, and non-pyrophoric gases with processes that require the additional purity that a high pressure purge is capable of supplying. Available with CGA 320, 326, 350, 510, 540, 580 or 590. Each CGA contains an integral check valve.

5-Valve Panel Model PAN-5500



The 5-valve panel provides all the same features as a 3-valve panel with the addition of a low-pressure vent valve, and adds the safety feature of being able to cycle purge the panel with an inert gas prior to disconnecting the cylinder. This panel provides the safety needed to handle toxic, semi-corrosive and flammable gases. The 5-valve panel is available with an optional venturi for vacuum evacuation of the panel during purging. The 5-valve panel is available with CGA 320, 326, 330, 350, 510, 540, 580, 590 or 660. Unlike the 1- and 3-valve designs, CGA's do not contain integral check valves.

Gas Delivery Equipment

Ordering Information

Model Series	Number of Valves	Delivery Pressure	Venturi Option	CGA	Option Package
PAN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MODEL SERIES

5 = PAN-5000 Series

NUMBER OF VALVES

1 = 1-Valve Panel
 3 = 3-Valve Panel
 5 = 5-Valve Panel

DELIVERY PRESSURE

0 = 30 psig
 1 = 100 psig

VENTURI OPTION

0 = No
 1 = Yes (Available on 5-valve panel only)

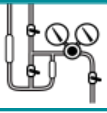
CGA - Select from the following available CGAs

1-Valve Panel: 320, 326, 346, 540, 580, 590
 3-Valve Panel: 320, 326, 350, 510, 540, 580, 590
 5-Valve Panel: 320, 326, 330, 350, 510, 540, 580, 590, 660

NOTES: 510 CGA *NOT* for acetylene service
 660 CGA *NOT* for ammonia service
 CGA's for 1-valve and 3-valve panels come with integral check valve
 No integral check valve in CGA for 5-valve panel

OPTION PACKAGE

0 = None
 A = Auto Shutdown (EFS, ESO, GSM-4)
 V = Excess Flow Valve
 X = Excess Flow Switch



Model GSM-12

Emergency Shutdown System Controller

Description

The GSM-12 Electronic Shutdown System is designed to provide the ultimate in safety when using flammable, toxic or reactive gases.

The GSM-12 consists of an electronic control station, a system of sensors that read various conditions and solenoid valves which activate up to two pneumatic valves in the gas system, which are typically installed at the inlet to the process gas manifold. The controller is programmed to monitor a large number of sensors and will automatically alarm, or alarm and shutdown, if a particular condition warrants an action. The controller also has an **ABORT** button on the front panel for manual shutdown. The specific sensor shutdown conditions are programmed into the system at the factory. Delay times between when a fault condition is first sensed and when an actual shutdown or alarm occurs, have been programmed to avoid any nuisance alarm tripping. Typical sensors offered with this system are listed below.



Typical Sensors used with GSM-12

- High Delivery Pressure
- Excess Flow
- Exhaust Failure
- Low Cylinder Contents (by pressure or weight)
- Process Line Containment
- Gas Detector Warning
- Gas Detector Alarm
- Fire Detector
- Remote Start
- Remote Shutdown

All of these sensors are available through Matheson, and are ordered separately.

Ordering Information

Model	Description
GSM-12	ESO Controller
FF4384C	Air Actuated Valve (1/4" NPT Female Inlet & Outlet)

Options

Exhaust pressure switch
Excess Flow sensor
Fire detection sensors
Gas sensors/detectors for various gases
Gas pressure sensors & cylinder scales
Gas cabinets (1, 2 and 3 cylinder capacity)
Gas distribution manifolds and switchover systems





GasScanner

Fixed Gas Detection Series



GS-1C



GS-2C



GS-4C



GS-8C

Introduction

The GasScanner Series is a powerful, low cost fixed gas detection system that is available for one, two, four or eight points of gas detection. It is microprocessor controlled, versatile, simple to install and operate, and priced to be the industry's best value gas detection controller.

It is capable of accepting Matheson Tri-Gas sensors for LEL level combustibles, oxygen, CO₂, corrosives, and toxic gases.* The GasScanner can also accept any 4-20 mA transmitters (2 or 3 wires, 24 VDC). Sensors can be mounted directly at the GasScanner housing, or can be wired remote from the controller.

The 10 amp rated relay contacts are strong enough to directly control external alarms and horns. The digital display has backlighting and simultaneous readout of the gas type and concentration.

The Gas Scanner is housed in a NEMA 4X rated case for a weather tight seal. This case design complies with lock out / tag out standards and can be fully secured. An external reset switch allows the alarm to be silenced from outside of the controller housing. Gas Scanner ships complete with a wall mounting kit for easy installation. Matheson Tri-Gas offers the industry's widest selection of standard and toxic gas detection sensors, which can be utilized with the Gas Scanner, providing gas-monitoring protection for almost any application.

Features

- Low cost versatile solution
- Easy to install, operate and expand
- Compact, weatherproof, NEMA 4X enclosure
- 115/220 VAC
- Audible alarm with reset button
- Built-in trouble alarm with relay
- Relay rating 10 amps, form C
- Provides 4-20 mA output
- Two programmable alarm levels
- Simultaneous readout on one, two, four or eight channels.
- Accepts any 4-20 mA transmitter
- CCSAUS Electrical Approval
- Accepts sensors for LEL, O₂, H₂S, CO, and CO₂ as well as toxic sensors*
- Long life sensors (2+ years typical)

* See Sensor list for available gases

Ordering Information

Model Number	Description
GS-1C	One Channel Controller
GS-2C	Two Channel Controller
GS-4C	Four Channel Controller
GS-8C	Eight Channel Controller



411b GSS Series

GasScanner Sample Diffusion Transmitters



Description

The GSS Series Gas Scanner Diffusion Transmitters are highly reliable and very cost effective for the detection of common gas hazards. The GSS Series Transmitters are available for LEL, O₂, H₂S, CO and for various fuels or solvents. These detector assemblies are rated for for Class1, Div. 1 Group B, C & D atmospheres. The only tools required to calibrate the GSS Series are a voltmeter, a screwdriver, and a cylinder of calibration gas. Field calibrations can be performed easily and quickly by one person.

The GSS Series Diffusion Transmitters are ideal for ether indoors or outdoors. The flame arrestor utilizes a patented water repellent coating. Splashguards are also available for use in very wet environments. The transmitters operate from 24 VDC (10.5 DC to 30 VDC), and provide a 4-20 mA signal that can be connected to a wide variety of controllers.

Features

- Explosion Proof Housing Class 1, Div 1, Group B, C, & D
- Available for LEL, O₂, CO, H₂S
- Infrared sensors available for combustibles and CO₂
- Special CO sensor without H₂ interference available as an option
- Cost effective
- 24 VDC operation
- LEL Sensors – UL approved. CO, H₂S, O₂ – CCSAUS Electrical Approval

Ordering Information

Model Number	Description
TGSS-C2H2	ACETYLENE, 100% LEL, Diffusion Transmitter
GSS-C4H6	BUTADIENE, 100% LEL, Diffusion Transmitter
GSS-C4H10	BUTANE, 100% LEL, Diffusion Transmitter
GSS-CO2	CARBON DIOXIDE, 5000 ppm, Diffusion Transmitter
GSS-CO	CARBON MONOXIDE, 300 ppm, Diffusion Transmitter
GSS-D2	DEUTERIUM, 100% LEL, Diffusion Transmitter
GSS-DSLFL	DIESEL FUEL, 100 % LEL, Diffusion Transmitter
GSS-ETHNL	ETHANOL, 100% LEL, Diffusion Transmitter
GSS-FLOL	FUEL OIL, 100% LEL, Diffusion Transmitter
GSS-GASLN	GASOLINE, 100% LEL, Diffusion Transmitter
GSS-C6H14	HEXANE, 100% LEL, Diffusion Transmitter
GSS-H2	HYDROGEN, 100% LEL, Diffusion Transmitter
GSS-H2S	HYDROGEN SULFIDE, 100 ppm, Diffusion Transmitter
GSS-C4H10	ISOBUTANE, 100% LEL, Diffusion Transmitter
GSS-C4H8	ISOBUTYLENE, 100% LEL, Diffusion Transmitter
GSS-ISPRPNL	ISOPROPANOL, 100 % LEL, Diffusion Transmitter
GSS-CH4	METHANE, 100% LEL, Diffusion Transmitter
GSS-MTHNL	METHANOL, 100% LEL, Diffusion Transmitter
GSS-CH4NG	NATURAL GAS, 100% LEL, Diffusion Transmitter
GSS-O2	OXYGEN, 0-25%, Diffusion Transmitter
GSS-C5H12	PENTANE, 100% LEL, Diffusion Transmitter
GSS-C3H8	PROPANE, 100% LEL, Diffusion Transmitter
GSS-C3H6	PROPYLENE, 100% LEL, Diffusion Transmitter



GSM Series

GasScanner Stand Alone Diffusion Transmitters



Description

The GSM Series is a state of the art transmitter that can operate as an independent, stand alone system or as part of a system connected with an analog signal to a GasScanner controller. The GSM Series detects LEL combustibles, O₂, H₂S, CO, and CO₂. These detector assemblies are rated for Class 1, Division 1, Group B, C and D atmospheres. It utilizes a magnetic wand technique for performing non-intrusive calibration. The GSM Series provides an automatic zero drift correction feature, which results in more stable readings and reduces the need for adjustments due to sensor aging.

The housing of the GSM does not need to be opened for zeroing or calibration, making it unnecessary to declassify the area for routine maintenance. It is designed so that a complete field calibration can be performed by one person. The stainless steel flame arrestor housing that covers the sensor (LEL, H₂S, or CO) is water repellent with a special patented water resistant coating.

Features

- Direct digital readout
- Monitors combustibles, H₂S, CO and O₂
- Catalytic and infrared option for LEL detection
- H₂ specific version available
- Operates independently or with any controller, PLC or DCS
- Non-intrusive calibration via magnetic wand
- 2 programmable alarm relays, plus fail relay
- Explosion proof housing
- UL version for LEL (standard)
- LEL Sensors – UL approved. CO, H₂S, O₂ – cCSAus Electrical Approval

Ordering Information

Model Number	Description
GSM-C2H2	ACETYLENE, 100% LEL, Diffusion Transmitter
GSM-C4H6	BUTADIENE, 100% LEL, Diffusion Transmitter
GSM-C4H10	BUTANE, 100% LEL, Diffusion Transmitter
GSM-CO2	CARBON DIOXIDE, 5000 ppm, Diffusion Transmitter
GSM-CO	CARBON MONOXIDE, 300 ppm, Diffusion Transmitter
GSM-D2	DEUTERIUM, 100% LEL, Diffusion Transmitter
GSM-DSLFL	DIESEL FUEL, 100 % LEL, Diffusion Transmitter
GSM-ETHNL	ETHANOL, 100% LEL, Diffusion Transmitter
GSM-FLOL	FUEL OIL, 100% LEL, Diffusion Transmitter
GSM-GASLN	GASOLINE, 100% LEL, Diffusion Transmitter
GSM-C6H14	HEXANE, 100% LEL, Diffusion Transmitter
GSM-H2	HYDROGEN, 100% LEL, Diffusion Transmitter
GSM-H2S	HYDROGEN SULFIDE, 100 ppm, Diffusion Transmitter
GSM-C4H10	ISOBUTANE, 100% LEL, Diffusion Transmitter
GSM-C4H8	ISOBUTYLENE, 100% LEL, Diffusion Transmitter
GSM-ISPRPNL	ISOPROPANOL, 100 % LEL, Diffusion Transmitter
GSM-CH4	METHANE, 100% LEL, Diffusion Transmitter
GSM-MTHNL	METHANOL, 100% LEL, Diffusion Transmitter
GSM-CH4NG	NATURAL GAS, 100% LEL, Diffusion Transmitter
GSM-O2	OXYGEN, 0-25%, Diffusion Transmitter
GSM-C5H12	PENTANE, 100% LEL, Diffusion Transmitter
GSM-C3H8	PROPANE, 100% LEL, Diffusion Transmitter
GSM-C3H6	PROPYLENE, 100% LEL, Diffusion Transmitter



411d GSK Series

GasScanner Sample Draw Transmitters



Description

The GSK Series is a complete sample draw gas monitor, including digital readout and alarm relays. The GSK Series is equipped with a new smart gas sensor technology using an intelligent sensor for remote location calibration and setup. These new smart sensors also double calibration interval requirements to once a year, which equates to reduced maintenance cost. In addition, the sensors can be calibrated away from the gas detector installation, for example in a service area or offsite. This eliminates the inconvenience of bringing calibration gases into the fab or monitoring location. GSK Series easily connects to existing GasScanner Control Boxes 1C- 8C or to PLC systems and is ideal for applications needing a local readout or a relay control for activating other devices.

Features

- Digital display (LED) for gas concentration
- Sensor information and calibration is stored within sensor memory
- Long life sensors
- Zero suppression and correction
- Smaller housing design for narrow wall mounting locations
- Self-diagnostic functions by microprocessor
- Electrochemical sensors for wide selection of toxic gases
- Built-in sampling pump
- Easy replacement of pump and sensor
- Two alarm levels, plus trouble alarm with relays
- 24 VDC operation

Ordering Information

Model Number	Description
GSK-NH3	AMMONIA, 75 ppm, Sample Draw Transmitter
GSK-ASH3	ARSINE, 0.2 ppm, Sample Draw Transmitter
GSK-BCL3	BORON TRICHLORIDE, 5 ppm, Sample Draw Transmitter
GSK-BF3	BORON TRIFLUORIDE, 9 ppm, Sample Draw Transmitter
GSK-CO	CARBON MONOXIDE, 150 ppm, Sample Draw Transmitter
GSK-CL2	CHLORINE, 1.5 ppm, Sample Draw Transmitter
GSK-CLF3	CHLORINE TRIFLUORIDE, 0.6 ppm, Sample Draw Transmitter
GSK-B2H6	DIBORANE, 0.3 ppm, Sample Draw Transmitter
GSK-DCS	DICHLOROSILANE, 15 ppm, Sample Draw Transmitter
GSK-SI2H6	DISILANE, 15 ppm, Sample Draw Transmitter
GSK-F2	FLUORINE, 3 ppm, Sample Draw Transmitter
GSK-HBR	HYDROGEN BROMIDE, 9 ppm, Sample Draw Transmitter
GSK-HCL	HYDROGEN CHLORIDE, 15 ppm, Sample Draw Transmitter
GSK-HF	HYDROGEN FLUORIDE, 9 ppm, Sample Draw Transmitter
GSK-H2S	HYDROGEN SULFIDE, 30 ppm, Sample Draw Transmitter
GSK-NO2	NITROGEN DIOXIDE, 15 ppm, Sample Draw Transmitter
GSK-O3	OZONE, 0.6 ppm, Sample Draw Transmitter
GSK-PH3	PHOSPHINE, 1 ppm, Sample Draw Transmitter
GSK-SIH4	SILANE, DH SENSOR, 15 ppm, Sample Draw Transmitter
GSK-WF6	TUNGSTEN HEXAFLUORIDE, 9 ppm, Sample Draw Transmitter
GSK-NF3	NITROGEN TRIFLUORIDE, 30 ppm, With Pyrolyzer, Sample Draw Transmitter

SECTION 12 56 53.13
PAINTED METAL LABORATORY CASEWORK

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 "Gypsum Board Assemblies" for sheet metal fastening ground in gypsum board partitions for anchoring laboratory casework.
2. Division 09 Section "Resilient Wall Base and Accessories" for resilient base applied to metal laboratory casework.
3. Division 11 Section 11 53 13 "Laboratory Fume Hoods" for fume hoods.
4. Division 11 Section 11 53 43, "Laboratory Service Fittings and Fixtures".
5. Division 11 Section 11 53 33, "Laboratory Safety Equipment".
6. 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 1, 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 butyryl 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. 1-3/4" 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. Casters: 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) Naphthalene
- 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-fired, 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".

2. Match Architect's sample.

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