DRAWING AND SPECIFICATION TRANSMITTAL LOCKWOOD GREENE ENGINEERS. INC.

SPARTANBURG. SOUTH CAROLINA 29304 P.O. 30X 491 (803)582-2351

TO Naval Facilities Engineering Command Bldg N-26

Atlantic Division Norfolk, Va. 23511

DATE JOB NO. JOB NAME

8/22/80 77239.16 Naval Regional Medical Center TRANSMITTAL NO

SHEET OF ORDER NO. Contract No:

N-62470-77-C-7526

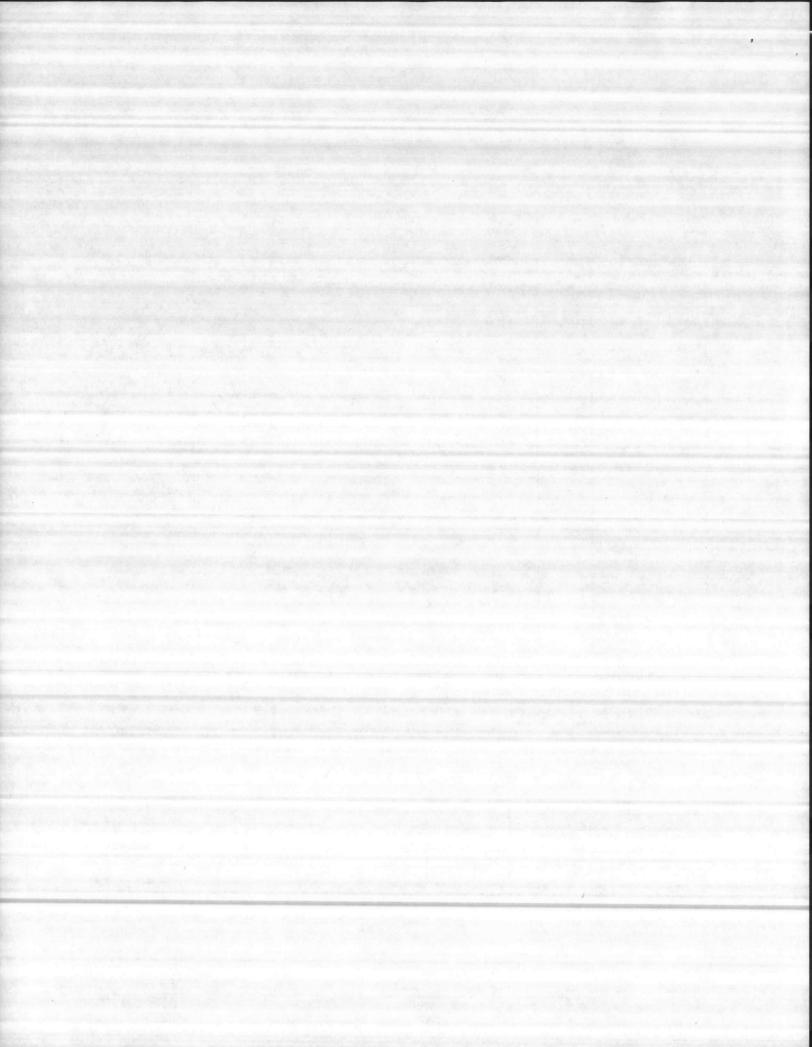
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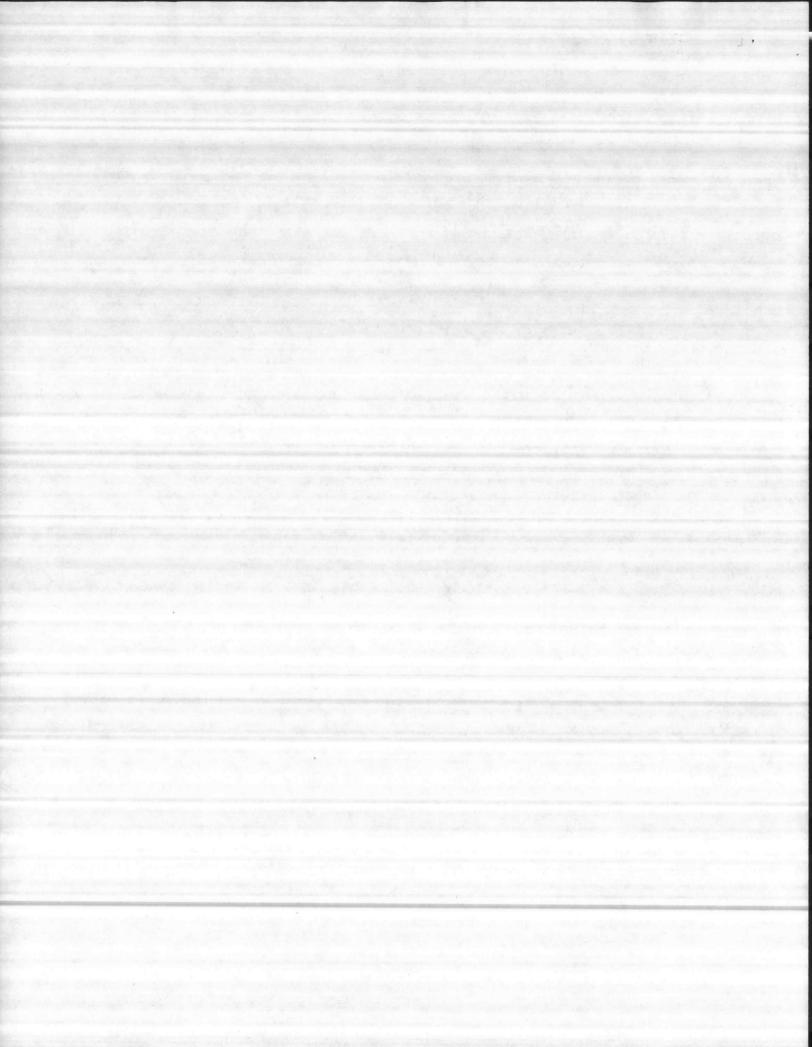
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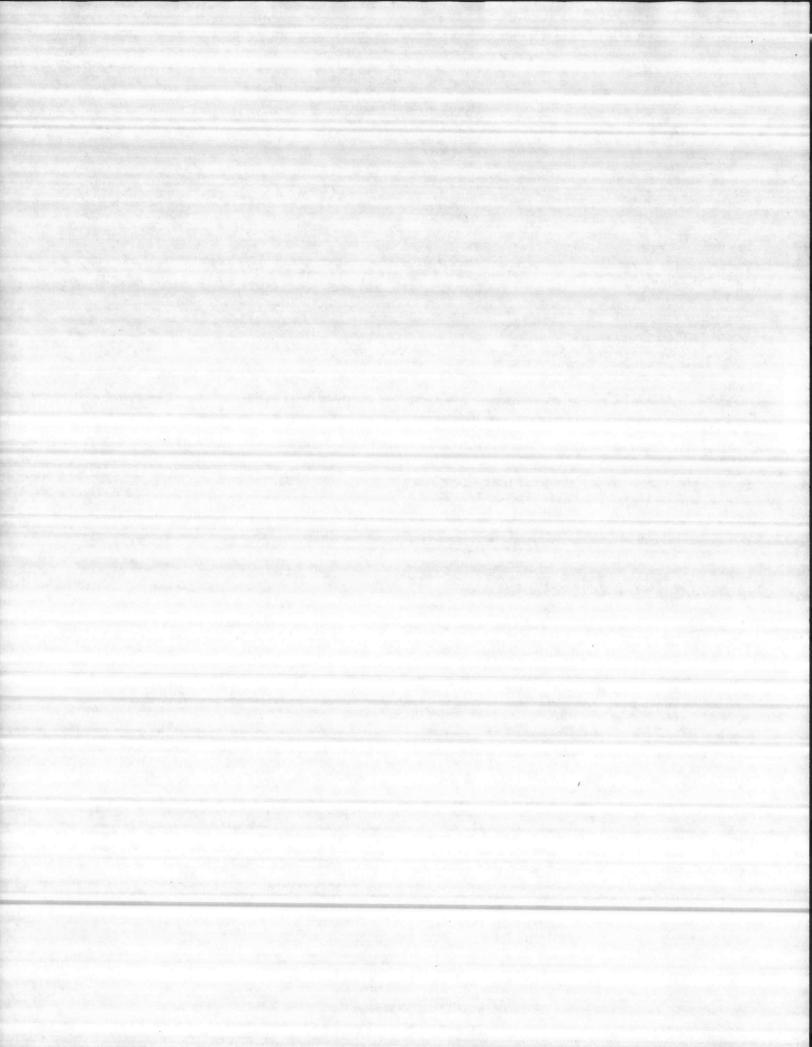
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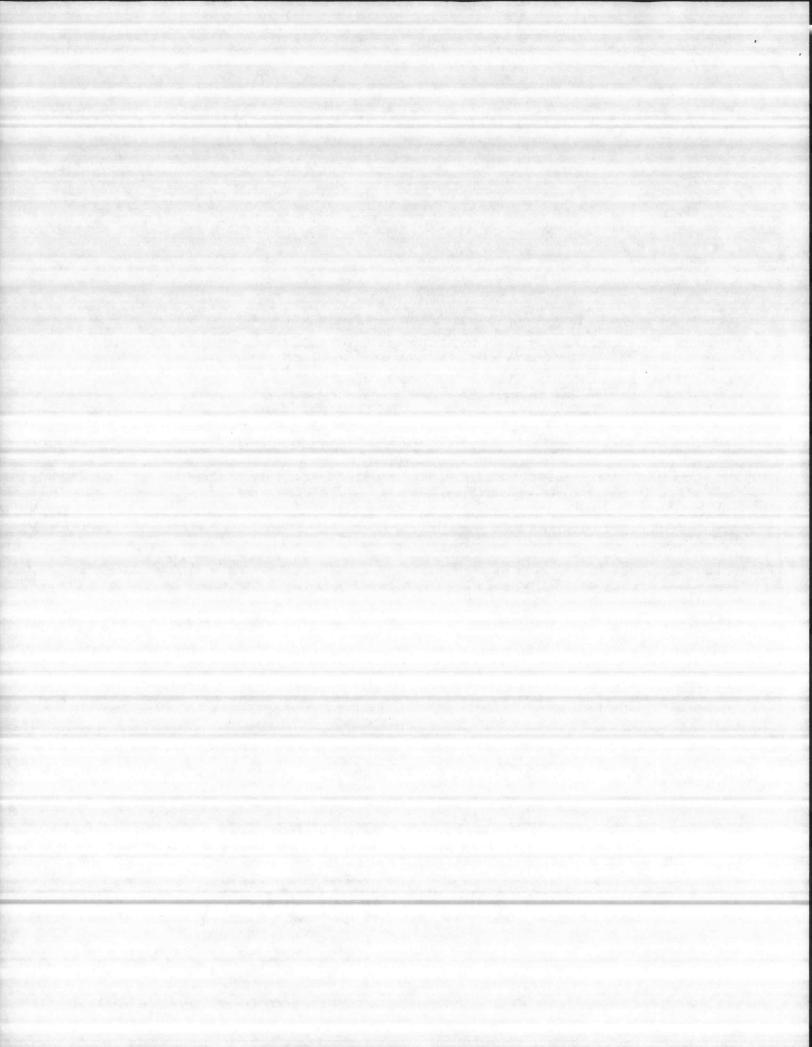
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"It is h marked in this submittal is that approved/prop i to be incorporated into Contract Number _____, is in compliance the the contract drawings and specifications, and can interest in dia the al' coted spices, and is (approved for use) (salattid for Gover ent approval). CARDINAL CONTRACTING CO.

Authorized R. viewer _____ Date _____ Date _____ Date _____ Date _____ Signature CQC Rep ______ Date _____ S-15-8.6

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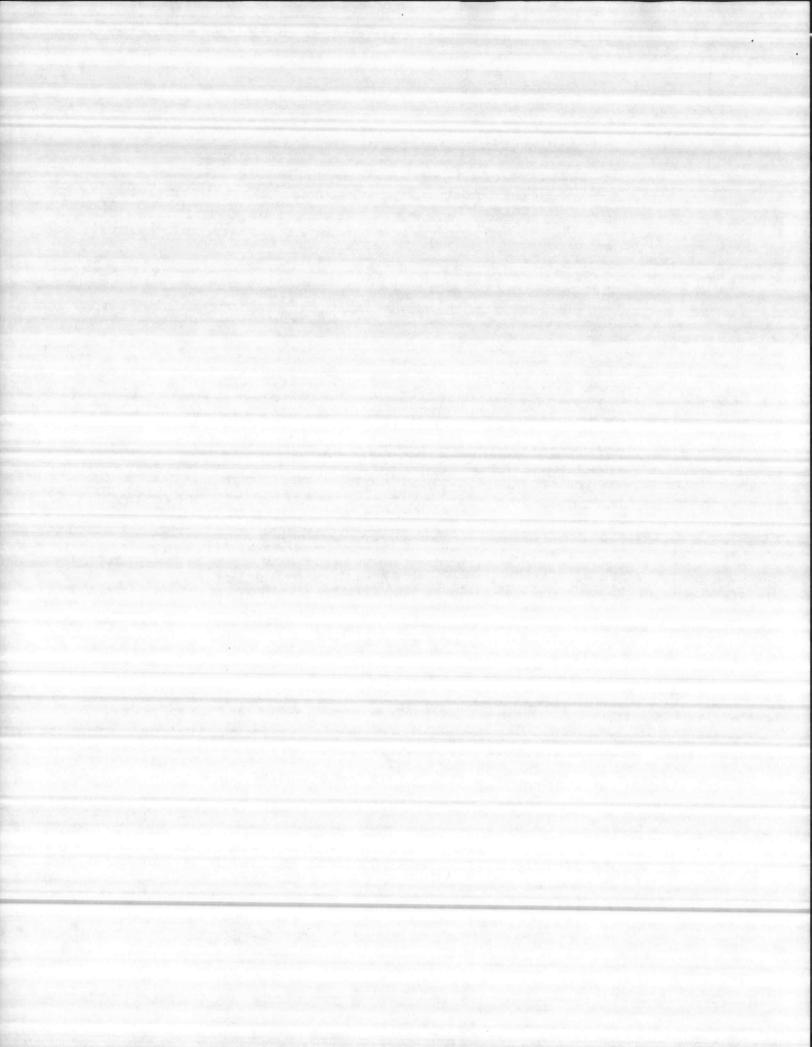




RH. 953444 LABORATORY FUME HOODS - VECTAIRE DESIGN

11.1. GENERAL REQUIREMENTS

- Laboratory fume hoods shall function as ventilated, enclosed work spaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
- Laboratory fume hoods shall provide safe operation when properly installed and connected to an exhaust system that provides the proper exhaust air volume to permit the fume hood to operate at the specified face velocity.
- Fume hoods shall be designed for consistant and safe air flow through hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in, this specification.
- Fume hood prototype evaluation of the manufacturer's standard product when required, shall take place in the manufacturer's test facility with samples, apparatus, instruments and test materials to be supplied by the manufacturer at no cost to the owner or his representative. Test procedures shall follow the format included in this specification. At his option, the owner may verify data with his instruments, providing instrument suitability and calibration are mutually acceptable.
- 5. Field evaluation procedures, when required, shall be a separate contract and shall follow the format included in this specification.
- Instructions covering safe and proper operation of the 6. fume hood shall be provided in two forms:
 - A corrosion resistant metal 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.
 - Written instructions in booklet form providing B. additional details on safe and proper operation and maintenance.
 - Samples of A and B above shall be submitted to the owner upon his request for his review and approval before proceeding.

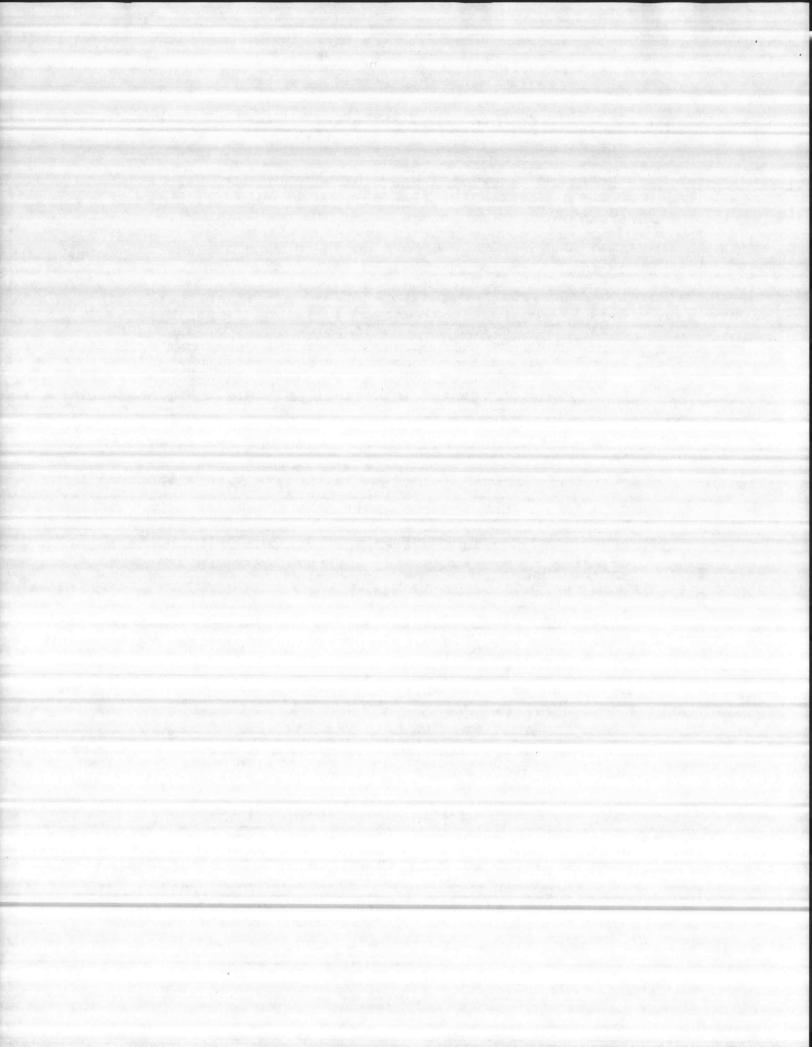


- 11.2. MATERIALS
 (NOTE TO SPECIFIER: SELECT AS REQUIRED)
 - Resisto Roc shall be a chemically resistant compound of asbestos fibers and Portland Cement, built up under pressure into a dense and rigid monolithic sheets with a dry density of 90 to 100 pounds per cubic foot, an average Modulus of Rupture of 4,500 P.S.I., and a Brinell hardness of 18 - 25 (500 kg. load, 10mm Ball, 10 seconds.
 - 2. Fume hood product numbers which include the suffix letter "F" shall have all interior liner surfaces, including both baffle surfaces, covered with a chemical fume and splash resistant three coat finish, consisting of a prime coat, a pigmented coat and a final sealer coat. Finish shall be baked between coats, sanded and wiped prior to the application of the next coat. Final appearance shall be smooth and light silver gray in color. Surface reflectance as measured by 45 degree reflectometer standardized at 21 and 40.2 shall be 35 percent minimum.
 - 3. Fume hood product numbers which include the suffix letter "E" shall have all interior liner surfaces, including both baffle surfaces covered with a chemical fume and splash resistant three coat finish consisting of a prime coat and two additional coats. Finish shall be baked, sanded, and wiped between coats. Final appearance shall be off-white. Surface reflectance as measured by 45 degree reflectometer standardized at 21 and 40.2 shall be 65 percent minimum.
 - 4. Interior finish "F" and "E" or finishes purported to be equal shall pass a chemical fume and splash test with a maximum of two fair or failure classifications. Test procedure is as follows:
 - A. Test No. 1 Spills and Splashes

Suspend a 42" by 12" panel (42" dimension horizontal) in a position to expose the surface to be tested in a vertical plane. Divide the panel vertically into 3/4" spaces with each space numbered from 1 to 49.

Using an eye dropper, apply five drops of each reagent as listed.

Liquid reagents shall be applied at the top of the panel and permitted to flow down full panel height. (CAUTION! Flush away any reagent drops.)



B. Test No. 2 - Fumes and Gases

Prepare a panel 24" x 12" by dividing panel into 2" squares. Number each square from 1 to 49. Using 100 milliliter beakers place 25 milliliters (approximately 1/2 inch of reagent) into each beaker. Place beakers in position so that test panel may be placed over beaker tops in the proper sequence. Place panel over beakers. Note: Beaker pouring lip permits atmospheric oxygen to enter and participate in the reaction of the reagent fumes.

C. After a 24 hour time period has elapsed, remove panel, flush off with water, clean with naphtha and detergent, rinsed and wiped dry. Evaluate.

D. EVALUATION RATINGS:

No Effect - No detectable change in surface material.

Excellent - Slight detectable change in color or gloss, but no change to the function or life of the surface material.

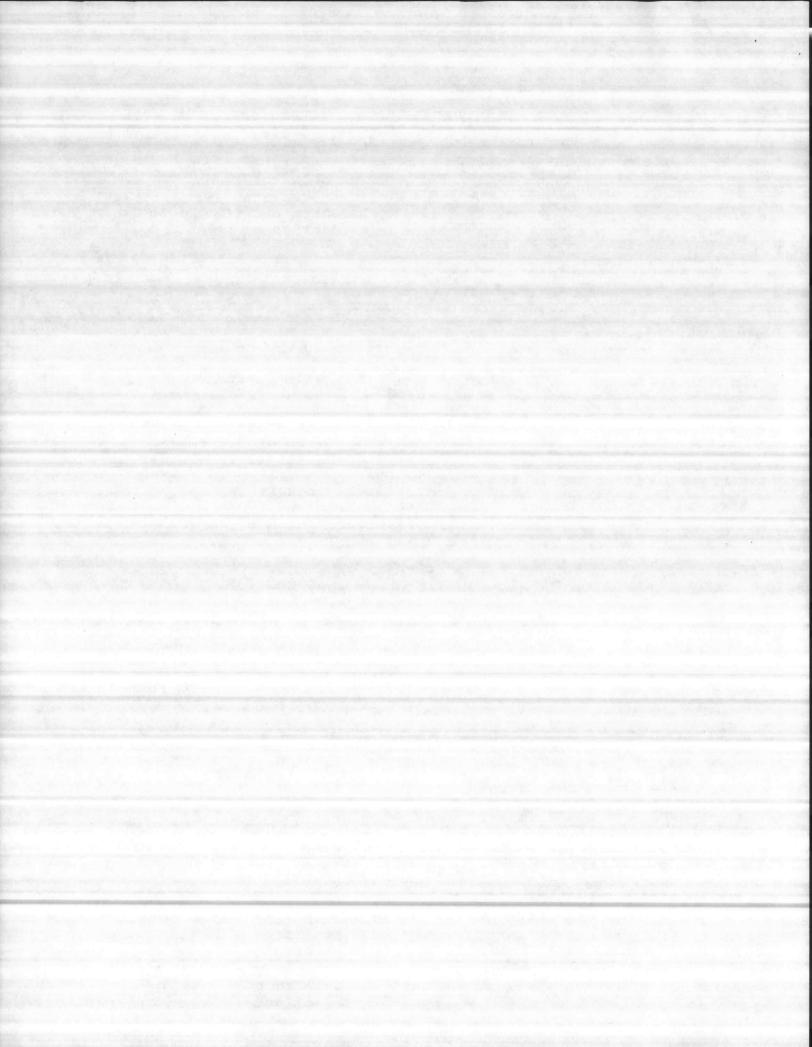
Good - A clearly discernable change in color or gloss, but no significant impairment of surface function or life.

Fair - Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period of time.

Failure - Pitting, cratering or erosion of surface material. Obvious and significant deterioration.

E. "E" FINISH, FUME HOOD LINER, 1066 WHITE

	ENT LIST		Ratin	g /
Cond	Centrations by Weight		Spills	Funes
1.	Hydrochloric Acid	37%	No Effect	No Effect
2.	Sulfuric Acid	33%	No Effect	No Effect
3.	Sulfuric Acid	77%	No Effect	No Effect
5.	Sulfuric Acid Formic Acid	96%	No Effect	No Effect
6.	Nitric Acid	90%	No Effect	No Effect
7.	Nitric Acid	26%	No Effect	Excellent
8.	Nitric Acid	30% 70%	No Effect	Excellent
9.	Hydrofluoric Acid	48%	Excellent No Effect	Failure
10,	Phosphoric Acid	85%	No Effect	Excellent
M.	Chromic Acid	60%	No Effect	No Effect
12.	Acetic Acid	98%	No Effect	No Effect



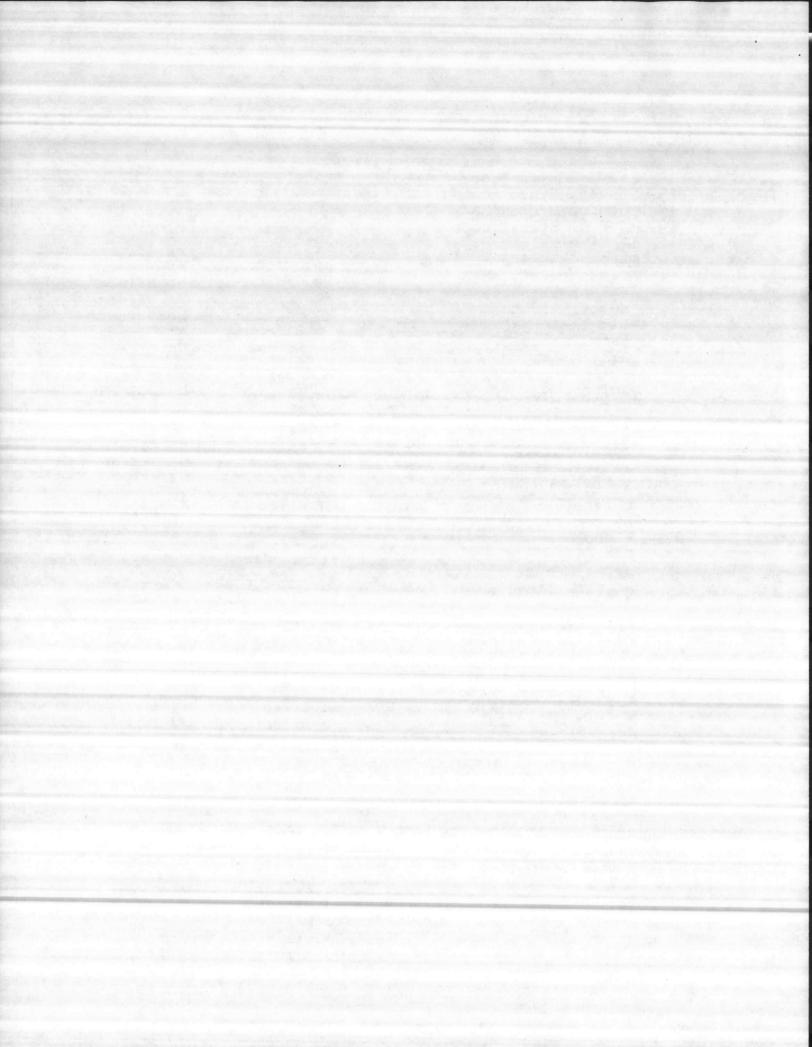
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Concentrations by Weight (continued)

13.	3 & 8 Equal Parts		No Effect	Good
14	Ammonium Hydroxide	28%	No Effect	No Effect/
15.	1	10%	No Effect	No Effect
16.		20%	No Effect	No Effect
17.	. Sodium Hydroxide	40%	No Effect	No Effect
18.	Sodium Hydroxide Flake	/6	No Effect	No Effect
19.	Sodium Sulfide		No Effect	No Effect
20.	Zinc Chloride		No Effect	
21.	Tincture of Iodine		No Effect	No Effect
22.	Silver Nitrate		No Effect	No Effect
23.	Methyl Alcohol			No Effect
24.	Ethyl Alcohol		No Effect	No Effect
25.	Butyl Alcohol		No Effect	No Effect
26.	Benzine		No Effect	No Effect
27.	Xylene		No Effect	No Effect
28.	Toluene		No Effect	No Effect
29.	Gasoline		No Effect	No Effect
30.			No Effect	No Effect
	Dichlor Acetic Acid	,	Excellent	No Effect
31.	Di Methyl Formamide	/	No Effect	No Effect
32.	Ethyl Acetate	/	No Effect	No Effect
33.	Amyl Acetate	X	No Effect	No Effect
34.	Acetone	/	No Effect	No Effect
	Chloroform /	1	No Effect	No Effect
36.	Carbon Tetrachloride		No Effect	No Effect
37.	Phenol		No Effect	No Effect
38.	Cresol /		Fair	No Effect
39.	Formaldehyde /		No Effect	No Effect
40.	Trichlorethylene		No Effect	No Effect
41.	Ethyl Ether		No Effect	
42.	Furfural /		No Effect	No Effect
43.	Methylene Chloride		No Effect	No Effect
44.	Mono Chlor Benzene			No Effect
45.	Dioxane		No Effect	Wo Effect
46.	Methyl Ethyl Ketone		No Effect	No Effect
47.	Acid Dichromate		No Effect	No Effect
48./	Hydrogen Perenida		No Effect	No Effect
48.	Hydrogen Peroxide		No Effect	No Effect
7.	Naphthalene		No Effect	No Effect

"F" FINISH, FUME HOOD LINER, 1245 PMA

	ENT LIST entrations by Weight		Spills Rati	ng <u>Fumes</u>
	Hydrochloric Acid Sulfuric Acid Sulfuric Acid Sulfuric Acid Formic Acid Nitric Acid Nitric Acid Nitric Acid	37% 33% 77% 96% 90% 20% 30% 70%	No Effect	No Effect Failure
9.	Hydrofluoric Acid	48%	No Effect	Excellent



REAGENT LIST

Concentrations by Weight (continued)

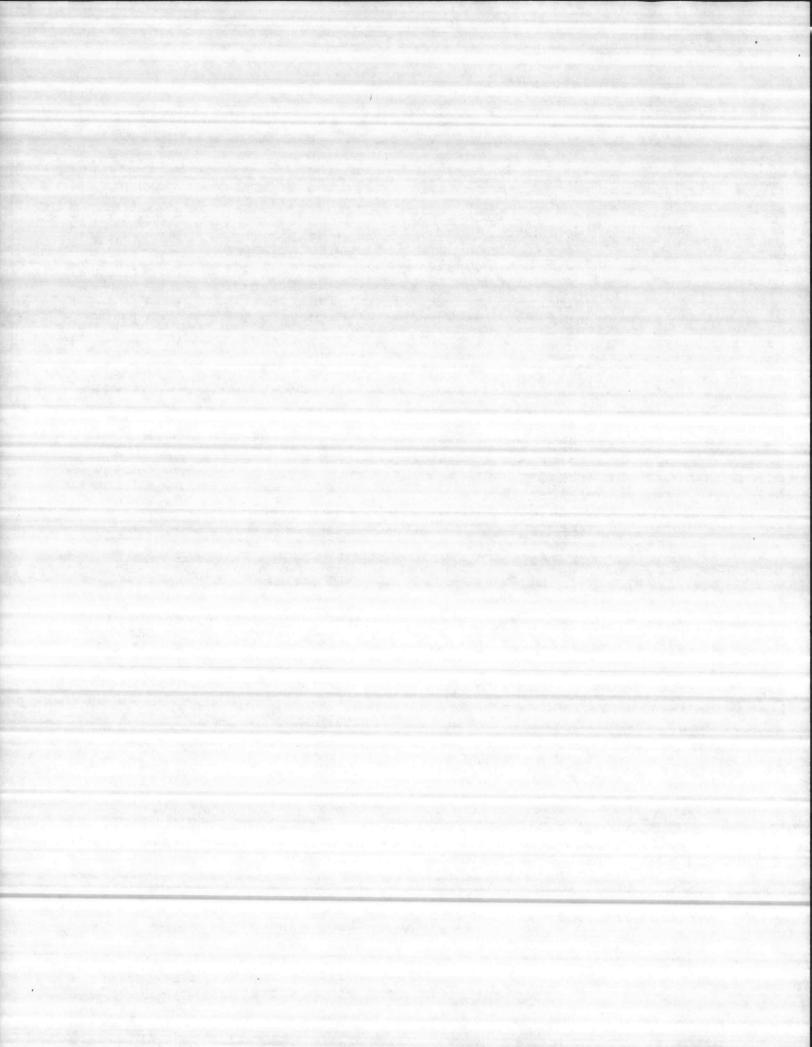
10.	Phosphoric Acid	85%	No Effect	No Effect
11.	Chromic Acid	60%	No Effect	No Effect
12.	Acetic Acid	98%	No Effect	No Effect
13.	3 & 8 Equal Parts	/6	No Effect	Excellent
14.	Ammonium Hydroxide	28%	No Effect	No Effect
15.	Sodium Hydroxide	10%	No Effect	No Effect
16.	Sodium Hydroxide	20%	No Effect	
17	Sodium Hydroxide	40%	No Effect	No Effect
18.	Sodium Hydroxide Flake	10/0	No Effect	No Effect
19.	Sodium Sulfide		No Effect	No Effect
20.	Zinc Chloride		No Effect	No Effect
21.	Tincture of Iodine		No Effect	No Effect
22.	Silver Nitrate		No Effect	No Effect
23.	Methyl Alcohol			No Effect
24.	Ethyl Alcohol		No Effect	No Effect
25.	Butyl Alcohol		No Effect	No Effect
26.	Benzine		No Effect	No Effect
27.	Xylene		No Effect	No Effect
28.	Toluene		No Effect	No Effect
29.	Gasoline		No Effect	No Effect
30.	Dichlor Acetic Acid		No Effect	No Effect
31.			Fair	No Effect
32.	Di Methyl Formamide Ethyl Acetate		No Effect	No Effect
33.			No Effect	No Effect
34.	Amyl Acetate Acetone		No Effect	No Effect
35.			No Effect	No. Effect
36.	Chloroform		No Effect	No Effect
37.	Carbon Tetrachloride		No Effect	No Effect
38.	Phenol		Excellent	No Effect
39.	Cresol		Excellent	No Effect
	Formaldehyde		No Effect	No Effect
40.	Trichlorethylene		No Effect	No Effect
41.	Ethyl Ether		No Effect	No Effect
42.	Furfural		No Effect	No Effect
43.	Methylene Chloride		No Effect	No Effect
44.	Mono Chlor Benzene		No Effect	No Effect
45.	Dioxane		No Effect	No Effect
46.	Methyl Ethyl Ketone		No Effect	No Effect
47.	Acid Dichromate		No Effect	No Effect
48.	Hydrogen Peroxide		No Effect	No Effect
49.	Naphthalene		No Effect	No Effect
				222000

5. Steel shall be high quality cold rolled mild steel and shall conform to ASTM Specification No. A366. All gauges shall be U. S. Standard.

Stainless steel shall be Type 302 or 304. All gauges shall be U. S. Standard.

Safety glass shall be laminated type, 7/32" thick.

6. Screws used to attach exterior structural members shall be sheet metal type, zinc plated. Interior fastening devices shall be truss head stainless steel screws.



Exterior panel members shall be fastened by means of concealed devices. Exposed screws are not acceptable.

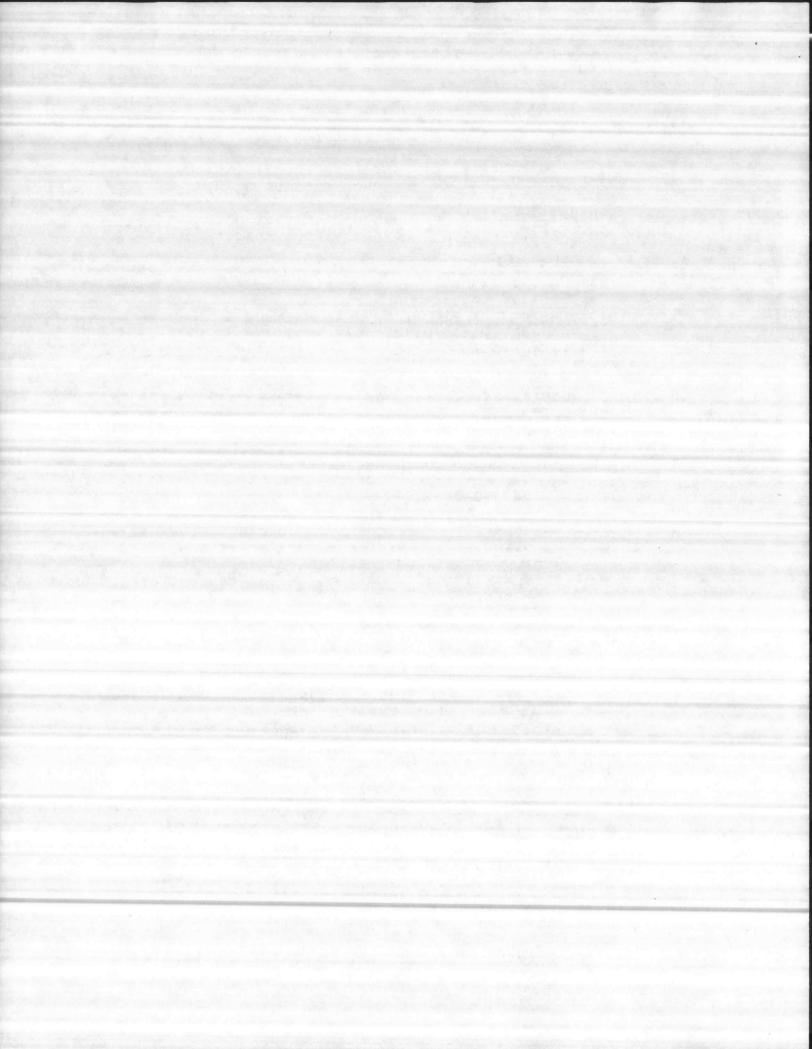
- 7. Sash cables shall be stainless steel.
- 8. Sash guides shall be corrosion resistant plastic.
- Ceiling closure panels shall be steel, finished to match hood exterior, 18 gauge minimum.
- Sash pull shall be corrosion resistant plastic, stainless steel or steel finished with a reagent resistant enamel.
- Bypass grilles shall be low resistance type, 18 gauge, directionally louvered upward.
- Pulley assembly for sash cable shall be 1-1/2" diameter nylon tired, ball bearing type, with cable retaining device.

NOTE: On wood or "fume hoods only" projects, insert steel finish specifications here and delete number 13, below.

13. Finish shall be as described for steel equipment.

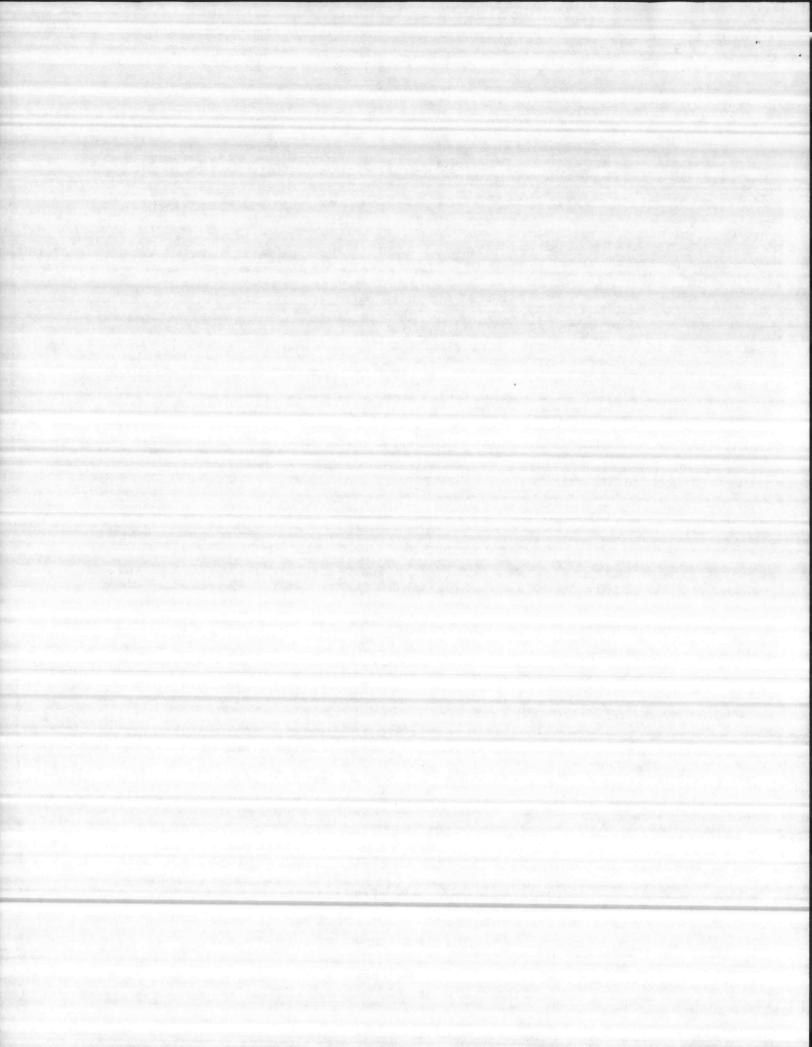
11.3. CONSTRUCTION AND DESIGN

- 1. Fume hood superstructure shall be double wall construction consisting of an outer shell of sheet steel and an inner liner of corrosion resistant material as specified. Double wall shall house and conceal steel framing members, attaching brackets and remote operating service fixture mechanisms. Frame, inner shell and outer shell shall be assembled, fastened and connected into a rigid, self-supporting entity.
- 2. Wall thickness shall be 4-7/8" maximum, providing maximum interior work area. Access to fixture valves concealed between walls shall be provided by removable panels on hood exterior, access panels on the inside liner walls, or through removable front posts.
- 3. A fluorescent light fixture shall be installed on exterior of roof. Hood roof shall have a safety glass panel sealed, cemented and caulked to isolate the light fixture from fumes and vapors. Fixture shall be largest possible for fume hood size up to 48" on six foot superstructure, two lamp, rapid start, UL listed. Eight foot superstructures shall have two 36" fixtures. Ballast shall be sound rated to limit noise level. Fixture interior shall be finished with a white, high reflecting baked enamel. Lamps shall be included.
- 4. Average interior illumination levels of the work area



shall be 80 foot candles minimum. Work area shall be defined as that area inside the superstructure from side to side and from face of baffle to the inside face of sash and from the working surface to a height of 28 inches.

- 5. Exhaust outlet shall be radiused, bell shaped and flanged, of lead coated 18 gauge steel finished with #1145 P.M.A. Hoods with stainless steel liners shall have 18 gauge stainless steel exhaust collars welded in place.
- Fume hood sash shall be full view type providing a clear and unobstructed side to side view of fume hood interior and service fixture connections. Sash shall be laminated safety glass set into a deep form, extruded Polyvinyl Chloride guide. Top and bottom sash rails shall be 2" maximum of 18 gauge steel finished with reagent resistant baked enamel. Glass shall be set into rails with Neoprene or Polyvinyl Chloride glazing channel. Bottom rail shall have an integral, formed, full width, flush pull. Top rail shall be formed to accept lead weights for fine tuning of sash for exact and positive operation. A single weight, pulley, cable, counter balance system shall be used to prevent sash tilting and permit one finger operation at any point along full width pull and to hold sash at any position without creep. Sash system shall be designed to prevent sash drop in the event of malfunction or failure of a cable. Three, four, five, six and eight foot models shall have a single sash and counter balance system. Eight foot models shall have two laminated safety glass panels separated by a reinforcing mullion. Postless sash designs shall be per drawing details. Sash shall open and close against rubber bumper stops.
- 7. Baffles shall provide controlled air vectors into and through the fume hood, and be fabricated of the same material as the liner. Exhaust slots shall be provided on the full perimeter of the baffle with top and bottom slots adjustable. A fixed, permanently open horizontal slot located 30" above the work surface shall be provided.
- 8. Baffle adjustment shall permit setting for (1) high thermal loading, (2) heavier than air gases or fumes generated near work surface, and (3) normal or average operation. Adjustment shall be instantaneous, one handed, with a single point control, accomplished while hood is in use, without disturbing apparatus. For safety, fume hood shall maintain essentially constant exhaust volume at any baffle position. Changes in average face velocity and exhaust volume as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity. Baffle designs which permit close-off of all slots or which require insertion of the operators head and shoulders for adjustment are not acceptable.



- 9. Service fixtures and fittings, mounted inside of fume hood shall consist of hose nozzle outlets and valves controlled from exterior and equipped with color coded index handles. Valves shall be needle point type with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be removable and replaceable. All service fixtures shall be provided with piping, from valve to outlet, using galvanized iron or copper for water, and black iron for gas and vacuum services. Fixture components exposed to hood interior shall be finished with fume and reagent resistant baked plastic enamel coating. Services shall be as shown or specified.
- 10. Electrical services shall be three wire grounding type receptacles rated at 125 V.A.C. at 15 amperes. 250 V.A.C. receptacles shall be provided where specified. Flush plates shall be chrome plated, stainless steel or coated with a baked plastic enamel finish.
 - 11. Work surface shall be dished a nominal one-half inch to contain spills. Fume hoods with stainless steel interiors shall have a reinforced, stainless steel work surface. Fume hoods with Resisto Roc liners shall have molded resin work surfaces. Radio chemical fume hoods shall have stainless steel work surfaces.
- 12. Fume hoods shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Measured average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums:

 Face Velocity
 Measured S.P.L. (W.G.)

 75 F.P.M.
 .30 inches

 100 F.P.M.
 .50 inches

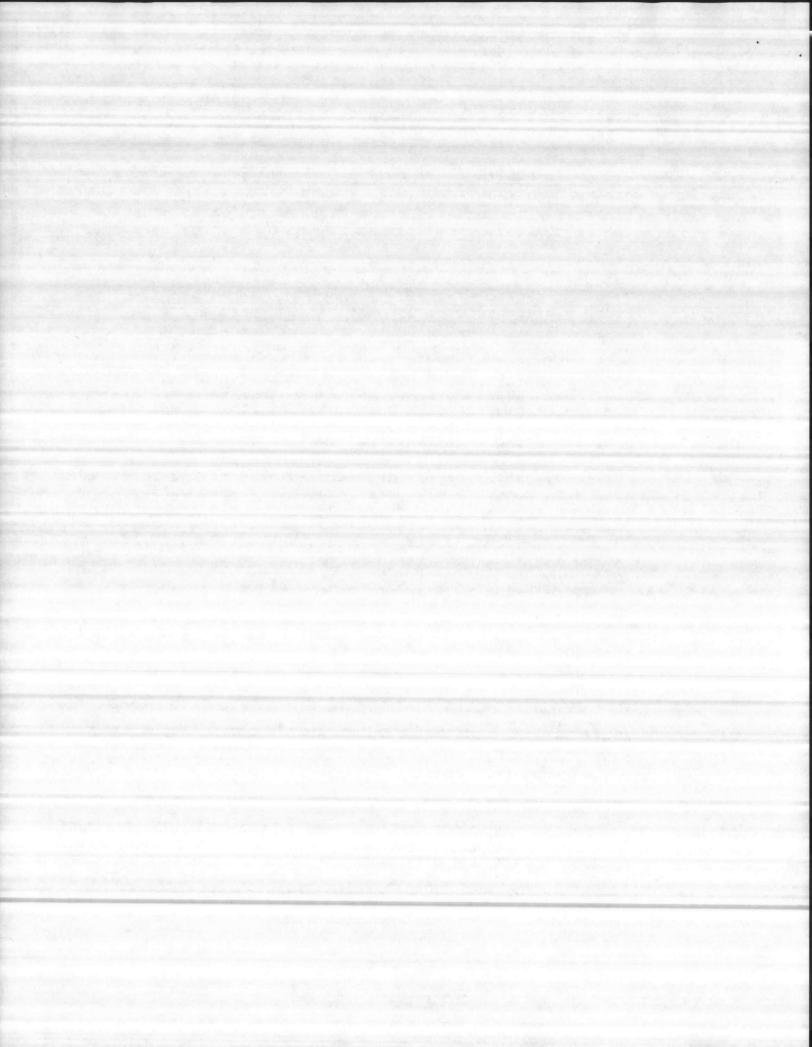
 125 F.P.M.
 .75 inches

 150 F.P.M.
 1.00 inches

13. Fume hoods shall be field convertible, from standard design to bypass type to auxiliary air by simple component replacement or addition. Change-over shall be accomplished without construction modifications and without special tools.

11.4. STANDARD VECTAIRE FUME HOODS

- 1. Shall be as described under General Requirements.
- 2. Shall be variable volume type, without bypass, with the face velocity and exhaust volume adjustable by moving the sash up and down.



NOTE: SELECT ONE

- 3. Liner shall be Resisto Roc.
- 3. Liner shall be Resisto Roc with all surfaces exposed to fumes and splashes finished with Type "F" silver gray baked plastic enamel.
- 3. Liner shall be Resisto Roc with all surfaces exposed to fumes and splashes finished with type "E" white baked plastic enamel.
- 3. Liner shall be welded, 16 gauge stainless steel, with vertical joints coved and upper horizontal joints spot welded. Interior surfaces shall be 2-B finish.
- 11.5. BYPASS TYPE VECTAIRE FUME HOODS (DUO FLOW)
 - 1. Shall be as described under General Requirements.
 - 2. Shall be constant volume type with a built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position. Bypass shall be positive in action controlled by the operation of the sash. A low impedance, directionally louvered panel shall be provided in the lintel bypass area and a one inch bypass shall be provided immediately above the work surface and directly below the bottom horizontal sash rail. As the sash is lowered, the bypass design shall limit the increase in face velocity to a maximum of four and one-half times the average face velocity as measured with the sash full open.

NOTE: SELECT ONE

- 3 Liner shall be Resisto Roc.
- 3. Liner shall be Resisto Roc with all surfaces exposed to fumes and splashes finished with Type "F" silver gray baked plastic enamel.
- Liner shall be Resisto Roc with all surfaces exposed to fumes and splashes finished with type "E" white baked plastic enamel.
- 3. Liner shall be welded 16 gauge stainless steel with vertical joints coved and upper horizontal joints spot welded. Interior surfaces shall be 2-B finish.
- 11.6. AIR FOIL FUME HOODS
 - 1. Shall be as described under General Requirements.
 - 2. Shall be constant volume type with a built-in automatic compensating bypass to maintain constant exhaust volume

