भारत सरकार
क्षेत्रीय औषध परीक्षण प्रयोगशाला
केन्द्रीय औषध मानक नियन्त्रण संगठन
(स्वास्थ्य सेवाओं का महानिदेशालय)
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
सैक्टर–39 सी, चन्डीगढ–160036
फोन नं: 0172–2688239, फैक्स नं: 0172–2636316

GOVERNMENT OF INDIA
REGIONAL DRUGS TESTING LABORATORY
CENTRAL DRUGS STANDARD CONTROL ORGANISATION
(Directorate General of Health services)
Ministry of Health & Family Welfare
SECTOR-39 C, CHANDIGARH – 160036
Tel. No: -0172-2688239, Fax- No: 0172-2636316
E-mail id: directorrdtlchd@yahoo.com

No. 3-8 /2019-20/St/Equipments/3167/19 Dated:20.12.2019

Tender notice

Subject:- Tender Rate Enquiry for supply and installation of Fume hood along with Accessories and proper exhaust system with Accessories in RDTL, Chandigarh.

Sealed Tender Rate Enquiries are invited from reputed interested and manufacturing firm(s)/distributors of Fume hood along with proper exhaust system who have been rendering/undertaking the specified work in the field of Scientific test equipment as per the specifications shown in Annexure A and B below:-

S.No.	Item Name	Specification	Qty
1.	Fume hood along with Accessories and proper exhaust system with Accessories	As per Annxeure A and B	1

2. The tenders should be submitted in sealed covers:-
   (a) The first sealed cover superscribed as **'Technical Bid'** should contain the following items:-
   (i) The Performa at **Annexure –II and III** duly filled in, along with relevant documents/information.
   (ii) Acceptance of terms and conditions as at **Annexure – I**
   (b) The sealed envelope should be superscibed with 'Tender Rate Enquiry' for supply of Fume hood along with proper exhaust system. Tender should be addressed to Director, Regional Drugs Testing Laboratory, Sector 39-C, Chandigarh within 21 days i.e. 10.01.2020 from the issue of this letter.

3. Quotation received after stipulated time & date will be rejected forthwith.

4. The competent authority in the RDTL reserves the right to amend any of the term and conditions in the tender document or reject any or all application (offers) without giving any notice or assigning any reason thereof. The decision of competent authority in this regard will be final and binding.

5. All the tenderers are requested to read and understand the terms and conditions of the contract as detailed in the Annexure – I before sending their quotations, as no change or violation of the aforesaid terms and conditions are permissible once the quotation is accepted by RDTL.

Dr. R.A.Singh
Director

Annexure-I

Terms and Conditions

1. **System should comply with the requirement of Good Laboratory practices**
2. **Vendor should provide all the testing certificate from the certified Agencies.**
3. **List of institutions/Organisations where the Fume hood has been installed should be furnished.**
4. **Vendors may inspect the site before submitting the quotation for assessments.**
5. **The shortlisted firm will have to provide the minimum 2 year warranty after the satisfactory installation.**
6. Necessary technical literature and catalogue should be forwarded along with Tender document. Any other equipment which is required and may be essential to run complete System but not mentioned in the tender document should be incorporated and quoted as a part of the system. The offer given in the Tender will be deemed to include all equipment required to effectively run the system.
7. Rates quoted for the Fume hood along with Accessories and proper exhaust system with Accessories should be inclusive of supply/ installation/freight etc. and no extra payment will be made for supply and installation of above items. Further, the number of the system may increase or decrease as per requirement of the competent authority.
8. Only manufacturing firms/authorized distributors are eligible to participate. While Submitting the Tenders, the tendering firm shall have to furnish the proof of PAN No., Service Tax No., Sales Tax No., etc. as per Annexure-II
9. The tender received after due date and time or incomplete in any respect shall be summarily rejected. However, in case of the successful tenderer, have to deposits necessary Performance Security.
10. No Advance payment would be made. Payment will be made only after installation, testing and commissioning of the systems and its successful running and satisfactory installation report to the competent authority.
11. The supply and installation of the Fume hood along with Accessories and proper exhaust system with Accessories, would be made within a **45 days** from the date of receipt of the supply.
12. The firm which qualifies in the Tender Process would be required to furnish a Performance Security to the tune of 10% of cost of the Fume hood along with Accessories and proper exhaust system with Accessories which should be valid for 14 months from the date of supply of the offer. The Performance Security will be retained in RDTL which will be returned to the concerned after expiry of the warranty period.
13. Over-writing on the quotations must be avoided. Otherwise the quotations are likely to be rejected. The RDTL reserves the right to accept or reject any tender, in whole or in part thereof without assigning/ specifying any reason (s) thereof and the decision of the competent authority in the RDTL shall be final and binding on the contractor firm.
14. All the participating firms may ensure that the Fume hood along with Accessories and proper exhaust system with Accessories is of only Genuine quality and if at any stage it is found that the item supplied is of sub-standard quality/inferior quality, the Performance Security will be forfeited and if the cost of the item is not covered from the Performance Security the same will be recovered from the supplier.
15. Tenders received after the stipulated time and date will not be accepted/considered.
16. Any dispute arising in the matter shall be resolved through an arbitrator to be nominated by the competent authority in RDTL.
17. The contract shall be subject to Indian Laws and jurisdiction of the court located in Chandigarh.

Annexure-II

PROFORMA (Technical bid)

S.No.	Particulars	To be filled by the Tenderer
1.	Name of the agency	
2.	Whether brief profile of the agency is enclosed	
3.	Detailed Office Address of the agency with office telephone No. e-mail address, Fax No., Mobile No. and name/designation of the contract person.	
4.	Whether registered with all concerned Govt. authorities (Register of companies, Commissioner Employees etc.)(Copies of all certificates of Registration should be attached)	
5.	PAN Number (copies to be enclosed)	
6.	TIN Number Registration No. (Copy to be enclosed)	
7.	Service Tax Registration No. (copy to be enclosed)	
8.	Whether a copy of terms and conditions- Annexure-I duly signed as token of acceptance of the' same is attached	
9.	Whether the firm is blacklisted by any Government Department or any criminal case is registered against the firm or its owner/partners anywhere in India (if no, an undertaking to this effect is attached in this regard.)	

(Signature of the authorized person)

Date:
Place:

Name:
Designation:
Seal:

Annexure-III

FINANCIAL BID FOR SUPPLY AND INSTALLATION OF FUME HOOD ALONG WITH ACCESSORIES AND PROPER EXHAUST SYSTEM WITH ACCESSORIES IN RDTL SECTOR 39-C, CHANDIGARH.

With reference to RDTL letter No.....dated.....Regarding tender for supply and installation of Fume hood along with Accessories and proper exhaust system with Accessories, I/we quote the rate, inclusive of supply/installation/freight etc. As under:-

S.No	Item Name/Qty	Specifications	Cost of the Fume hood along with Accessories and proper exhaust system with Accessories
1.	Fume hood along with Accessories and proper exhaust system with Accessories/ (1)		
2.	Taxes, if any		
3.	Grand Total		

IMPORTANT:
In case of discrepancy between the unit price and total price, the unit price shall prevail for computation.

Date:
Place:

(Signature of the authorized person)

Name:
Designation:
Seal:

Annexure-A

FUMEHOOD SPECIFICATION

DESCRIPTION OF WORK

1.00 STANDARD FUME HOOD PERFORMANCE REQUIREMENTS

A. Fume hoods shall be with belted counterweight sash design and adjustable LED lighting. Sash and air entry framework of the hood shall minimize eddying of air currents at the hood face, and vertical rear baffle system shall minimize turbulence and vortexes in all portions of the hood interior.

B. Standard Fume Hood Types

Constant Volume Fume Hood
1. Constant Volume Fume Hood designed to yield 80 FPM face velocity at 18" sash opening
2. Notched belt and sprocket sash system
3. LED lighting, with variable intensity and color range

C. Containment:

1. The purpose of this specification is to pre-qualify the performance of the bidder's laboratory fume hood before award of contract. At their option, owners or their representatives may require the same tests to be performed and the same performance be achieved before acceptance of the hood after award of contract. The owner or their representative shall witness the tests. Failure to meet the performance specified shall be cause for rejection of the bidder.

2. Test Method:
The hood shall be tested per the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 110-2016.

3. Location of Tests and Test Facility:

All tests referenced herein shall be performed in the bidder's fume hood test facility. Field-testing is described in Section 3.01.F. The test facility shall meet the following requirements:

a. The test facility shall have sufficient area so that a minimum of 5 feet of clear space is available in front of and on both sides of the hood for viewing tests.

b. The facility's ventilation system shall have adequate heating and air conditioning so that room air temperatures can be maintained within the desired ranges.

c. Standard room air currents in the test area shall be less than 30 FPM.

d. The hood exhaust system shall be properly calibrated so that the desired exhaust air volumes can be easily attained.

e. Make-up air to the test room shall be ceiling-supplied as in a standard chemical laboratory.

4. Instrumentation, Equipment and Test Personnel: Qualified personnel to perform the tests shall be supplied by the bidder. Instrumentation and equipment required shall be supplied by the bidder at their expense. Required instrumentation shall include but not be limited to the following items:

   a. Thermal anemometer capable of measuring air velocities from 10 to 600 ft./minute

   b. One-half minute smoke candles or other source of high volume smoke

   c. Smoke tubes or other source of localized smoke

   d. Miran 103 analyzer calibrated to indicate concentration of sulfur hexafluoride or equivalent.

   e. Flowmeter - 15 L/minute capacity

   f. Tank of sulfur hexafluoride with a two-stage regulator or other tracer gas suitable for detector to be used

   g. Adjustable mannequin, 5' 0' to 5'8" in height, with reasonable human proportions and arms hanging at its side

   h. ASHRAE 110-1995 tracer gas ejector

5. Twisting Manikin Test A manikin mounted to a twisting base will be placed in standard ASHRAE 110 position. Arms will be altered to hold objects similar in dimension to two 600 ml beakers inside the hood. Manikin twist angle will be such that at the extreme right and left rotational positions, one "beaker" is outside the sash plane. At a rotation rate of 4 cycles per minute, a four-minute run will be undertaken with a sensor in the manikin breathing zone. Average breathing zone concentration shall remain less than 0.05 PPM.

2.00 MATERIALS AND CONSTRUCTION

A. Fume Hood Superstructure Frame:

A structure of steel support members shall be provided to support exterior panels and interior liner and baffle panels. To allow for maintenance and replacements, the baffle panels shall be removable without disassembly of the frame structure and outer steel panels. Likewise, the exterior steel panels shall be removable without disassembly of the frame structure and inner liner panels.

B. Fume Hood Side Walls: Double wall ends, not more than 4.5" wide, with sash track flush with front vertical fascia, shall be provided to maximize interior working area. This fascia shall contain space for the required service controls and electrical devices. The front vertical fascia shall be in a plane 45° from the hood face and incorporate a port to provide accelerating air through the lower corners of the face opening.

C. Fume Hood Dimensions: Double wall end panel thickness shall not exceed 4.5". Interior clear working height shall be not less than 48" at any location in the interior of the hood on bench hoods. Interior depth from the back of the sash to the front of the rear baffle shall not be less than 24". The sash opening shall be not less than 28" in height above the worksurface on bench hoods.

D. Sash Support System: Fume hood sash support to employ notched belt and shaft interlocked gears. Belt to be Polyurethane with green polyamide fabric on notch side, 10mm wide x 5.6mm thick rated at 3600N tensile strength. Support system to be rated to 300,000 cycles (one cycle = one full up and one full down sash motion) without a failure. Sash support system to employ retainers to ensure sash remains level and square throughout use.

E. Fume Hood Airfoil:

Painted Steel

An 18 gauge painted steel, convergence z-cross section airfoil shall be mounted flush to the worksurface immediately in front of the sash plane. It shall nest into the port on each side, and provide no open space between it and the top front edge of the worksurface. Raised airfoils, or flush designs that create openings within the hood chamber, are not acceptable.

F. Fume hood top panel shall incorporate a dynamic barrier bypass providing a clean air stream behind the sash plane.

G. Fume Hood Baffles: The fume hood baffles shall be fixed, and constructed of the same material as the hood lining. They shall consist of multiple sections with vertical slots and a continuous horizontal slot at the worksurface. Each baffle panel shall be easily removable from the interior, without the use of tools, or requiring liner disassembly. Mechanical or manually adjustable baffles are not acceptable.

H. Fume Hood Duct Collar:

FRP

Each fume hood up to six feet in length shall contain one (1) 12" diameter FRP duct collar in the hood roof for exhausting the hood. Fume hoods over six feet in length shall contain two (2).

I. Fume Hood Lighting: An LED light fixture shall be provided in the hood roof. The light shall provide (15) intensity adjustment levels, and (3) color options. Illumination at the worksurface shall be at 100 foot-candles at the full intensity setting. The light fixture shall be isolated from the hood interior by a 1/4" thick tempered glass panel sealed from the hood cavity. Fixture shall be UL listed.

J. Sash Glass:

Laminated Safety Glass (Option G1)
Fume hood sash to be laminated safety glass.

K. Fume Hood Combination Sash: A combination sash shall be provided. The sash shall have horizontal sliding glass panels in a vertical rising steel frame. The bottom of the sash frame shall have a full length metal handle. The sash shall be counterbalanced with a single weight to prevent tilting and binding during operation. The sash shall be connected to the counterweight system with two, 1/2" wide steel-reinforced polyurethane notched belts that engage two sprocket shaft drives. The glass panels shall be top hung 1/4" laminated safety float glass mounted with metal rollers in an aluminum track.

L. Fume Hood Services: Front Mounted Remote Control Fittings: Service fitting valves shall be needle valve design and mounted on the hood front vertical fascia with the working components of the valve accessible from the hood exterior. Valves shall be furnished with molded nylon hooded handles with color-coded index buttons and color-coded service outlet.

M. Fume Hood Electrical Fixtures:

The hood superstructure shall be pre-wired and contain wire gauge, connections, fixtures and wire color coding. Wiring electrical services shall consist of two duplex receptacles and a light switch. 2 Nos. of 5/15 Amps (Make: North West), 230 Volt AC, and 3-wire polarized grounded with ground fault interruption.

The receptacles shall be of specification grade, side wired only, to insure a positive connection. The light switch shall be 5 Amps. 230 volt AC and 3-wire polarized grounded. Wiring shall terminate in one 6" x 6" x 4" service junction box located on the fume hood roof.

N. Hood Worksurface:

Black Granite:

Hood worksurface shall be 1-1/4" thick jet black granite made in the form of a watertight pan, not less than 3/8" deep to contain spillage with a 6" wide safety ledge across the front edge. A cup sink flush with the recessed worksurface shall be provided. The worksurface and cup sink shall be available in black.

O. Interior Service Access: Access to services shall be through a trapezoid shaped gasketed panel constructed of the same material as the liner. The panel shall be easily removable without the use of tools.

P. Fume Hood Liners:

Reinforced Phenolic Resin Lining: Interior liner panels shall be 1/4" thick made from a compression molded cellulose fiber reinforced phenolic resin core with integrally cured white melamine surfaces. Interior liner panels shall be fastened using stainless steel screws with plastic covered heads.

Q. Fume Hood Base Cabinets

Normal Base cabinet:

Base units under hoods shall be fabricated of Cold rolled prime grade roller leveled furniture steel. Gauges of steel used In construction shall be 18 gauges except as follows: Corner gussets for leveling bolts and apron corner braces, 12 gauges. Hinge reinforcements, 14 gauges. Top and intermediate front horizontal rails, apron rails and reinforcement Gussets, 16 gauge. Door assemblies and adjustable shelves, 20 gauge. Performance of the painted surfaces shall match that of the fume hood outer panels.

Accessories:

1. Digital Face Velocity Alarm System:

Fume hoods shall be provided with an alarm system to detect low and high hood face velocities. The alarm system shall indicate the actual face velocity of the hood regardless of sash position. The system shall have an air velocity sensor mounted on the interior side liner of the hood where it is easily accessible for cleaning. The velocity monitor shall have a digital display of the air velocity through the hood face in feet per minute. The alarm signals shall activate any time the face velocity falls below the low velocity alarm set point.

There shall be both visual and audible alarm signals. The audible alarm shall have a mute. Low and high alarm contacts shall be provided for remote monitoring. An hour-long "event timeline" detailing low velocity episodes shall be part of the alarm readout.

2. Ceiling Enclosure:

Fume hood to be fitted with a steel enclosure to fill the space between the top of the hood and the ceiling. Enclosure is to be three sided and designed and manufactured to provide a finished appearance. Front panel of enclosure is to be removable.

R. Fume Hood Finish:

After the component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.

After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components shall be individually painted, insuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

The completed finish in standard colors shall meet the performance test requirements specified under Section 2.02 A. Steel Paint Finish Performance Test Results.

2.01 PERFORMANCE REQUIREMENTS

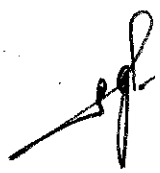
A. Steel Paint Finish Performance Test Results (Chemical Spot Tests):

1. Testing Procedure:

Chemical spot tests for non-volatile chemicals shall be made by applying 5 drops of each reagent to the surface to be tested and covering with a 1-1/4" dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals shall be tested by placing a cotton ball saturated with reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 77° ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

2. Test Evaluation:
Evaluation shall be based on the following rating system.

Level 0 – No detectable change.
Level 1 – Slight change in color or gloss.
Level 2 – Slight surface etching or severe staining.



Level 3 – Pitting, cratering, swelling, or erosion of coating.
Obvious and significant deterioration.

After testing, panel shall show no more than three (3) Level 3 conditions.

3. Test Reagents:

Test No.	Chemical Reagent	Test Method
1.	Acetate, Amyl	Cotton ball & bottle
2.	Acetate, Ethyl	Cotton ball & bottle
3.	Acetic Acid, 98%	Watch glass
4.	Acetone	Cotton ball & bottle
5.	Acid Dichromate, 5%	Watch glass
6.	Alcohol, Butyl	Cotton ball & bottle
7.	Alcohol, Ethyl	Cotton ball & bottle
8.	Alcohol, Methyl	Cotton ball & bottle
9.	Ammonium Hydroxide, 28%	Watch glass
10.	Benzene Cotton	ball & bottle
11.	Carbon Tetrachloride	Cotton ball & bottle
12.	Chloroform	Cotton ball & bottle
13.	Chromic Acid, 60%	Watch glass
14.	Cresol	Cotton ball & bottle
15.	Dichlor Acetic Acid	Cotton ball & bottle
16.	Dimethylformanide	Cotton ball & bottle
17.	Dioxane	Cotton ball & bottle
18.	Ethyl Ether	Cotton ball & bottle
19.	Formaldehyde, 37%	Cotton ball & bottle
20.	Formic Acid, 90%	Watch glass
21.	Furfural	Cotton ball & bottle
22.	Gasoline	Cotton ball & bottle
23.	Hydrochloric Acid, 37%	Watch glass
24.	Hydrofluoric Acid, 48%	Watch glass
25.	Hydrogen Peroxide, 3%	Watch glass
26.	Iodine, Tincture of	Watch glass
27.	Methyl Ethyl Ketone	Cotton ball & bottle
28.	Methylene Cloride	Cotton ball & bottle
29.	Mono Chlorobenzene	Cotton ball & bottle
30.	Naphthalene	Cotton ball & bottle
31.	Nitric Acid, 20%	Watch glass
32.	Nitric Acid, 30%	Watch glass
33.	Nitric Acid, 70%	Watch glass
34.	Phenol, 90%	Cotton ball & bottle
35.	Phosphoric Acid, 85%	Watch glass
36.	Silver Nitrate, Saturated	Watch glass
37.	Sodium Hydroxide, 10%	Watch glass
38.	Sodium Hydroxide, 20%	Watch glass

39.	Sodium Hydroxide, 40%	Watch glass
40.	Sodium Hydroxide, Flake	Watch glass
41.	Sodium Sulfide, Saturated	Watch glass
42.	Sulfuric Acid, 33%	Watch glass
43.	Sulfuric Acid, 77%	Watch glass
44.	Sulfuric Acid, 96%	Watch glass
45.	Sulfuric Acid, 77% and Nitric Acid, 70%, equal parts	Watch glass
46.	Toluene	Cotton ball & bottle
47.	Trichloroethylene	Cotton ball & bottle
48.	Xylene	Cotton ball & bottle
49.	Zinc Chloride, Saturated	Watch glass

* Where concentrations are indicated, percentages are by weight.

4. Performance Test Results (Heat Resistance):

Hot water (190° F - 205° F) shall be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.

5. Performance Test Results (Impact Resistance): A one-pound ball (approximately 2" diameter) shall be dropped from a distance of 12 inches onto the finished surface of steel panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close eye-ball examination.

6. Performance Test Results (Bending Test): An 18 gauge steel strip, finished as specified, when bent 180° over a 1/2" diameter mandrel, shall show no peeling or flaking off of the finish.

7. Performance Test Results (Adhesion): Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".

8. Performance Test Results (Hardness): The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand are valued in this way: 8-H is the hardest, and next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which is the softest). The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one-that is, the hardest pencil that will not rupture the film is then used to express or designate the hardness.

B. Fume Hood Liner Performance:

1. Chemical Spot Tests - 24 Hours:

Chemical spot test shall be made by applying 10 drops (approximately 1/2 cc) of each reagent to the surface to be tested. Each reagent (except those marked **) shall be covered with a 1-1/2" diameter watch glass, convex side down to confine the reagent. Spot tests of volatile solvents marked ** shall be tested as follows: A 1" or larger ball of cotton shall be saturated with the solvent and placed on the surfaces to be tested. The cotton ball shall then be covered by an inverted 2-ounce, wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire 24-hour test period and at a temperature of 77 degrees F. + 3 degrees F. At the end of the test period, the reagents shall be flushed from the surfaces with water and the surface scrubbed with a soft bristle brush under running water, rinsed, and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Spots where dyes have dried shall be cleaned with a cotton swab soaked in alcohol to remove the surface dye. The test panel shall then be evaluated immediately after drying.

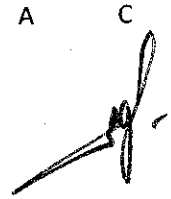
2. Legend / Ratings:

1 - MER (Modified Epoxy Resin)
2 - Glass Reinforced Polyester
3 - Stainless Steel 304
4 - Stainless Steel 316
5 - Reinforced Phenolic Resin

A = No effect or slight change in gloss
B = Slight change in gloss or color
C = Slight etching or severe staining
D = Swelling, pitting, or severe etching

3. RESULTS:

	1	2	3	4	5
1. Acetic Acid 98%	A	C	B	B	A
2. Acetone **	A	A	A	A	A
3. Acid Dichromate	A	B	A	A	A
4. Ammonium Hydroxide ** 28%	A	A	B	B	A
5. Amyl Acetate **	A	A	A	A	A
6. Benzene **	A	A	A	A	A
7. Butyl Alcohol **	A	A	A	A	A
8. Carbon Tetrachloride **	A	B	A	A	A
9. Chloroform **	A	B	A	A	A
10. Chromic Acid 60%	B	C	C	C	A
11. Cresol	A	A	A	A	A
12. Dichloroacetic Acid	A	A	B	A	A
13. Dimethylformamide	A	A	A	A	A
14. Dioxane **	A	A	A	A	A
15. Ethyl Acetate **	A	A	A	A	A
16. Ethyl Ether **	A	A	A	A	A
17. Ethyl Alcohol **	A	A	A	A	A
18. Formaldehyde	A	A	A	A	A
19. Formic Acid 90%	A	B	A	A	A
20. Furfural **	B	C	A	A	C



21. Gasoline **	A	A	A	A	A
22. Hydrochloric Acid 37%	A	A	B	B	A
23. Hydrofluoric Acid 48%	B	A	D	D	A
24. Hydrogen Peroxide 30%	A	A	A	A	A
25. Methyl Ethyl Ketone **	A	A	A	A	A
26. Methyl Alcohol **	A	A	A	A	A
27. Methylene Chloride **	A	B	A	A	A
28. Monochlorobenzene **	A	A	A	A	A
29. Naphthalene **	A	A	A	A	A
30. Nitric Acid 20%	B	A	B	A	A
31. Nitric Acid 30%	B	B	B	A	A
32. Nitric Acid 70%	B	B	B	A	A
33. Phenol ** 85%	A	A	A	A	A
34. Phosphoric Acid 85%	A	A	B	A	A
35. Silver Nitrate	B	C	A	A	C
36. Sodium Hydroxide 40%	A	A	A	A	A
37. Sodium Hydroxide 20%	A	A	A	A	A
38. Sodium Hydroxide 10%	A	A	A	A	A
39. Sodium Hydroxide Flake	A	A	A	A	A
40. Sodium Sulfide	A	A	A	A	A
41. Sulfuric Acid 77%	A	A	C	A	A
42. Sulfuric Acid 96%	C	B	C	A	C
43. Sulfuric Acid 33%	A	A	C	A	A
44. Tincture of Iodine	A	C	B	B	A
45. Toluene **	A	A	A	A	A
46. Trichlorethylene **	A	A	A	A	A
47. Xylene **	A	A	A	A	A
48. Zinc Chloride	A	A	B	A	A
49. Nitric 70%/Sulfuric Acid 77%*	B	B	B	A	A

*Equal parts of Nitric Acid 70% and Sulfuric Acid 77%.
**Indicates these solvents tested with cotton and jar method

2.0 MATERIAL OF CONSTRUCTION

Fume Hood superstructure :	18 gauge CRC Sheets, Electrode position Powder coated 60-80 micron
Table top :	32 mm Jet Black Granite Table top
Electrical sockets :	PVC
Gas fixtures :	Brass Lacquer Coated
Gas piping :	SS304
Vacuum Fixtures :	Brass Lacquer Coated
Vacuum Piping :	Copper/SS/PP
Water fixtures :	Brass Lacquer Coated
Water Piping :	Brass Lacquer Coated
Electrical cables :	Copper wire with PVC Sheath

3.0 APPLICABLE CODES & STANDARDS:

ASHRAE Standard 110-2016 - Laboratory Fume Hoods	Method of Testing Performance of
NSF STD#49 -	Photometric Method of Testing
NIH03-112C -	National Institute of Health Specification
UL -	Underwriters Laboratories
ASTM D552 -	Bending Test
NFPA-45 -	National Fire Protection Association

Special Note:

- Drain line from cup sink to main drain line will be in the Plumbing contractor scope.
- Water & Gas tie to the pre-piped hood tubing (Tube size is 3/8") with connector will be Gas tubing Contractor.
- Incoming Single phase Raw power to the Fume hood DB (Distribution Box) and Tie to the DB will be Electrical contractor scope.

Annexure-B

EXHAUST SYSTEM SPECIFICATION

CENTRIFUGAL PP EXHAUST FAN

The exhaust fans supplied and installed shall be of 'Centrifugal Corrosion Resistant' type and shall be capable of delivering the design flow rate against all duct losses.

The fans shall be robust in construction and suitable for continuous duty operation. It shall be mounted with ease of maintenance and shall be installed with proper vibration isolators to minimize vibration transmission to ductwork and support structure.

Fans selected shall be silent and vibration free when running and suitable for outdoor use and shall not exceed 3000rpm.

Aerodynamic performance of the fan shall be tested and comply **'ISO 5801'** standards.

Sound level shall be tested and comply with **'ISO 5136.2'** standards.

The casing shall be of self-supporting design, thermoformed welded by machine. The material of construction shall be **polypropylene (PP)** and suitable for use against corrosive 'medium' and a maximum allowable operating temperature of 70°C.

No metal parts shall be exposed and in contact with the airstream.

Impeller material of construction shall be **polypropylene (PP)** and suitable for use against corrosive.

Electro-galvanized stand shall be used to support the fan and the motor in view of the corrosive environment.

A standard hub seal shall be fitted onto the impeller hub to prevent the corrosive 'medium' from contacting the shaft.

MOTOR AND ACCESSORIES

The standard TEFC electric motor shall be with class 'F' insulation and class 'B' temperature rise. Motor shall be suitable for outdoor installation with IP55 protection and suitable for operation with 415V/3Ph/50Hz electrical supply. Motor shall be flange mounted (B5) or foot mounted (B3) based on the fan configuration.

PP/FRP DUCTING:

a. PP means PPGL: One side smooth & glassy finish and other end is mat finish.

- The smooth surface should be the inner surface of the duct.

- On mat side, FRP lining to be done.
- 25 mm x 25 mm Stitch welding is done on inner surface and continuous welding on outer surface with 5 mm welding thickness.

b. FRP Lining to be done on the outer surface of PPGL I.e. on mat side.

- One layer FRP is one mm.
- The final layer should be with fine mat to have smooth and good finish.
- While making the lining, there should not be any air pockets or any sort of Uneven finish.
- There should be time gap between the FRP layers, allowing each layer to be got dried.

c. Isothelic resin to be used.

d. The flange thickness should be 1.5 times of the duct thickness up to 750 mm and 2 times above 750 mm ducting.

e. All flanges are to be matched with M8, GI fasteners and flat washers on both the sides.

f. All the flanges should have fasteners at the 4 corners.

g. All the fasteners to be fixed at a pitch distance of between 125 mm to 150mm.

h. All the flanges should be properly ground and dressed.

i. Duct support distance should not be more than 2500 mm.

j. Any duct length should not be more than 3600 mm.

k. All square / rectangular ducts with more than 1800 mm length should have a brazing frame at the center on the external surface.

l. Provide 40 x 40 flanges up 750 mm duct size and 50 x 50 above 750 mm.

m. The finish paint should be admiral grey unless specified.

n. 5 mm Thick Neoprene gasket shall be used between the flanges.

PP DAMPERS

Dampers shall be double thickness heavier than the thickness of the large duct & shall be rigid in construction.

The volume control dampers shall be of an approved type , lever operated & complete with locking devices which will permit the dampers to be adjusted & locked in any positions.

Construct blades of 5 mm thick PP MOC, provide heavy-duty molded self-lubricating nylon bearings, 13mm (1/2") diameter Plastic axles spaced on 225mm (9") centers. Construct frame of 300 mm diameter outer with Flange for fitting minimum 6 bolts and nuts.

PVC FLEXIBLE HOSE

Provide flexible duct connections wherever ductwork connects to vibration isolated equipment and on all exhaust final connections to fume hoods, spot extractor and canopy as indicated on the drawings. Construct flexible connections of PVC coated collapsible hose clipped into duct and equipment to make air-tight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse and torsional movement and also capable of absorbing vibrations of connected equipment.

Flexible connections shall be air tight and resistant to water and fire.

Flexible connections shall be fitted to isolate fans from equipments and/or ductwork. The connections shall be arranged to permit the renewal of the connection without disturbing the duct work or the plant.

DUCT SUPPORT SYSTEM

A complete supporting system consisting of fully threaded rods, double L bottom brackets nuts, Washers, clamps for circular ducts and anchor bolts as supplied.

To provide the required thermal brake effect, Neoprene or equivalent material of suitable thickness shall be used between duct joints.

Bird screens

Galvanized woven mesh or weld mesh bird screens in rigid galvanized iron frames shall be installed behind all external louvers and over all relief and exhaust air openings to the outside of the building.

Special Note:

- Blower Electrical Panel & provision to fix the VFD is in Electrical contractor scope.
- Electrical cabling from Blower electrical panel to Blower motor will be in Electrical contractor scope.
- Push button for Blower on/off should be provided in Blower Electrical Panel.
- Any Civil wall cutouts for Ducting, Civil foundation for Blower will be in Civil contractor scope.
- Requirement of Scrubber will be decided by Client; accordingly blower should be designed.
- If required, the technical committee may visit for site inspection.